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SOFTWARE DESIGN SPECIFICATION

PART II:

ORBITAL FLIGHT TEST (OFT) DETAILED DESIGN SPECIFICATION

VOLUME III – APPLICATIONS: BOOK 2 – SYSTEM MANAGEMENT

PREPARED BY IBM UNDER NAS 9-14444

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SPACE SHUTTLE ORBITER AVIONICS SOFTWARE

SOFTWARE DESIGN SPECIFICATION

PART II:

ORBITAL FLIGHT TEST (OFT) DETAILED DESIGN SPECIFICATION

VOLUME III - APPLICATIONS: BOOK 2 - SYSTEM MANAGEMENT

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PREFACE

This issue of the Systems Management (SM) Detailed Design Specification and its updates supercedes all previous editions and meets the requirements specified in the applicable documents listed in Section 1. The Remote Manipulator System (RMS) design specification is a part of this document. Sections 1, 2, 3.1, 3.2.1 and the various appendices also contain information about RMS and its relationship to the SM major function.

Questions about the technical content of this document should be directed to Ray Napier, MC77, IBM Corporation, 1322 Space Park Drive, Houston, Texas, 77058 (713-333-7442). Questions specifically about RMS functions should be directed to Wes Nickodemus, same address, phone 333-7650.

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1. INTRODUCTION

Systems Management (SM) software provides the user a means to monitor vehicle subsystems during on-orbit phases. Information related to the vehicle subsystem health and status is provided to the user through automatic fault detection, performance data readouts, and configuration status displays. Vehicle subsystem management is accomplished by user assessment of information provided by SM and subsequent user actions to affect vehicle configuration. SM also performs special computations and sequences to provide additional information and to provide assistance in the maintenance of several vehicle subsystem.

Data monitored includes Operational Instrumentation (OI) data from the PCM Master Unit, data from the Payload MDM's (includes midbody MDM's), and software generated data.

In addition to the monitoring of the vehicle subsystem, SM software provides the user the capability to update parameters which control SM processing.

The purpose of the SM portion of this document is twofold: (a) to define the functions to be performed by the SM application software and (b) to describe at a detailed level the design employed to accomplish these functions. To achieve this, the remainder of the SM portion of this document is organized into two sections. Section 2 defines the control structure of the SM application. Section 3 describes the design of the SM application and is organized as follows:

a. Section 3.1 - Overview of the SM application

b. Section 3.2 - Detailed descriptions of the Operational Sequences (OPS) control segments and the cyclic processes they control.

c. Section 3.3 - Detailed descriptions of the SM Specialist Function (SPEC) control segments and all the display controlled "on-demand" processes that are invoked by either an OPS or SPEC control segment as a direct result of an item entry to a display.

Sections 3.2 and 3.3 describe each processing element (module) in the SM application. Each description consists of text, an input/output table (Module Data List) and a structured control flow diagram.

The text provides a narrative description of the flow through the module (paragraph C - process description) and other information pertinent to that process and its interfaces to other processes.

Control flows describe the processing flow of a module and reflect the level of detail as specified in the SM level B CPDS, SM level C FSSR part B or RMS level C FSSR Volume 1, as appropriate.

Module Data Lists provide a tabular list of parameters required to control the processing flow and provide additional information about those parameters as follows:

Item Number - Items are sequentially numbered for reference purposes.

Item Name - A generic (English) title for the parameter. This name is the same as that used in the control flow and the various appendixes.

Descriptor - A reference to a full description of the parameter in an appendix. If the parameter is table resident in an SM compool, it is further described in Appendix A. If it is locally declared or a CALL LIST parameter, it is further described in Appendix E. Additionally, interprocess variables are further described in Appendix D.

Activity Type - denotes usage of parameter

- I - Input
- O - Output
- L - Locally declared variables
- C - Locally declared constants
- Z - Compool Constant
- R - Input interprocess or hardware parameter
- W - Output interprocess or hardware parameter

Source/Destination - Specifies the external modules which reference the data. The three character ID's (see Table 1-1) of all modules supplying (inputs) or receiving the parameters are specified. Additionally, Downlist (DL) or CRT Display (CRT) may be specified as a destination in this column to indicate the parameters are available for Downlist and/or CRT display. Uplink Processor (SUL) and I-Load (ILD) may be specified as a source in this column.

HAL Name - The HAL name/Assembly Language name assigned to the parameter (include Assembly Language aliases, if applicable). Naming standard are specified in the Space Shuttle Orbiter Avionics Software Programming Standards Document. The third character of non-local (functional) data has a unique identifier for each functional area within an FSW application. The functional IDs for the SM application (excluding RMS) are listed in Table 1-2. The Programming Standards document does not define a convention for local data. However, SM adheres to the following local data standard:

- Locally DECLARE'd data will begin with the three character ID of the module using the data (i.e., data local to PM control will be of the form SPM_X....X).

- Local TEMPORARY data will have no standard convention, but should have a name descriptive of its use.

MML - The Master Measurement List number specified in the Level B or C requirement for the parameter. If no MML is specified, the column is blank.

Requirement Symbol - The symbol used in the Level C requirements to denote the parameter. If none is specified, the column is blank.

Appendixes A - E provide the following information:

A - Data Base Definitions - a description of the tables contained in the SM compools.

B - I/O Data Tables - Description of data tables for non mission-dependent I/O.

C - Traceability Matrix - A two-way cross reference (requirements to SDS section, SDS section to requirements).

D - Interprocess Variables Definition - Lists variables which are referenced at two or more priority levels and the three character ID's (see Table 1-1) of the modules which update or reference them. If the module listed is assuming the priority of some other process, the three-character ID of that process is listed in parentheses following the ID of the module. Where control over how the variables are updated and referenced is necessary, e.g., to maintain time homogeneity, this control is discussed.

If two or more variables share the same table locations, references, and controls, these variables are listed as one group. A reference to the appendix describing the variable is listed with each location.

No attempt is made to list all variables which are asynchronously referenced by the cyclic display processor.

E - Data Item Descriptor - Variables in the Module Data Lists that are not listed in Appendix A. (i.e., not SM Compool resident). This appendix is organized by SDS section number. The item # in Appendix E corresponds to the item # for that entry in the respective section's Module Data List.

The following documents were used in preparation of this version of the System Management Flight Software Detailed Design Specification.

Applicable Documents

a. Space Shuttle Program Orbiter Project Computer Program Development Specification, Volumn I, Book 7, "OFT System Level Requirements, Software (Level A)", SS-P-0002-170.

Volume 5, Book 3 "OFT Functional Level Requirements Systems Management (Level B)", SS-P-0002-530I July 27, 1979.

Space Shuttle Orbiter Flight Test Level C Functional Subsystem Software Requirements Systems Management Part B - Section 6, October 16, 1978.

b. Space Shuttle Orbital Flight Test Orbiter Avionics Software Design Specification, Volume I, "Software System Overview"
Volume II, "Systems Services"
Part 1 Flight Computer Operating System (FCOS)
Part 2 User Interface (UI).
Part 3 System Control (SC)
Volume III, "Applications"
Part 1 Guidance, Navigation and Control (GNC)
Part 3 Vehicle Utility

c. SM Offline Preprocessor, Detail Design Specification

d. RMS Level C FSSR, SD 77-SH-0002A, 12-15-78.

e. Display & Controls Level C FSSR, SD76-SH-002, 12-15-78.

SM DRs, CRs, and PCRs

DR	36014	Illegal Entry on DEU4 Following Common Set FTS
DR	35864	Fuel Cell Purge Termination Logic
DR	35852	SIV Flag Incorrect After SM2 Recall
CR	19918	Fuel Cell Purge Termination Logic
CR	19825	PBD Command on Change Only
CR	19821	PBD Single Point Failure Channelization Change
CR	12863	KU Band Acquisition Sequence Change
PCR	36187	Uplink Data Control

RM DRs, CRs, and PCRs

CR	19195B	CNTL IO CLEANUP
CR	19262B	MT6 DR2
CR	19310A	IO TABLE INCONSISTENCIES
CR	19313	COMP OF EE TO STR MATRIX
CR	19314	2N FILTER SING CAUTION
CR	19316A	TEMP DATA INITIALIZATION
CR	19317	TEMP CONV WITH 2 ARMS
CR	19368A	MSID NBR COMPLETION

CR	19423A	RMS DOWNLIST RQMTS STS 2
CR	19508	TEST WORD CHECKING
CR	19510	STATE CHG FOR VERNIER
CR	19512	HCCF CURRENT LIMITING
CR	19515	POSITION ENC BIAS CORR
CR	19522	PHASING II
CR	19523B	PARAMETER VALUES/RANGES
CR	19524	MANUAL-IDLE-MANUAL TRANS
CR	19526	REL/DERIG CK CORRECTION
CR	19527A	CONSISTENCY CK INHIBIT
CR	19551	MOD TO D/L CR 19423A
CR	19633	CORR TRNSF OF VEEPORSEL
CR	19652A	RUNAWAY JNT CONSIS CHECK
CR	19783A	MSID ASSIGN-CR INCORPORATION
PCR	31648	RAISE RMS MCIU PRIORITY

ALPHABETICAL LISTING OF THREE CHARACTER ID'S

NAME	PROCESS	SECTION
DMP	MASS MEMORY MESSAGE PROCESSOR	3.3.7.3
RAS	AUTOMATIC SEQUENCE PROCESSOR	3.3.8.10
RCD	MCIU DECODER	3.3.8.5
RDD	DEDICATED DISPLAY	3.3.8.17
REX	RMS EXECUTIVE	3.3.8.4
RFP	POSITION HOLD	3.3.8.13
RHM	HEALTH MONITOR	3.3.8.14
RIT	TEMPERATURE PROCESSOR	3.3.8.15
RJS	HAND CONTROLLER	3.3.8.8
RKG	KINEMATIC DATA GENERATOR	3.3.8.6
RMC	RMS SPECIALIST FUNCTION CONTROL SEGMENT	3.3.8.1
RNC	MCIU ENCODER	3.3.8.16
RPO	RESOLVED POSITION ALGORITHM	3.3.8.9
RQC	INPUT PROCESSING AND CONFIGURATION DETERMINATION	3.3.8.18
RRP	RESOLVED RATE PROCESSOR	3.3.8.11
RSC	SINGLE JOINT CONTROL	3.3.8.7
RTV	TOTAL VELOCITY	3.3.8.12
RUD	RMS ITEM PROCESSOR	3.3.8.2
RVM	CONSISTENCY AND ENCODER CHECKS	3.3.8.21
RWP	POSITION HOLD CHECKS	3.3.8.20
RXY	CONFIGURATION INITIALIZATION	3.3.8.19
RYE	DATA CONVERSION PROCESSOR	3.3.8.3
SAM	ANTENNA MANAGEMENT ITEM PROCESSOR	3.3.4
SBD	PAYLOAD BAY DOORS ITEM PROCESSOR	3.3.5
SBS	BACKWARD SCALING	3.2.1.8
SCI	SCM INITIALIZATION/CLEANUP	3.3.2.3
SCM	SUBSYSTEM CONFIGURATION MANAGEMENT PROCESS	3.3.2.2
SCS	SCM SPECIALIST FUNCTION CONTROL SEGMENT	3.3.2.1
SDA	BASIC DATA ACQUISITION	3.2.1.3.1
SFD	FAULT DETECTION AND ANNUNCIATION	3.2.1.6
SFS	FORWARD SCALING	3.2.1.7
SGA	GENERAL DATA ACQUISITION	3.2.1.3.2
SI1-SI4	PAYLOAD CONTROL INITIALIZATION/CLEANUP	3.3.6.3
SLS	COMMUNICATION INSTRUMENTATION SPECIALIST FUNCTION CONTROL SEGMENT	3.3.3.1
SM2	ORBIT/DOORS (OPS2) CONTROL SEGMENT	3.2.1
SPC	PAYLOAD CONTROL ITEM PROCESSOR	3.3.6.2
SPM	PERFORMANCE MONITOR CONTROL	3.2.1.4
SPP	PRECONDITION PROCESSING	3.2.1.5
SP1-SP4	PAYLOAD CONTROL SPECIALIST FUNCTION CONTROL SEGMENT	3.3.6.1

Table 1-1

SSA	APU FUEL QUANTITY	3.2.1.12
SSB	PAYLOAD BAY DOORS	3.2.1.20
SSC	FUEL CELL PURGE	3.2.1.18
SSD	SPECIAL PROCESSES DATA ACQUISITION	3.2.1.10
SSF	FUEL CELL COMPUTATION	3.2.1.13
SSH	HYDRAULIC WATER BOILER QUANTITY	3.2.1.14
SSM	ANTENNA MANAGEMENT	3.2.1.22
SSN	O_2/N_2 QUANTITY	3.2.1.15
SSO	SPECIAL PROCESSES DATA OUT	3.2.1.11
SSP	SPECIAL PROCESSES EXECUTIVE	3.2.1.9
SSR	RECORDER TAPE POSITION	3.2.1.17
SSS	STANDBY WATER COOLANT LOOP TEMPERATURE CONTROL	3.2.1.21
SST	HYDRAULIC FLUID ON-ORBIT TEMPERATURE CONTROL	3.2.1.19
SSW	H_2O PUMP DELTA PRESSURE	3.2.1.16
STC	TABLE MAINTENANCE CYCLIC PARAMETER UPDATE	3.3.1.3
STM	TABLE MAINTENANCE PROCESS	3.3.1.2
STS	TABLE MAINTENANCE SPECIALIST FUNCTION CONTROL SEGMENT	3.3.1.1
SUL	SM UPLINK PROCESSOR	3.2.1.23
S2I	OPS 2 INITIALIZATION/CLEANUP	3.2.1.1
VMM	MASS MEMORY READ/WRITE SPEC CONTROL	3.3.7.1
VMP	MASS MEMORY READ/WRITE SPEC ITEM PROCESSOR	3.3.7.2
VCY	GTS CYCLIC UPDATE PROCESSOR	3.3.3.3
VTF	TELEMETRY FORMAT LOAD PROCESS	3.3.3.4

Table 1-1 (Cont'd.)

FUNCTIONAL ID ASSIGNMENT

FUNCTIONAL AREA	FUNCTIONAL DATA ID
Basic Processes	A
Table Maintenance	T
SCM	C
Payload Control	P
APU Fuel Quantity	Q
Payload Bay Doors	B
Fuel Cell Purge	U
Fuel Cell Computation	F
Hydraulic Water Boiler Quantity	H
Antenna Management	M
O_2/N_2 Quantity	N
Recorder Position Tape	R
Standby Water Coolant Temp Control	L
Hydraulic Fluid Temp Control	O
H_2O ΔP	W
Special Process	S
Uplink Processor	V
Common (multi-area)	Z

Table 1-2

2. FUNCTIONAL DESCRIPTION

The Systems Management structure consists of three major functions: Basic SM Processes, Special Processes, and Display and Uplink Controlled Processes. The functions and the major processes included in each are shown in the hierarchy diagram in Figure 2-1.

Basic SM Processes acquire data from the various vehicle subsystems and monitor this data to provide fault detection and warning in the event of a vehicle subsystem failure. Data Acquisition acquires the data and makes it available for further processing. Performance Monitoring provides the control for Fault Detection and Annunciation (FDA), and Precondition Processing (dynamic limit selection for FDA processing).

Special Processes, under the control of a Special Processes Executive, provides specialized computations and processing sequences to determine and control the status and performance of various vehicle subsystems. Vehicle subsystems data necessary for Special Processes is acquired by Special Processes Data Acquisition and made available to Basic SM Processes. Error conditions determined as a part of computations or sequences are annunciated from the Special Processes.

Display and Uplink Controlled Processes provide functions which can be used to initiate, alter, or terminate certain processing within Basic SM Processes and Special Processes. Some of these functions provide the onboard capability to modify certain tables used by SM Processes. Display and Uplink Controlled Processes consists of Table Maintenance, Subsystem Configuration Management, Communications Instrumentation, Antenna Management, Mass Memory Patch, Payload Bay Doors, Payload Control, the Remote Manipulator System, and the Uplink Processor.

A more thorough functional description of Systems Management may be found in the Design Overview, Section 3.1.

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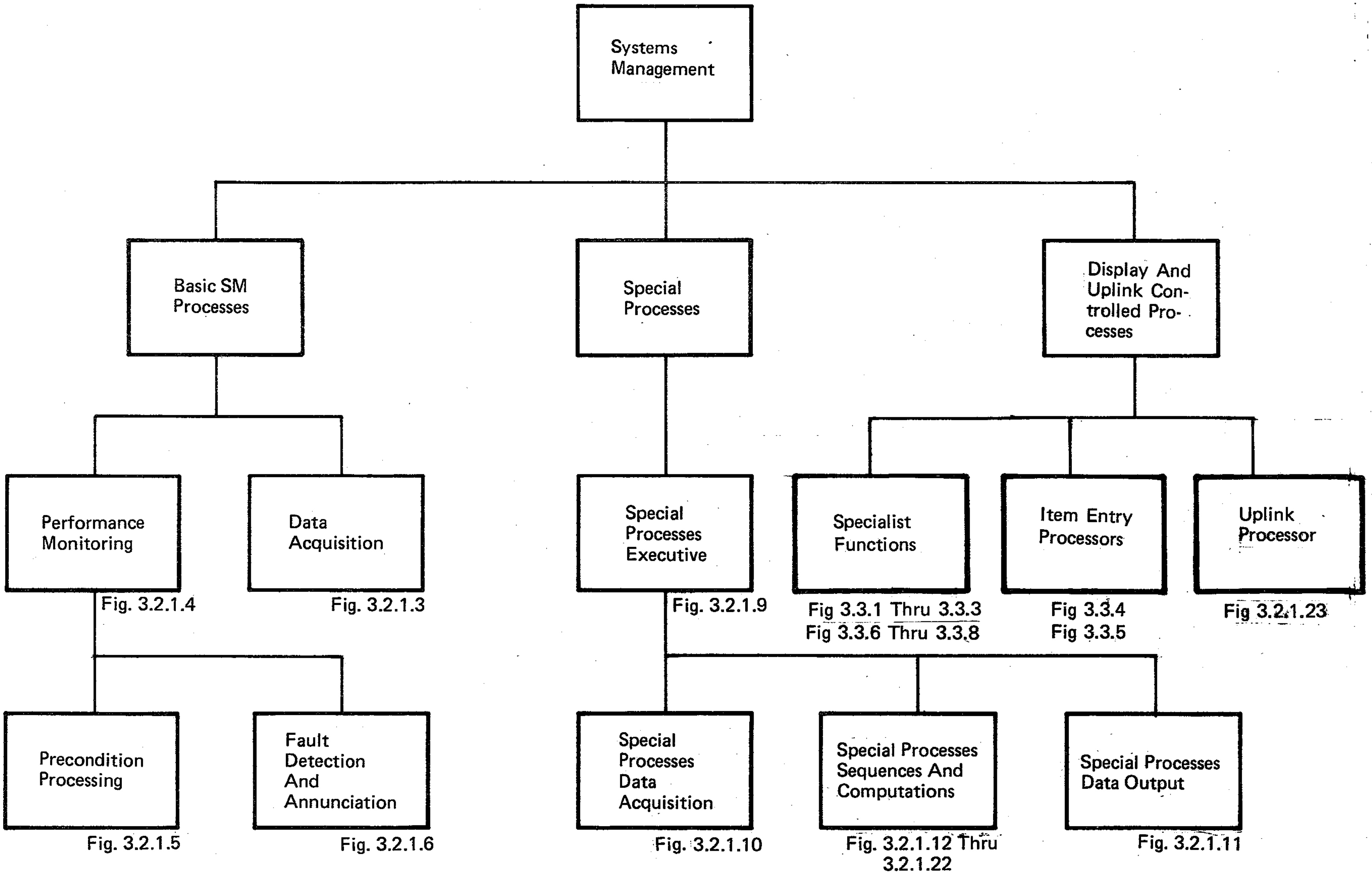

Figure 2-1. Systems Management Hierarchy Diagram

3. SOFTWARE DESIGN

This section describes the SM software processing elements. The emphasis in the presentation is on describing the design of the SM application processing elements, the tables used, and the control and interface relationships. As such, a major part of this section is a series of structured control flow diagrams. Each diagram has descriptions which detail the process and tables which list process inputs and outputs. Prior to presenting the processing elements, high level design consideration, assumptions, and structure (tables and processing elements) are discussed.

3.1 DESIGN OVERVIEW

3.1.1 Design Consideration

The Systems Management software is designed to operate within the framework of the overall Orbiter Flight Program design. The SM design is influenced and constrained by the System Software designs to ensure accurate and efficient interfaces with the system services. The FCOS provides the services for all I/O operations and supervises the timing and execution of SM software components. The User Interface software provides the service functions by which the user communicates with the SM software. System Control software initializes the AP101 GPC software to a point where the SM software can be activated.

The SM software design is also influenced by organization of processes into Operational Sequences (OPS) and Specialist Functions (SPEC). Control segments, the software implementation of OPS and SPEC, centralize the structure of the software at a high and visible level. The segment design is determined by which functions are valid for a particular OPS or SPEC. The control segment determines the sequencing of functions within the OPS or SPEC based on user input, time or events. The SM OPS and SPEC structure is described in Section 3.1.4.

Another consideration influencing the SM design is the decision to divide the processing into Basic SM Processes, Special Processes, and Display and Uplink Controlled Processes. This decision allows the OFT design of the Basic SM Processes to resemble the ALT design so that minimal changes are required to reflect additional OFT requirements and so that new code for Special Processes and Display Controlled Processes may be developed independently from modifications to existing code. This decision also leads to easier CPU load balancing of the cyclic processes included in SM (Basic SM Processes and Special Processes). Figures 3.1.1-1 and 3.1.1-2 are an example representation of how this load balancing could be accomplished. The actual process ordering and offsets are determined using performance data obtained from executing the actual code.

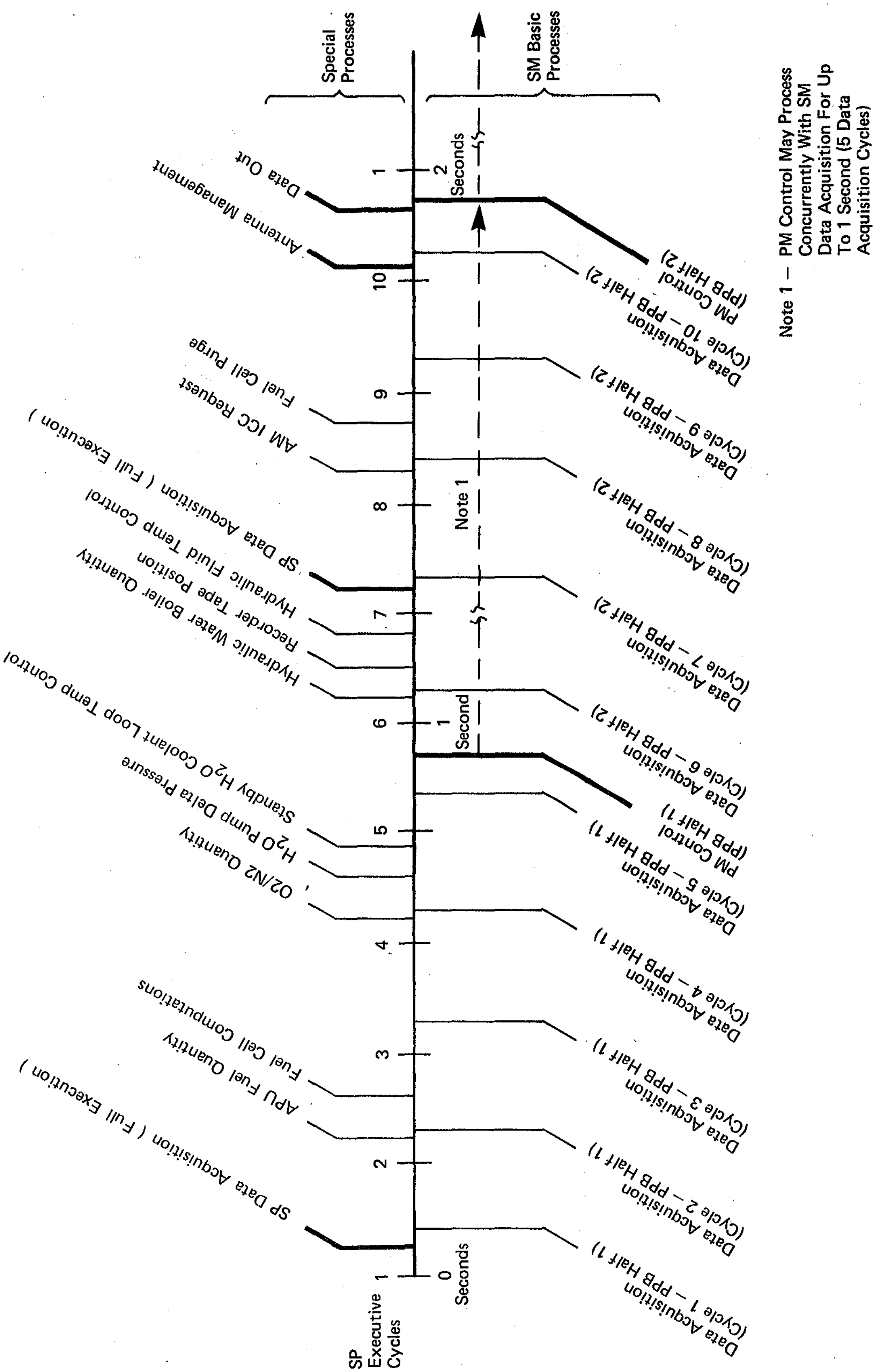

Figure 3.1.1-1. Sample Load Balancing - SM OPS 201

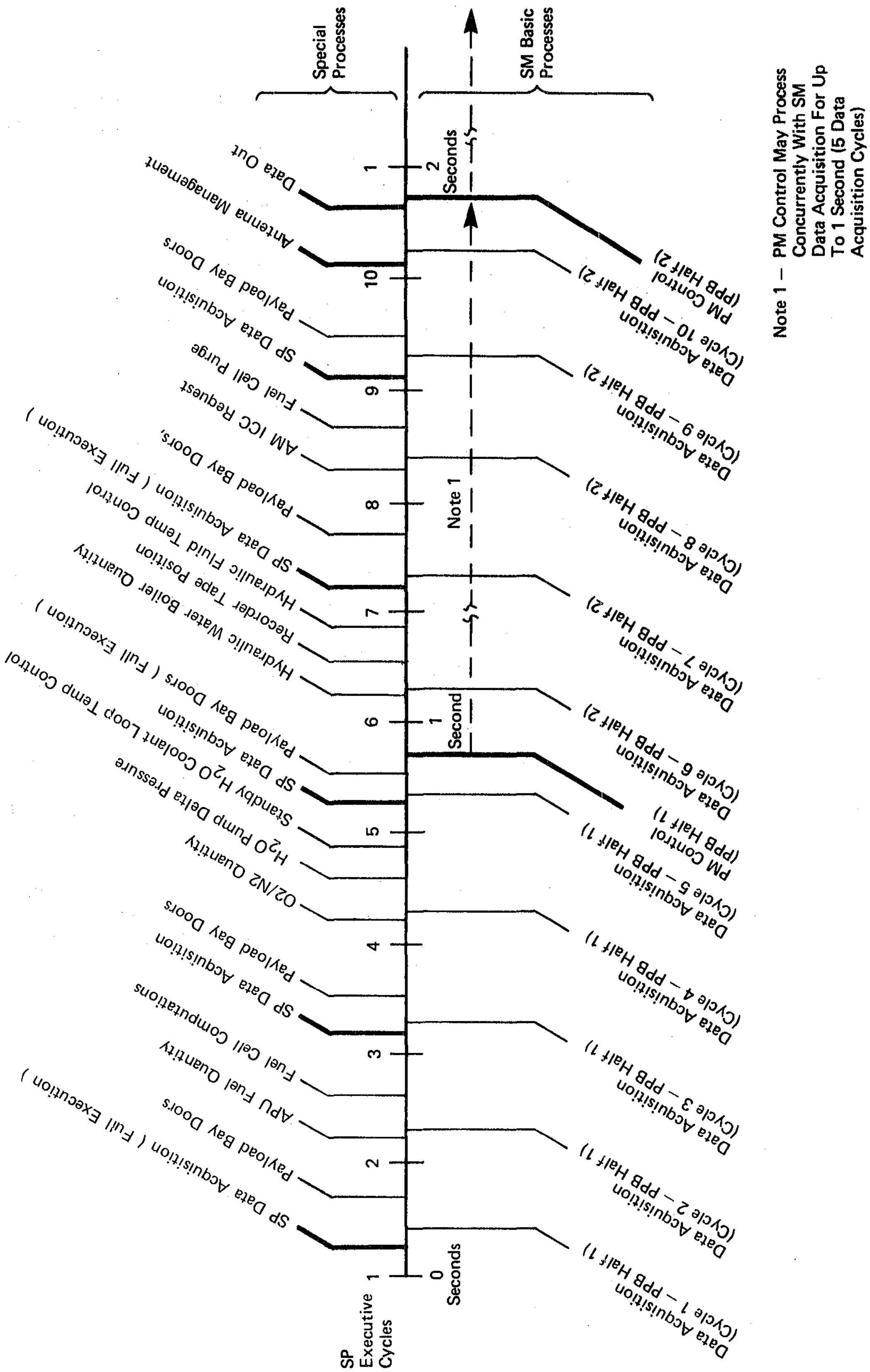

Figure 3.1.1-2. Sample Load Balancing - SM OPS 202

A final consideration which influenced the SM design is the utilization of a table driven approach. This approach is employed for two reasons. First, Basic SM Processes consist of cyclic processing of input parameters utilizing repetitive logic with parameter unique processing control data. With the table driven design, generalized processing routines can be coded which process many parameters based on the table resident control information for each parameter. This method prevents coding similar logic for each parameter to be processed, thereby reducing memory requirements. The second reason for adopting the table driven design is to accommodate the requirement to allow the changing of the processing control data on a parameter basis inflight via keyboard and on a system basis during ground turnaround operations.

3.1.2 Design Assumptions

This section lists assumptions made in the SM design. The purpose in listing the assumptions is to make visible specific items which if determined to be invalid would impact the design. Additional assumptions which apply across the total Orbiter Flight Program are identified in Volume 1.

a. SM processes use "current values" and do not ensure time homogenous data (except for interprocess data with homogeneity requirements).

b. All discretes within an acquired word are acquired at the same sample rate; that rate being the highest rate specified for any one discrete in the word.

c. All parameter samples acquired for Basic SM Processes are processed.

d. Channelization data for parameters used in special processing is not mission-dependent.

e. Data is not acquired from serial channels for Basic SM Processes or Subsystem Configuration Management (SCM). However, data acquired from serial channels for Special Processes is available in the SM COMPOOL to Basic SM Processes and to SCM.

3.1.3 SM Table Structure Overview

In a table-driven design, the tables are an integral part of the software and key to understanding the design is to understand the tables and how they 'control' the process. Significant table attributes which must be understood are function, content, organization and relationships between the tables and the processes. Content relates to whether the table contains control information or data. Organization defines the structure and substructures of entries within the table. An example organization would be by parameter sample rate and then by parameter type. Relationships between the tables relates mainly to how reference is made to the tables by the processes.

An overview of the SM tables and buffers and their relationships is shown in Figures 3.1.3-1 through 3.1.3-3. Tables contained within the dashed blocks are associated with the indicated process or function group. Those tables not enclosed are common to many processes and cannot be associated with any particular process. Tables connected by solid lines have a direct index or reference relationship. A table pointing to another (as depicted by the arrow) has an address or an index into the table being pointed to. Tables connected by dashed lines are similarly organized and thus do not require a direct index.

Appendix A.2 describes each table. Reference should be made to these descriptions as the process descriptions and control flows are studied. Particular attention should be given to the organization of entries within the table. For example, if the first level table organization is by parameter type, the process is controlled accordingly. A secondary organization within the table (i.e., by sample rate) will represent a 'nested' control loop within the process being described.

Many of the SM tables contain data that may change from mission to mission. These tables are generated by an offline table preprocessor (refer to the SM Preprocessor Detail Design Specification). The Preprocessor initializes certain variable data items to a required state. For example, the parameter I/O status bits in the CDA are initialized to ensure that invalid Parameter Status Indicators are initially displayed for all parameters. The Preprocessor also generates certain buffers because the structure of these buffers is determined by the content or organization of the tables.

Linkages between the tables/buffers (the Preprocessor output) and the SM executable code are resolved via a 'system build' process performed in the Software Development Laboratory (SDL).

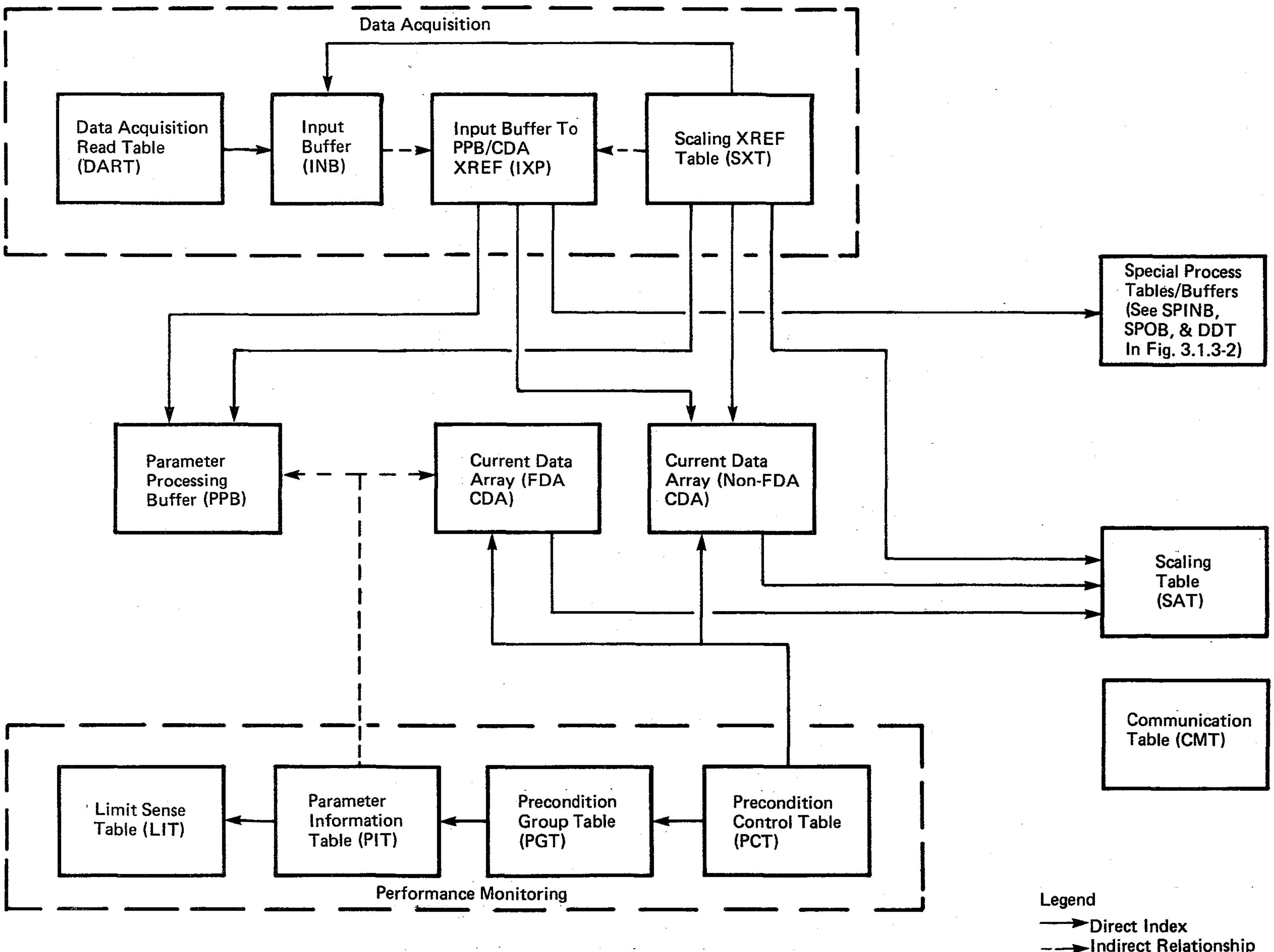

Figure 3.1.3-1. Basic SM Processes Table/Buffer Relationships

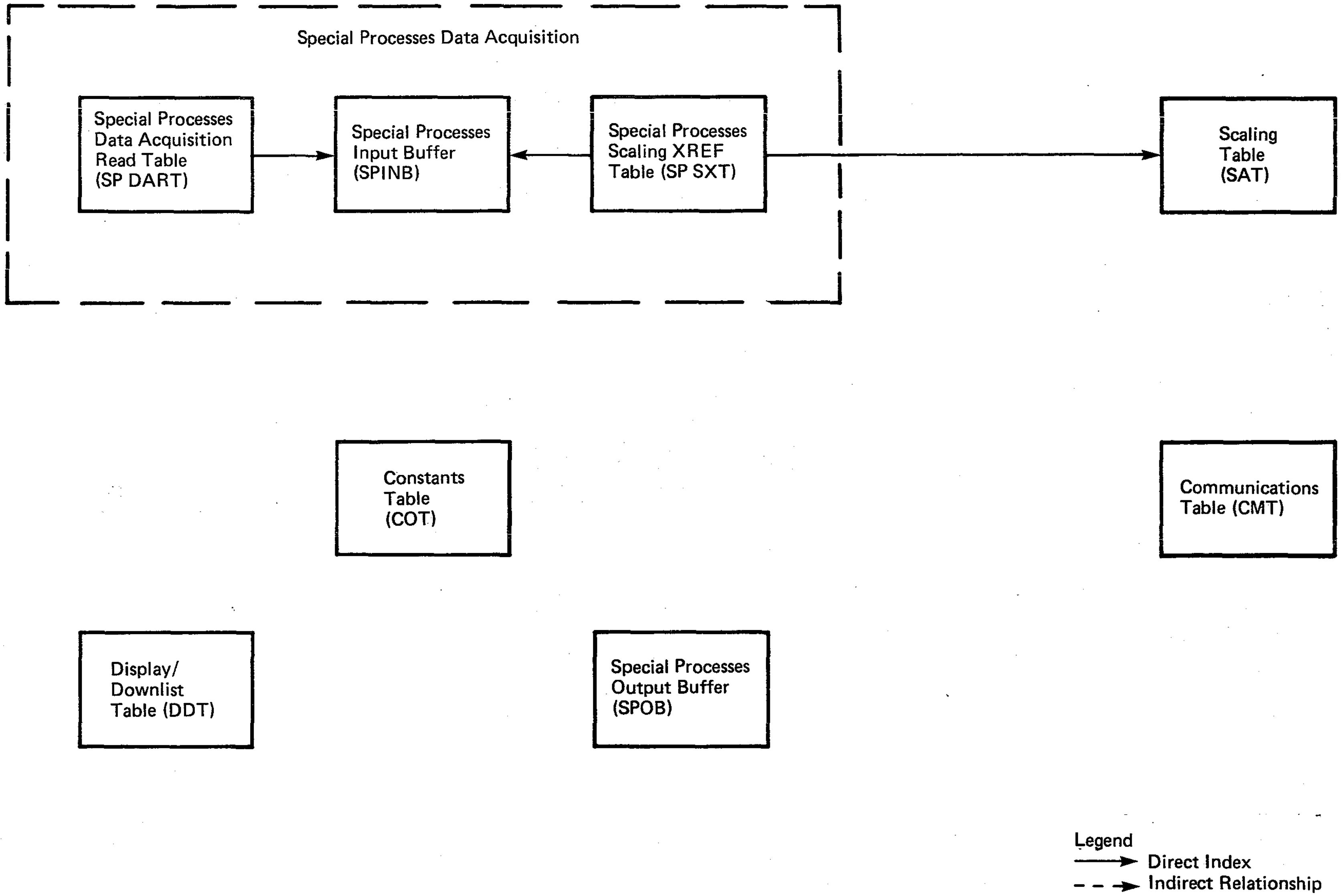

Figure 3.1.3-2. Special Processes Table/Buffer Relationships

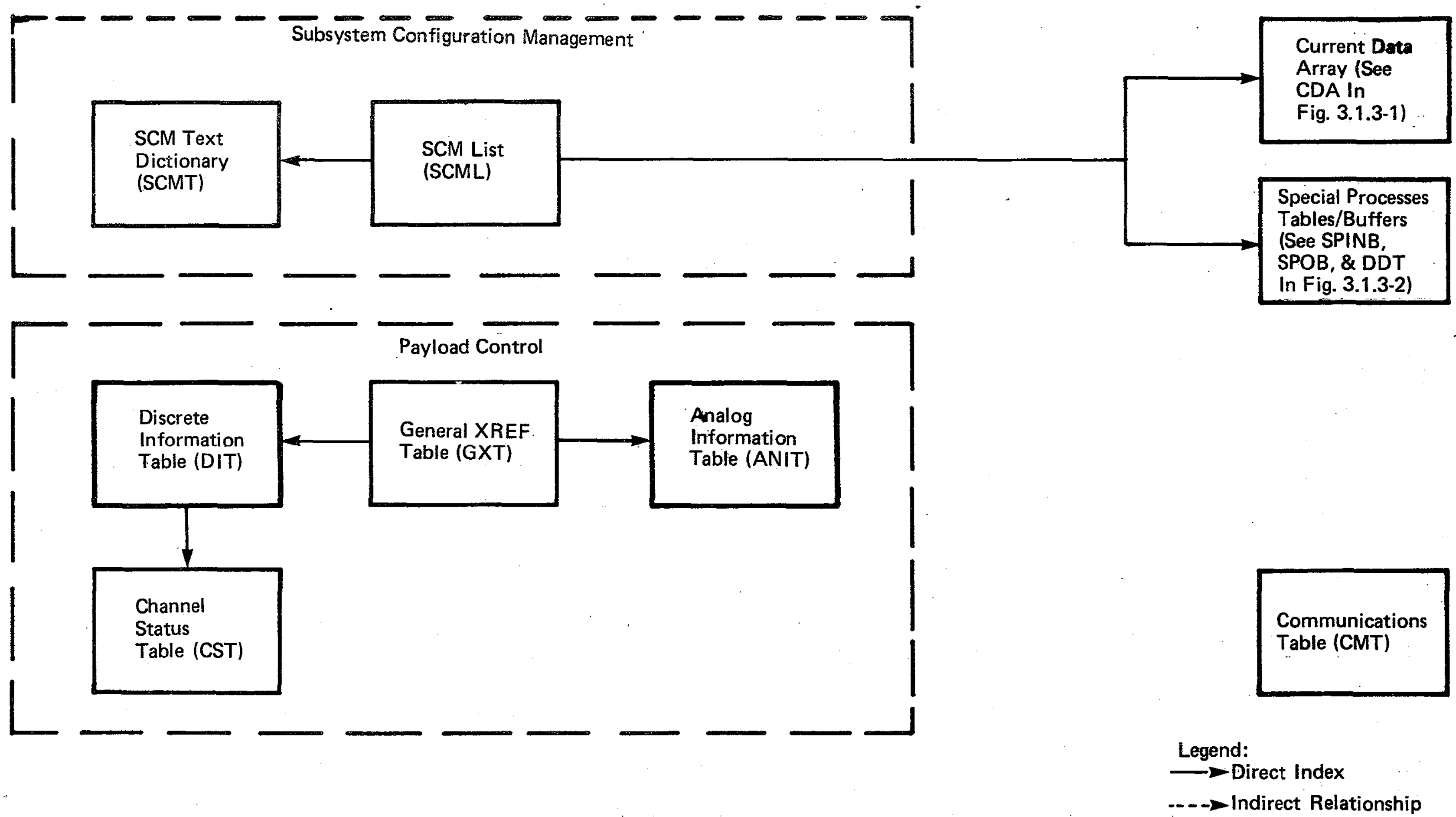

Figure 3.1.3-3. Display Controlled Processes Table/Buffer Relationships

3.1.4 Processing Element Structure

The SM processing elements are organized into two basic structures: Operational Sequences (OPS) and Specialist Functions (SPECs). Each OPS contains certain SM functions which are valid during the time that particular OPS is active. In addition, certain functions defined as SPECs are also valid during a particular OPS. These SPECs are initiated only upon user request.

Within the OPS/SPEC structure, the SM processing elements are grouped into three basic areas: Basic SM Processes, Special Processes, and Display and Uplink Controlled Processes. The Basic SM Processes and Special Processes are controlled by OPS control segment(s) while the Display Controlled Processes are controlled by OPS control segments and/or SPEC control segments. Figure 3.1.4-1 shows the control flow from the SM OPS and SPEC control segments to the various SM processes. Also shown in Figure 3.1.4-1 is RMS processing which also executes within the SM OPS/SPEC structure.

The functions which comprise the primary role of Basic SM Processes, Data Acquisition and PM Control, are valid in SM OPS 2 and are structured as two cyclic processes. Each is scheduled by the OPS control segment. Figure 3.1.4-2 illustrates the data flow through Basic SM Processes, i.e., the relationship between the two basic processes (Data Acquisition and PM control) and the primary data buffers these processes utilize.

The Special Processes execute asynchronously to Basic SM Processes and consists of three groups of functions: Data Acquisition, Computations and Sequences, and Data Output. All functions in these groups are invoked by the Special Processes Executive which is scheduled cyclically by the SM OPS 2 control segment. The functions invoked by the Special Processes Executive differ according to which are valid for the currently executing Mode. Figure 3.1.4-3 illustrates the data flow through the three groups of functions comprising the Special Processes and the primary data areas used by these functions.

The Display and Uplink Controlled Processes are all "on-demand" functions which are invoked by an OPS or SPEC control segment as a direct result of an entry to a display (or in the case of the SM Uplink Processor, a signal from the Systems Services Uplink Software). Except for RMS all data flow between the control segments, the Display and Uplink Controlled Processes, and any affected cyclic processes is via the Communications Table (see Appendix A.2).

The Subsystem Measurement Management (SMM) Display processing function is related to SM, but not part of the SM processing structure. SMM Display Processing is performed asynchronously to the SM processes discussed above. The User Interface function, (SDS-Volume II, Part 2), updates the active SMM display(s) by utilizing a set of tables that contain various control information and pointers to parameter values and statuses in the SM COMPOOL's. These tables are built by an offline process, the Display Format Generator (DFG) program. Inputs to the DFG program are generated by the SM Preprocessor and are discussed in the SM Preprocessor Detailed Design Specification - Phase II, Section 6. This design approach allows SMM displays to be defined and generated independently of the SM executable code.

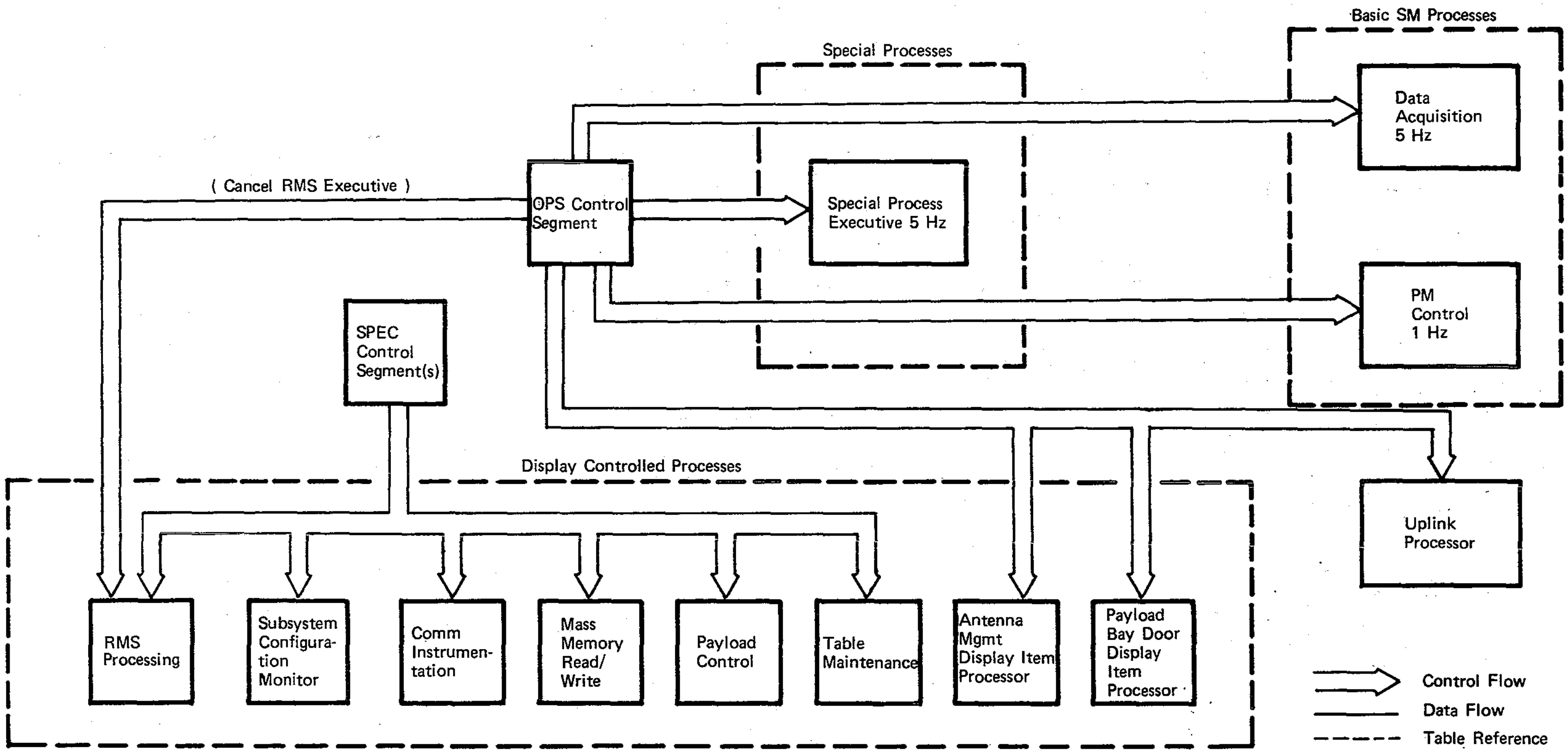

Figure 3.1.4-1. SM Control Overview

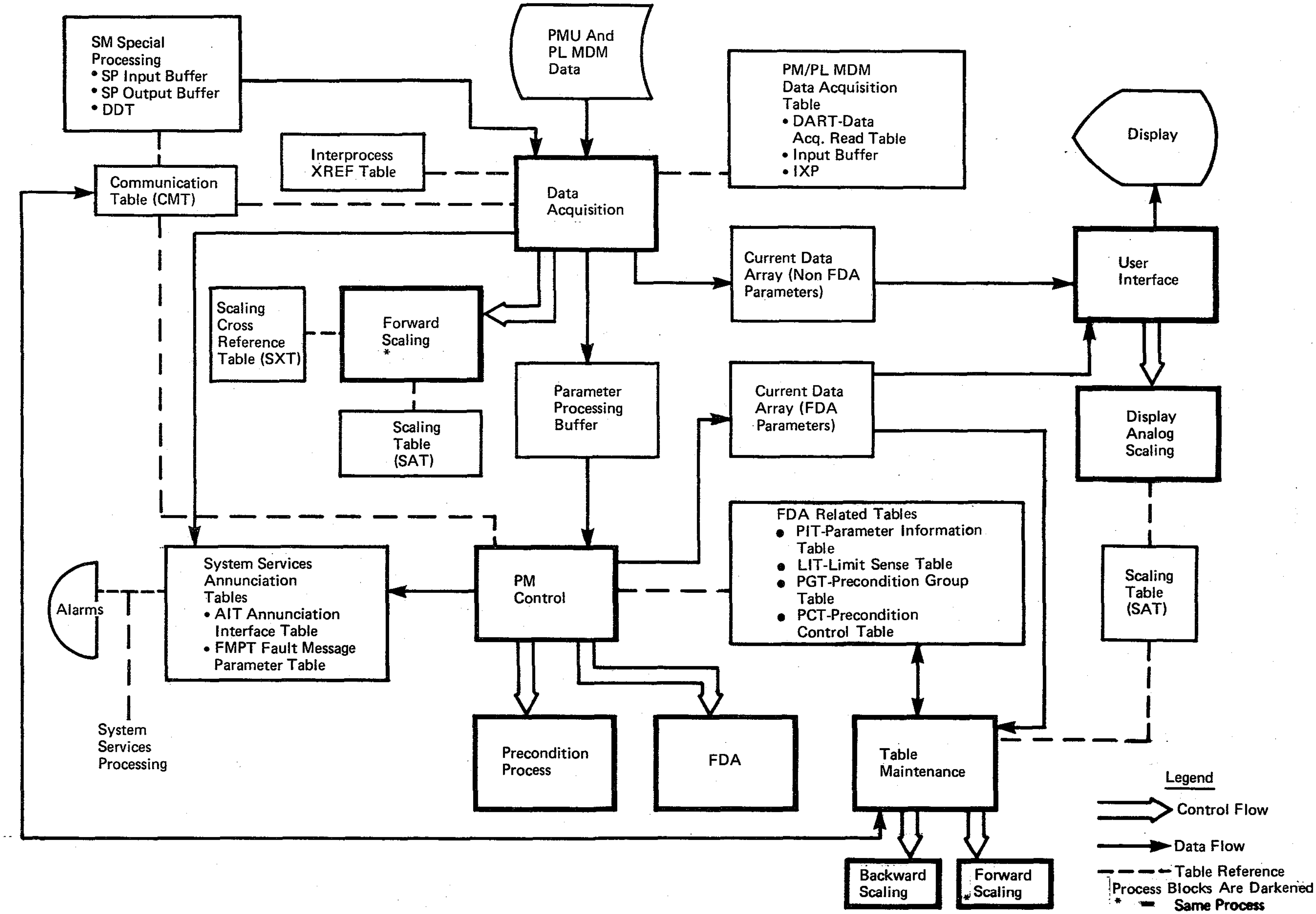

Figure 3.1.4-2. Basic SM Process Overview

30

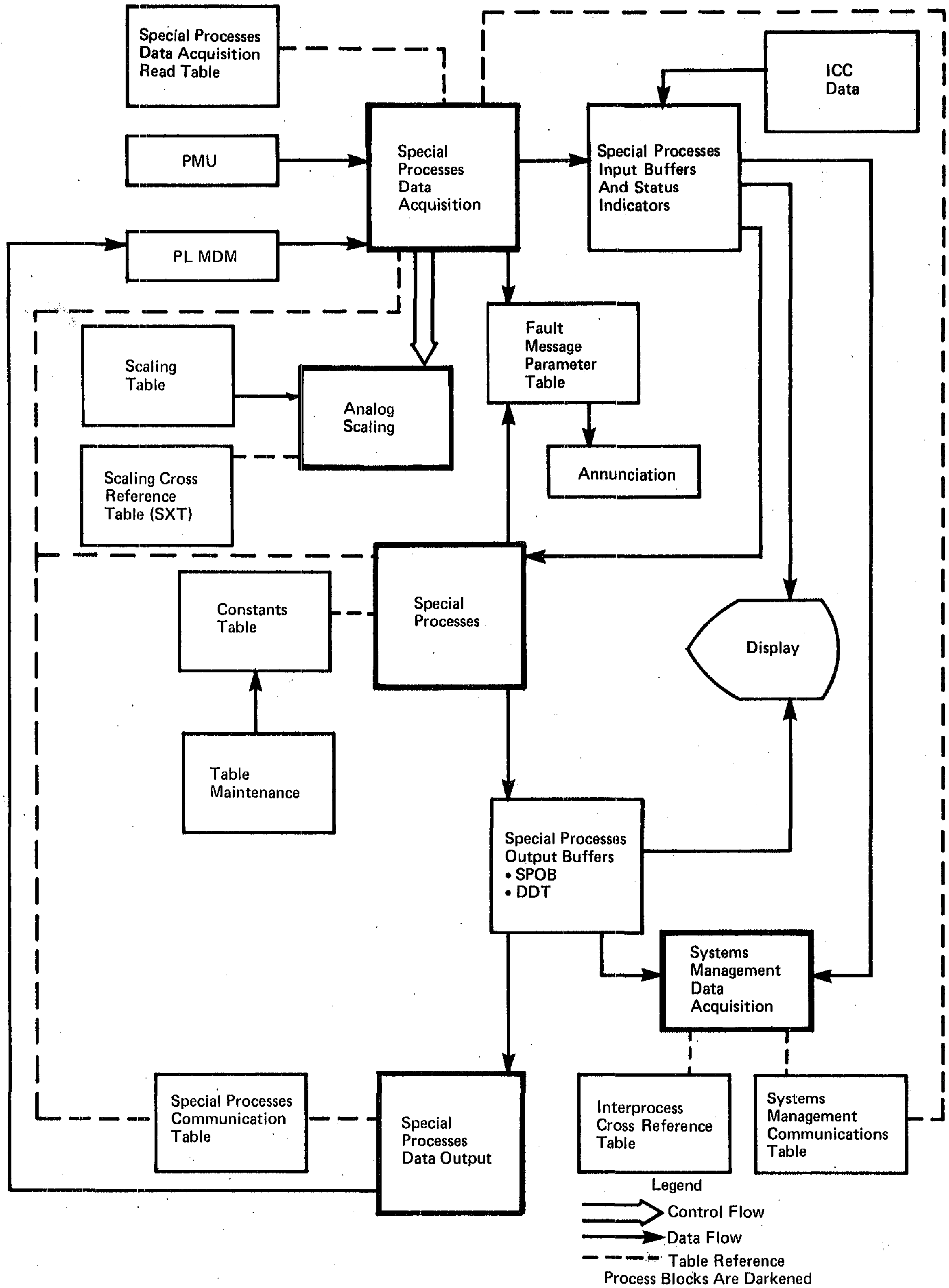

Figure 3.1.4-3. Special Processes Overview

3.1.5 RMS Overview

RMS processing operates as a specialist control function under SM OPS 2. The system has six internal configurations (Suspend, Temperature, Idle, Single, Manual, Auto). To obtain configuration independence, the RMS executive modules perform all the configuration control processing. RMS program module interface management has been centralized in the executive modules through the use of program dispatcher tables.

Figure 3.1.5-1 illustrates the RMS external interfaces [Flight Computer Operating System (FCOS), SM Table Maintenance (SM TM SPEC), User Interface (UI), Downlist (DL)]. Figure 3.1.5-2 shows the internal RMS hierarchy. Table 3.1.5-1 contains the list of RMS program module names.

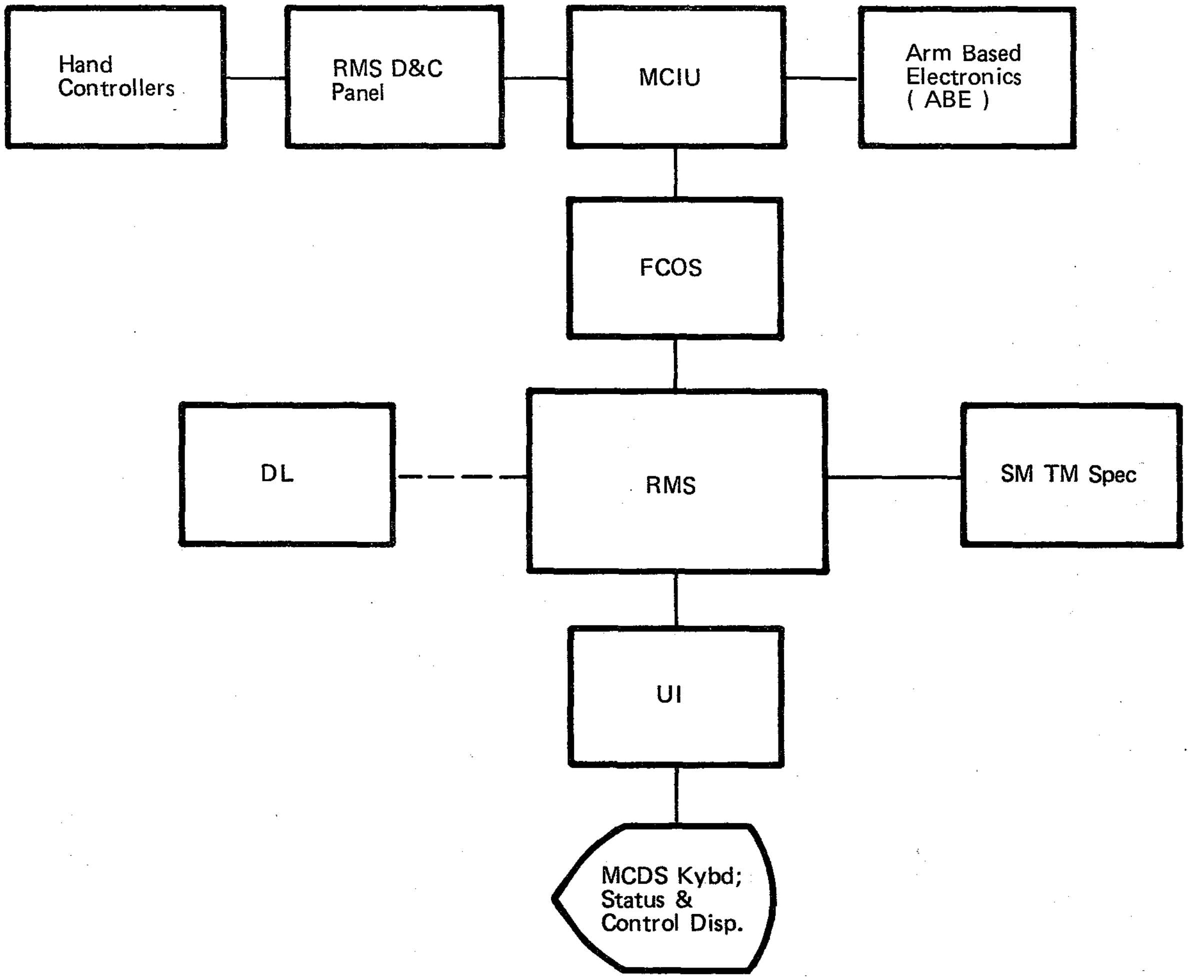

Figure 3.1.5-1. RMS External Interfaces

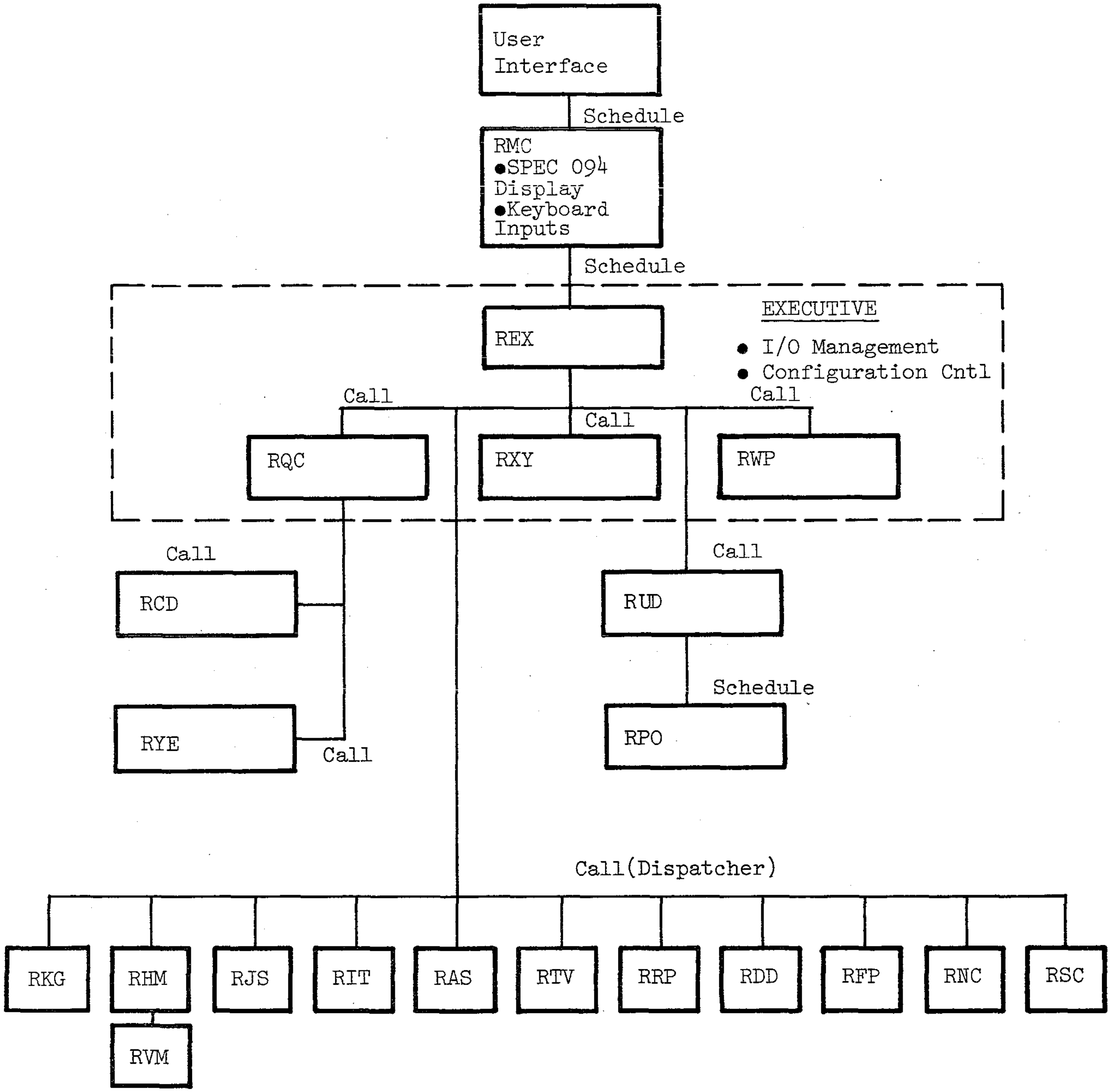

Figure 3.1.5-2. RMS Internal Hierarchy

Table 3.1.5-1. Module Names/Acronyms

RMC	RMS Specialist Function Control Segment
RUD	RMS Item Processor
REX	RMS Executive
RQC	Input Processing and Configuration Determination
RXY	Configuration Initialization
RWP	Position Hold Checks
RCD	MCIU Decoder
RKG	Kinematic Data Generator
RSC	Single Joint Control
RJS	Hand Controller
RPO	Resolved Position Algorithm
RAS	Automatic Sequence Processor
RRP	Resolved Rate Processor
RTV	Total Velocity
RFP	Position Hold
RHM	Health Monitor
RIT	Temperature Processor
RNC	MCIU Encoder
RDD	Dedicated Display
RYE	Data Conversion Processor
RVM	Consistency and Encoder Checks

3.2 Operational Sequences

A description of the SM Orbit/Doors (OPS 2) Control Segment is presented. Functions active throughout this OPS are identified; and Mode processing and displays are identified. The displays available within the SM OPS 2 Control Segment are shown in Table 3.2-1 with valid SM OPS transitions identified in Table 3.2-2. No attempt is made to identify specific item entries or unique processing associated with item entries in the control segment flows. Item entry processing is more fully discussed in Section 3.3 (Display and Uplink Controlled Processes).

Valid Specialist Functions (SPECs) within each SM OPS are shown in Table 3.2-2. Two unique Specialist Functions may be active within each OPS. Descriptions of all SM Specialist Functions valid for SM OPS 2 are in Section 3.3.

When a valid OPS transition, as specified in Table 3.2-2, occurs between two OPS containing SM processing, certain data is maintained for use by the new OPS. This data includes:

- The parameters maintained by the Communications/Instrumentation SPEC function indicating the last 128 KBPS and 64 KBPS format IDs entered.
- All values input from the Antenna Management display.
- All values updated by the Table Maintenance SPEC function.
- Ku-band antenna control discretes updated by uplink.
- Values maintained by FDA processes to control their processing.

If the transition does not involve a memory reconfiguration, no action is required to maintain the data. If the transition involves overlaying the data, the data is saved and restored to the SM tables before the new OPS initiates any processing. Since there is only one OPS configuration currently defined containing SM processing, no valid transitions can occur which involve memory reconfigurations, and thus no processes are presented which maintain the above data.

Table 3.2-1. SM OPS Display Content

DISPLAY TITLE	OPS SEQ	OPS	SPEC	DISP
SM Systems Summary 1	2			X
SM Systems Summary 2	2			X
CRYO/Fuel Cell[1]	2			X
Environmental[1]	2			X
APU/HYD[1]	2			X
SM Table Maintenance	2		X	
SCM	2		X	
PCMMU/PL Comm	2		X	
Communications Management[1]	2			X
Antenna Management	2	X		
Payload Bay Doors	2	X		
HYD Thermal[1]	2			X
PDRS Control	2		X	
PDRS Status	2			X
Electrical[1]	2			X
Payload Control SPEC (1-4)	2		X	
Payload Parametric[1]	2			X
Propellant Thermal[1]	2			X
APU/Environmental Thermal[1]	2			X
Mass Memory Read/Write	2		X	

1 These displays may be mass memory resident. The remaining displays are main memory resident.

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Table 3.2-2. SM OPS SPEC Function Table

Specialist Function	Section Number	Valid in SM OPS		
		2	8	9
Table Maintenance	3.3.1	yes	no	no
Subsystem Configuration Management	3.3.2	yes	no	no
Communications/Instrumentation	3.3.3	yes	no	no
Payload Control (1-4)	3.3.6	yes	no	no
General Test Support		no	no	yes
First Sensor Self Test		no	no	yes
Second Sensor Self Test		no	no	yes
TCS Control		no	no	yes
System Services SPECs		yes	yes	yes
RMS	3.3.8	yes	no	no
Mass Memory Patch	3.3.7	yes	yes	no

Valid SM OPS Transition Table

TO / FROM	OPS 0	SM2	SM8	SM9
OPS 0	yes	yes	yes	yes
SM 2	yes	yes	no	no
SM 8	yes	no	yes	yes
SM 9	yes	no	yes	yes

TABLE 3.2-2

3.2.1 Orbit/Doors (OPS 2) Control Segment (SM2_OPS)

The Orbit/Doors Control Segment activates System Management processing and presents the Antenna Management (AM) display (Mode 201) or the Payload Bay Doors (PBD) display (Mode 202).

a. Control Interface - The Orbit/Doors Control Segment is SCHEDULE'd by the User Interface Sequence Request Processor upon user request.

   Invocation: SCHEDULE SM2_OPS PRIORITY(PRIO_SM2);

b. Inputs - Inputs to this module are specified in Table 3.2.1-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1-1. When SM OPS 2 is selected the Orbit/Doors Control Segment calls the OPS 2 Initialization/Cleanup module to initialize data areas. It then schedules Data Acquisition, Performance Monitor Control, the Special Processes Executive, and the Uplink Processor.

   Mode 201 - Orbit Mode

   After the cyclic processors are scheduled, the OPS 2 Initialization/ Cleanup module is called to perform Mode 201 initialization, the AM display is presented and the Control Segment waits for a new OPS, new mode or item entry. If an item entry is made, the AM Item Processor is called to process the request. If Mode 202 is selected, the OPS 2 Initialization/Cleanup module is called to perform mode cleanup and the Mode 202 processing as described below is performed. If a new OPS is selected, the OPS2 Initialization/Cleanup module is called to perform mode cleanup, then Data Acquisition, Special Processes Executive, and the RMS Executive are cancelled and the OPS 2 Initialization/Cleanup module is called to perform OPS cleanup.

   Mode 202 - PBD Operations Mode

   After the cyclic processors are scheduled, the OPS 2 Initialization/ Cleanup module is called to perform Mode 202 initialization, the PBD Operations display is presented and the control segment waits for a new OPS, new mode or item entry. If an item entry is made, the PBD Item Processor is called to process the request. If Mode 201 is selected, the OPS 2 Initialization/Cleanup module is called to perform mode cleanup and the Mode 201 processing as described above is performed. If a new OPS is selected, the OPS 2 Initalization/Cleanup module is called to perform mode cleanup, then Data Acquisition, Special Processes Executive, and the RMS Executive are cancelled and the OPS 2 Initialization/Cleanup module is called to perform OPS cleanup.

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d. Outputs - Outputs from this module are specified in Table 3.2.1-1.

e. Module References - Process

Process	Section	Reference
OPS 2 Initialization/Cleanup	3.2.1.1	CALL
AM Item Processor	3.3.4	CALL
PBD Item Processor	3.3.5	CALL
Data Acquisition	3.2.1.3.1	SCHEDULE/ CANCEL
Performance Monitor Control	3.2.1.4	SCHEDULE
Special Processes Executive	3.2.1.9	SCHEDULE/ CANCEL
Uplink Processor	3.2.1.23	SCHEDULE
RMS Executive	3.3.8.4	CANCEL

f. Module Type and Attributes:

Type: Program

Attributes: N/A

g. Template References

D INCLUDE TEMPLATE	CZ1_COMMON	System Services Common Compool
D INCLUDE TEMPLATE	DIS_PLAY	UI external procedure used by the grammar macros (Display Presentation and Control)
D INCLUDE TEMPLATE	DNX_BMS	UI external procedure used by grammar macros (Application Moding and Sequencing)
D INCLUDE TEMPLATE	SDA_DATA_ACQ	Data Acquisition
D INCLUDE TEMPLATE	SPM_CONTROL	Performance Monitor Control
D INCLUDE TEMPLATE	SSP_EXEC	Special Processes Executive
D INCLUDE TEMPLATE	SAM_ITEM	AM Item Processor
D INCLUDE TEMPLATE	SBD_ITEM	PBD Item Processor

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Template References (Cont'd)

D INCLUDE TEMPLATE S21_CLNUP	OPS 2 Initialization/Cleanup
D INCLUDE TEMPLATE SUL_UPLINK	Uplink Processor
D INCLUDE TEMPLATE REX_RMSEXEC	RMS Executive
D INCLUDE DAG#RAM	Common grammar macro set.
D INCLUDE DBG#RAM	OPS Control Segment grammar macro set.
D INCLUDE DDG#RAM	Allows references to MCDs keyboard inputs.
D INCLUDE OPSCMACS	Contains FCOS OPS Cancel macros.
D INCLUDE ZPRIOTIM	Contains REPLACE names for baseline priorities, phasing and rates of scheduled processes (ref. SAM 10).

h. Error Handling - None

i. Constraints and Assumptions - The OPS 2 Control Segment is monitored by UI. UI filters out illegal OPS, mode, or other illegal entries not defined for the OPS 2 Control Segment.

TABLE 3.2.1-1 Orbit/Doors Control Segment MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Item Entry	E	I/O	CRT/ SBD,SAM			
2	Init/Cleanup Request	E	O	S2I	N/A		

4/2

Note: The Decisions And Sequencing Portrayed In This Figure Are Largely Controlled By The Systems Services Transition Matrices As Well As Crew Selection Through The MCDS, Sequencing Events And CHANGE Grammar Statements. As Such, Blocks Not Explicitly Representative Of Applications Code Are Indicated By An Asterisk. This Note Applies To All Subsequent Control Segment (OPS And SPEC) Control Flows.

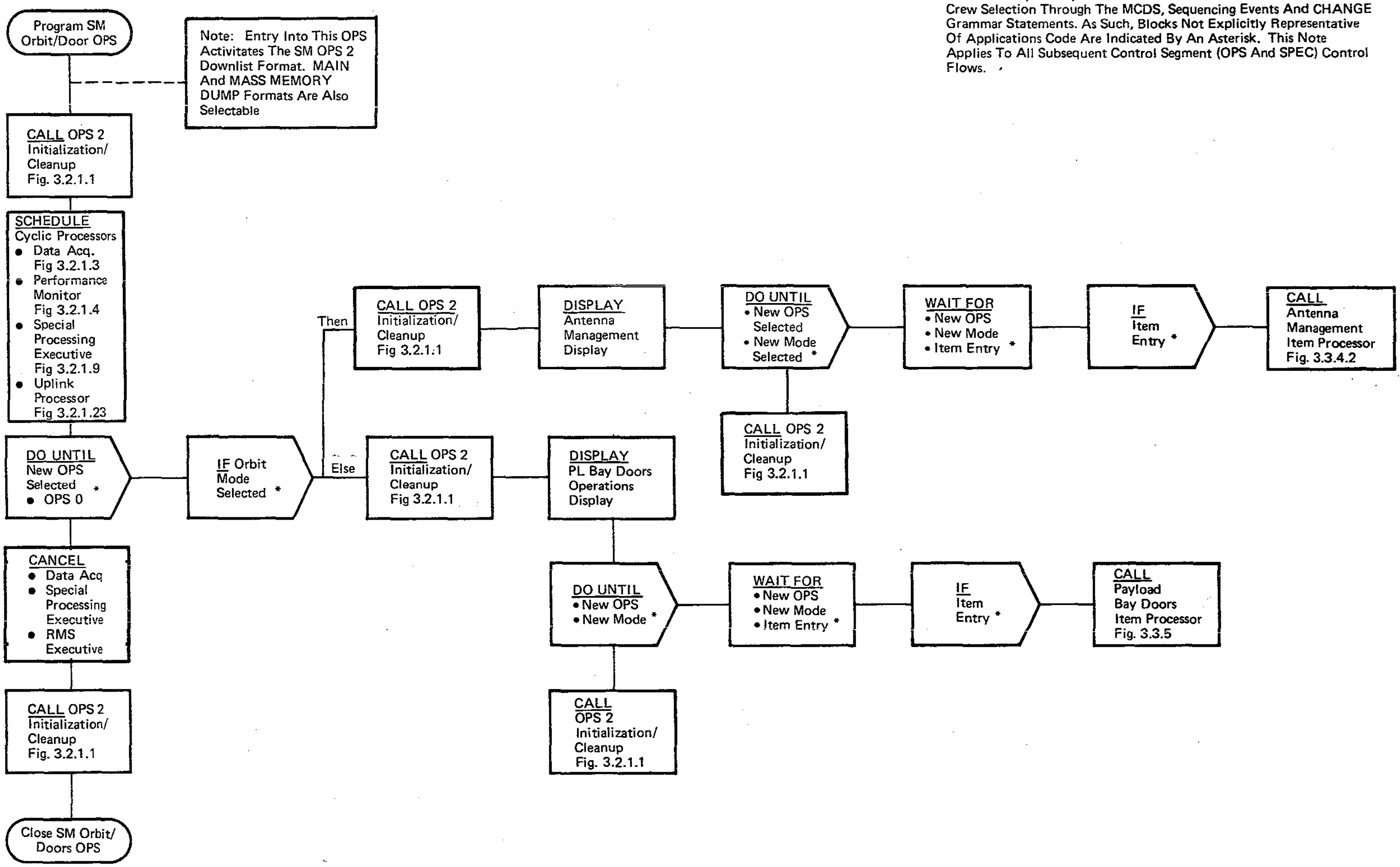

Figure 3.2.1-1. SM Orbit/Doors (OPS 2) Control Segment

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3.2.1.1 OPS 2 Initialization/Cleanup (S2I_CLNUP)

The OPS 2 Initialization/Cleanup module provides for centralized entry and exit processing for the SM OPS Control Segment (SM 2).

a. Control Interface - The OPS 2 Initialization/Cleanup module is CALL'ed on demand by the Orbit/Doors Control Segment.
Invocation: CALL S2I_CLNUP (Init/Cleanup Request*, DEU No)

b. Inputs - Inputs to this module are specified in Table 3.2.1.1-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.1-1 through 3.2.1.1-4. The OPS 2 Initialization/Cleanup module determines which processing to perform and then does OPS initialization, OPS cleanup, mode initialization or mode cleanup. The restore of checkpointed data is done in OPS Initialization if System Services indicates to SM that restore was requested by the user via the DPS Utility display. If no I/O error occurs during the restore process, the data is dispersed to the SM tables.

d. Outputs - Outputs from this module are specified in Table 3.2.1.1-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism)

g. Template References

D Include Template	CGE_DISPATCHER	Hybrid Dispatcher Include Segment
D Include Template	SHD_HYB_DISPATCH	SM Hybrid Dispatch Table
D Include Template	CSS_COT	Constants Table (COT)-Values
D Include Template	CSA_SM_CMT	Basic Processes CMT
D Include Template	CSS_SP_CMT	Special Processes CMT
D Include Template	CSB_PBD_CMT	Payload Bay Doors Display Parameters
D Include Template	CSS_SPOB	Special Process Output Buffer
D Include	CSAPIT	Parameter Information Table (PIT)
D Include	CSAPCT	Precondition Control Tables (PCT)
D Include	CSALIT	Limit sense Table (LIT)
D Include	CSCOTSRC	Constants Table (COT)
D Include	CST_TM_CMT	TM Display Parameters Tables

D Include Template	SSB_PL_BAY_DOORS	Payload Bay Doors
D Include Template	CZ2_COMMON	UI/FCOS SHARED Compool
D Include Template	CZ1_COMMON	System Services Common Compool
D Include Template	DMA_MAC	System Services Annunciation Routine
D Include Template	CDL_ANNUN	System Services Annunciation Compool
D Include IOMACS		Contains I/O Macro flags
D Include MMUMACS		Contains MM Read/Write Macros
D Include DMA # MACS		System Services error annunciation macro replace statements
D Include CVN_MM_UTILITY		SM/VU common buffer

h. Error Handling - None

i. Constraints and Assumptions

1. Assume no retry if I/O error on restore read.

2. When a checkpoint write is initiated, SM writes to whichever MM is assigned to us. When requesting a restore, the user needs to ensure that he/she is reading from the correct MM.

3. If an I/O read error is encountered when initializing in the OPS (whether restore was requested or not), the checkpoint time will be zeroed. If the read completes successfully, the checkpoint time will be updated with what resides on MM (at this point, we have no way of knowing whether the checkpoint unite completed successfully, so a bad time may be displayed).

TABLE 3.2.1.1-1 OPS 2 Initialization/Cleanup MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Parameter processing buffer half indicator	A.2.11 D.19	O	SPM	CSAB_CMT_BUF_HALF		
2	Ready flag$_1$ and read flag$_2$	A.2.11 D.1	O	SPM, SDA	CSAB_CMT_READY_FLAG1 CSAB_CMT_READY_FLAG2		
3	Performance Monitor Control cancel flag	A.2.11 D.20	O	SPM	CSAB_CMT_PM_CANCEL		
4	Data Acquisition ready cycle counter	A.2.11 D.21	O	SDA	CSAV_CMT_CC		
5	Init/Cleanup Request	E	I	SM2	S2I_ID		
6	Control Timer	A.2.11 D.23	O	SSS	CSLV_CONTROL_TIMER		
7	(deleted)						
8	(deleted)						
9	PBD Active/Inactive flag	A.2.22 D.25	O	SSP	SHD_DISPATCH_TBL. FREQ$(6;1)		
10	Power on/off items	A.2.11 D.13	O	SSB	CSBB_POWER_ON_OFF_SELECT ITEM		
11	Auto mode select item	A.2.11 D.13	O	SSB	CSBB_AUTO_MODE_SELECT_ITEM		
12	Manual mode select items	A.2.11 D.13	O	SSB	CSBB_MANUAL_MODE_SELECT_ITEMS		
13	PBD Fail Indicators	A.2.11	O	CRT	CSBB_OPEN_FAIL_INDICATORS CSBB_CLOSE_FAIL_INDICATORS		
14	PBD close preparation Fail Indicator	A.2.11	O	CRT	CSBB_CLOSE_PREP_FAIL_INDICATOR		
15	(deleted)						
16	Auto Mode Flag	A.2.11 D.27	O	SSB	CSBB_AUTO_MODE_FLAG		
17	Manual Mode Flag	A.2.11 D.27	O	SSB	CSBB_MANUAL_MODE_FLAG		
18	Pump Indicator	A.2.11 D.27	O	SSS	CSLB_PUMP_ONOFF		

TABLE 3.2.1.1-1 OPS 2 Initialization/Cleanup (cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
19	PBD Common Fail Indicator	A.2.16 D.28	O	SSO, CRT, DL	CSSB_CUR_ANN$(7)	V72X3490X	
20	Mode Termination Event Indicator	A.2.11 D.17	I	SSB	CSBB_OPEN_FAIL_INDICATOR		
21	Hydr Fluid Init Flag	A.2.11 D.29	O	SST	CSOB_SP_HYDR_INIT		
22	Uplink Cancel Flag	A.2.11 D.30	O	SUL	CSVE_UL_CANCEL		
23	(deleted)						
24	MASK2	A.2.1	O	PIT	CSAS_PITP_MASK2		
25	LIT	A.2.8	O	S2I	CSAS_LIT_ANALOG_LOW_LIMIT CSAS_LIT_ANALOG_HIGH_LIMIT CSAS_LIT_EU_LOW_LIMIT CSAS_LIT_EU_HIGH_LIMIT		
26	Checkpoint Buffer	A.2.25	I	UI	CDHV_BLOCKS		
27	PIT MAX N-Count	A.2.1	O	Common Buffer	CSAS_PITA_MAX_N_CT CSAS_PITE_MAX_N_CT		
28	PIT limit values	A.2.1	O	Common Buffer	CSAS_PITS_LIM_STATES		
29	Number of Analog PIT entries	A.2.1	I	PIT	CSAS_PITA_NUM_ENTRIES		
30	Number of EU PIT entries	A.2.1	I	PIT	CSAS_PITE_NUM_ENTRIES		
31	Number of parent PIT entries	A.2.1	I	PIT	CSAS_PITP_NUM_ENTRIES		
32	Number of COT Scolars	A.2.12	I	COT	CSAS_COT_NUM_SCALARS		
33	Number of COT discretes	A.2.12	I	COT	CSAS_COT_NUM_DISCRETE		
34	Number of COT Analogs	A.2.12	I	COT	CSAS_COT_NUM_INTEGER		
35	Scalar Constants	A.2.12	I	COT	CSAS_COT_SCAL_VALUE		
36	Discrete Constants	A.2.12	I	COT	CSAS_COT_DISC_VALUE		
37	Analog Constants	A.2.12	I	COT	CASA_COT_INT_VALUE		
38	Pointer to next halfword	E	L		S2I_BUFR_IND		

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TABLE 3.2.1.1-1 OPS 2 Initialization/Cleanup (cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
39	Size of LIT	E	L		S2I_LIT_SIZE		
40	Number of words	E	L		S2I_NUM_SCALARS		
41	'Set flag cycle 5' act/ inact flag	A.2.22	O	SSB, SSD	SHD_DISPATCH_TBL. FREQ$(5;1)		
42	DA (202, 201) frequency	A.2.22	O	SSP	SHD_DISPATCH_TBL.FREQ$(3)		
43	DA (201) frequency	A.2.22	O	SSP	SHD_DISPATCH_TBL.FREQ$(4)		
44	Current N-ct	A.2.1	O	PIT	CSAS_PITA_CUR_N_CT CSAS_PITE_CUR_N_CT CSAS_PITS_CUR_N_CT		
45	Hard fail flag	A.2.1	O	PIT	CSAS_PITA_HARD_FAIL CSAS_PITE_HARD_FAIL CSAS_PITS_HARD_FAIL		
46	Bypass Ind	A.2.1	O	PIT	CSAS_PITA_BYPASS_IND CSAS_PITE_BYPASS_IND CSAS_PITS_BYPASS_IND		
47	limit high	A.2.1	O	PIT	CSAS_PITA_LIMIT_HI CSAS_PITE_LIMIT_HI		
48	limit low	A.2.1	O	PIT	CSAS_PITA_LIMIT_LO CSAS_PITE_LIMIT_LO		
49	Parm Count	A.2.1	O	PIT	CSAS_PITP_PARM_CT		
50	Sys Summ Variables	E	O	UI	CZ1V_SYSUM_PAGE$(3,1) CZ1V_SYSUM_PAGE$(3,2)		
51	Restore Enable Ind	E	I/O	UI	CZ1B_CKPT_RETRV_ENA		
52	ICC Status Flag	E	O	UI	ICC_CZ1B_CKPT_RETRV_ENA		
53	TSW	A.2.25	I/O	FCOS	CDHV_RW_TSW		
54	CHKPT Time	A.2.11.4	O	TM	CSTV_CHKPT_TIME		
55	NUM PRECON Groups	A.2.5	O	PCT	CSAS_PCT_NUM_PRECONDS		
56	Warm Up CT	A.2.5	O	PCT	CSAS_PCT_WARMUP_COUNT		
57	Max Warm Up	A.2.5	I	PCT	CSAS_PCT_MAX_WARMUP		
58	Last Solution	A.2.5	O	PCT	CSAS_PCT_LAST_SOLUTION		

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TABLE 3.2.1.1-1 OPS Initialization/Cleanup (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
59	ACT LS	A.2.1	O	PIT	CSAS_PITA_ACT_LIM_SET CSAS_PITE_ACT_LIM_SET CSAS_PITS_ACT_LIM_SET		
60	DEU NO	E	I/O	UI	S2I_DEU_NO		
61	Class 5 Error MSG	FMPT	O	Message Line	CDLK_V92X0074X	V92X0074X	
62	Fault summary message flag	E	O	UI	CDLB_SM_RECORDER_FLAG	V92X7000X	
63	AM ICC enable flag	E	O	UI	ENABLE_AN_DATA_MSG		
64	Mass Memory address Table	E	I/O	UI	CZ1V_MM_ADDR_TBL$(2:)		
65	Uplink Control Site in View Flag	E	O	UI	CZ1B_D_UL_CNTL$4		
66	Uplink Control ICC Enable	E	O	UI	ICC_CZ1B_D_UL_CNTL		
67	Switch Bypass Item	A.2.11, D.13	O	SSB, CRT, DL	CSBB_SWITCH_BYPASS_ITEM	V93X5814X	
68	PBD Open Item	A.2.11, D.13	O	SSB, CRT, DL	CSBB_PBD_OPEN_ITEM	V93X5815X	
69	PBD Close Item	A.2.11, D.13	O	SSB, CRT, DL	CSBB_PBD_CLOSE_ITEM	V93X5817X	
70	PBD Stop Item	A.2.11, D.13	O	SSB, CRT, DL	CSBB_PBD_STOP_ITEM	V93X5816X	
71	Control Switch Position Indicator	A.2.11, D.13	I	SSB, CRT, DL	CSBB_SWITCH_BYPASS_ITEM		
72	Uplink Control Auto Flag	E	I/O	UI/UI	CZ1B_D_UL_CNTL$3		
73	Uplink Control Inhibit Flag	E	O	UI	CZ1B_D_UL_CNTL$1		

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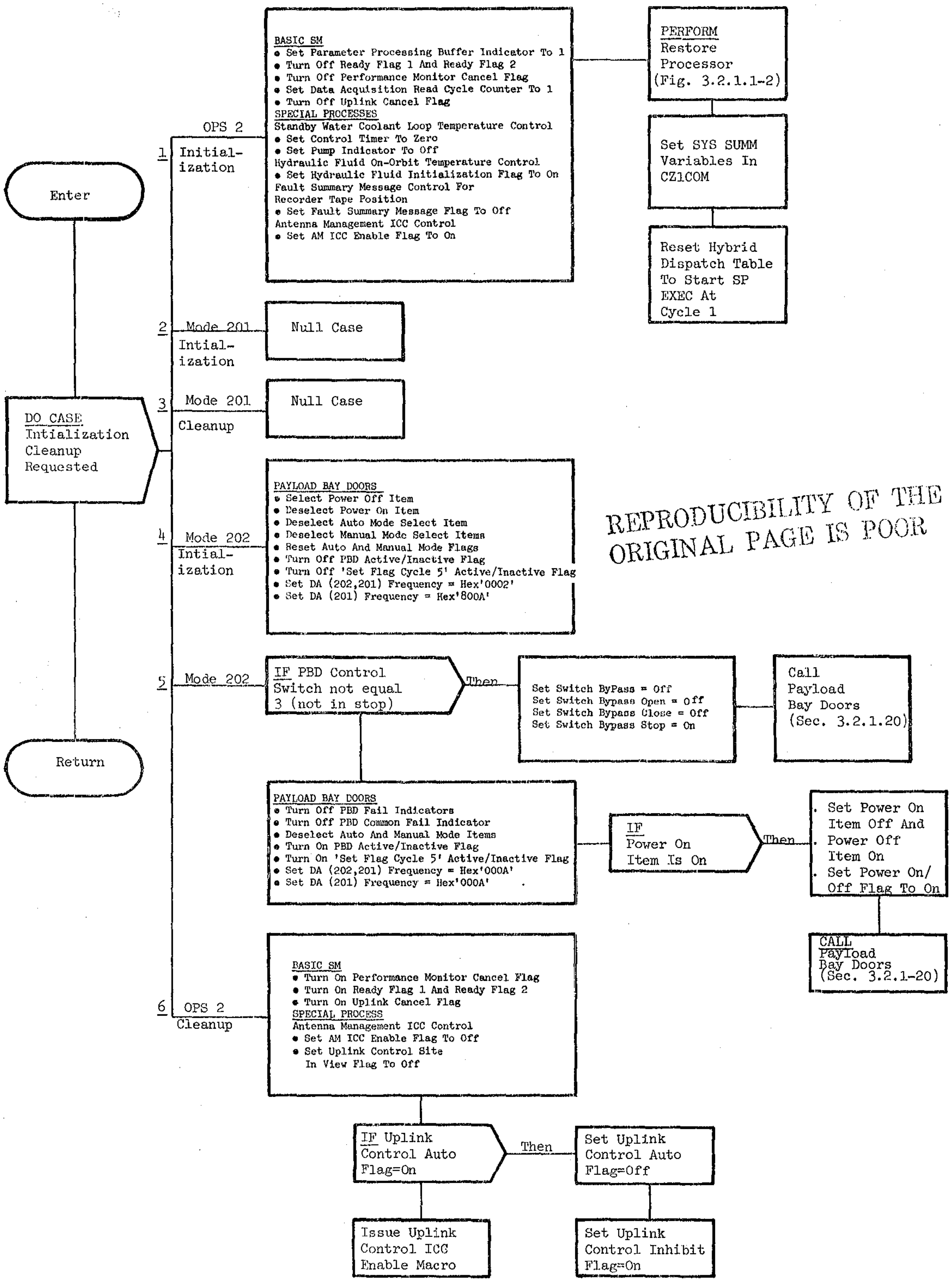

Figure 3.2.1.1-1 OPS 2 Initialization/Cleanup

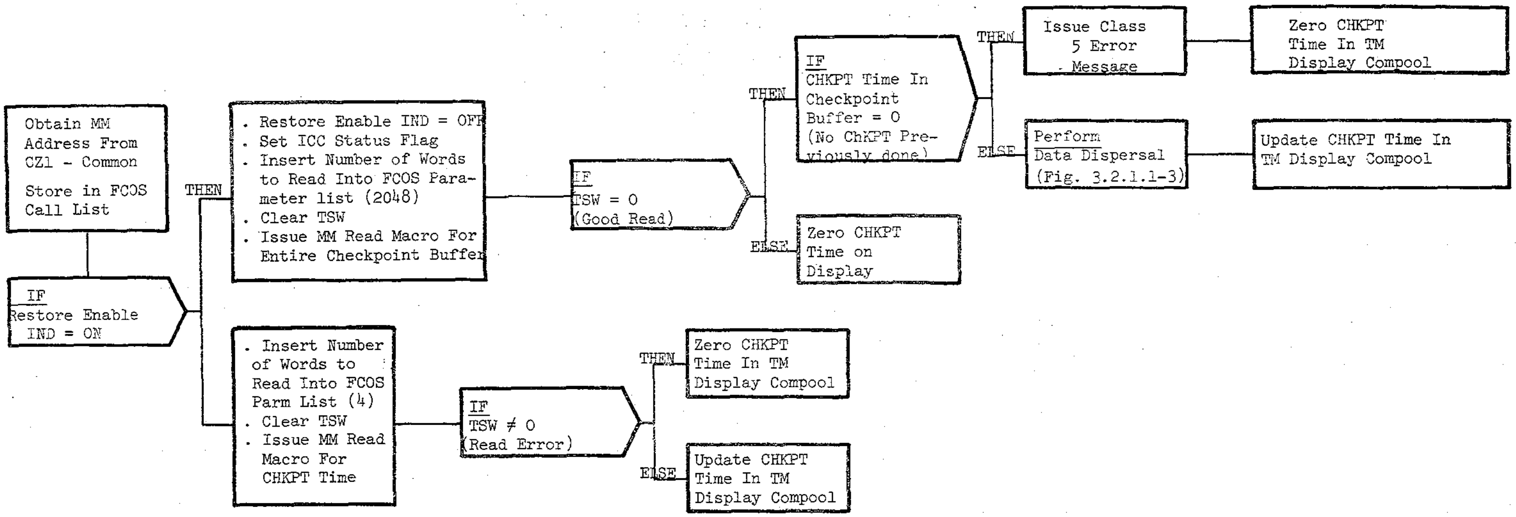

Figure 3.2.1.1-2. Restore Processor

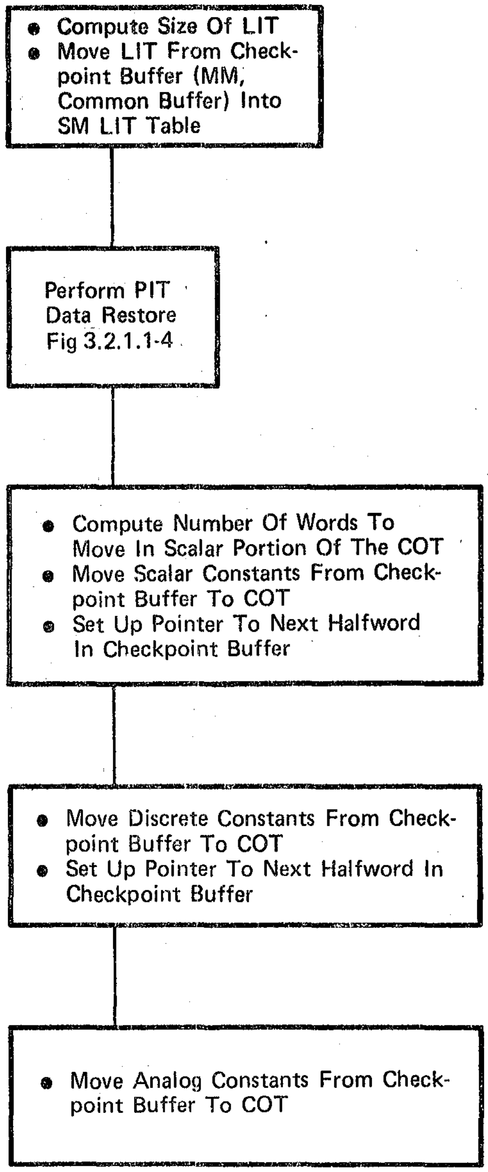

Figure 3.2.1.1-3. Data Dispersal

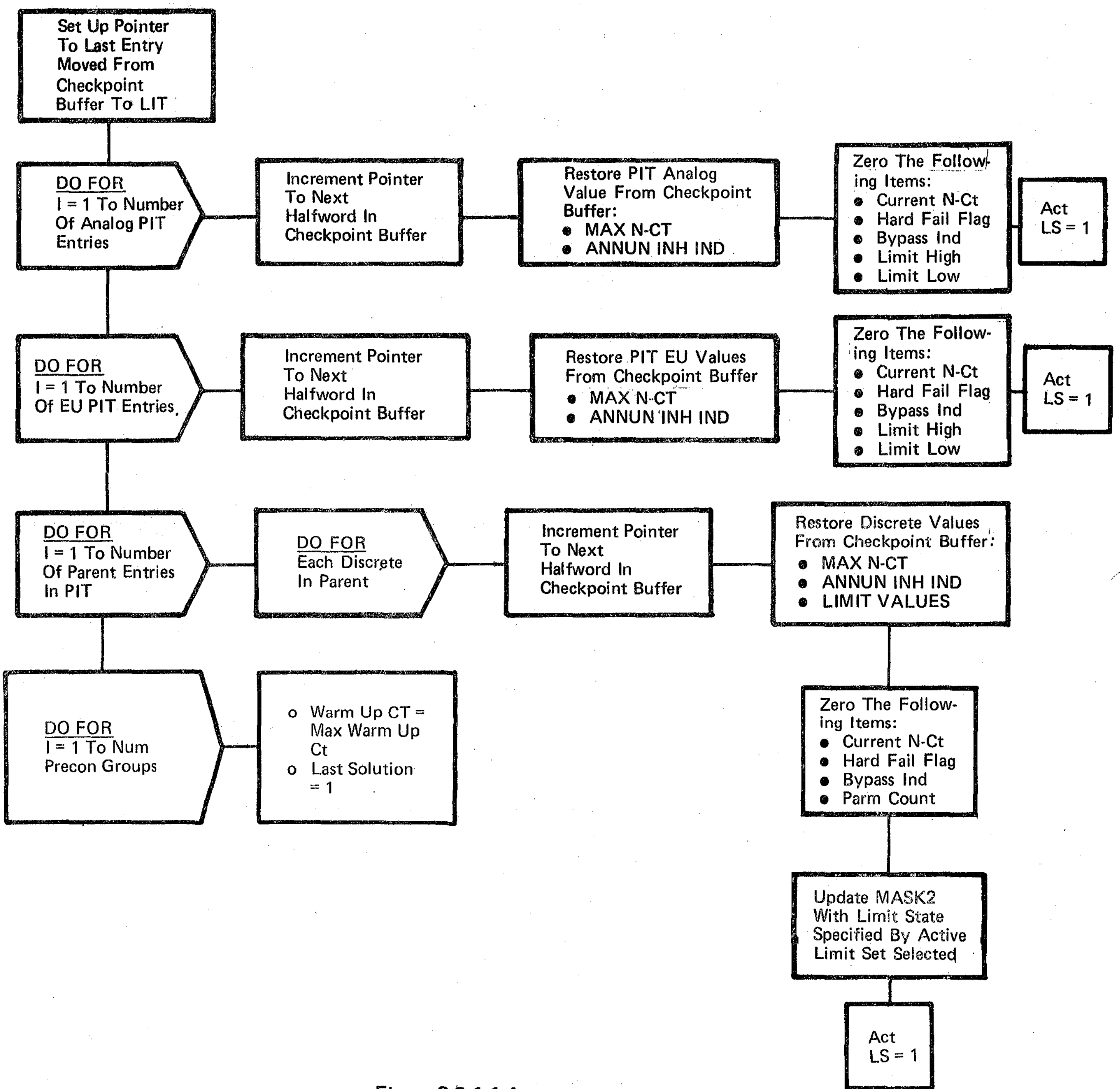

Figure 3.2.1.1-4. Pit Data Restore

3.2.1.3 SM DATA ACQUISITION

The Basic SM Data Acquisition function acquires all data required by the other basic SM functions (Ref. Section 3.2.1.3.1). The Special Processes (SP) Data Acquisition function acquires all data required by Special Processes from the PCM Master Unit (PMU) and the payload MDM's (Ref. Section 3.2.1.11). General Data Acquisition is a function called by both Basic and SP Data Acquisition to acquire and screen the data (Ref. Section 3.2.1.3.2).

Figure 3.2.1.3-1 shows an overview of the control flow from the Basic and SP Data Acquisition routines to General Data Acquisition and Forward Scaling. Figure 3.2.1.3-1 also shows an overview of the data flow and table references for General Data Acquisition and Forward Scaling. The General Data Acquisition call list contains address pointers to required tables and a flag identifying the calling routine. Forward Scaling is called to scale and move analog parameters after acquisition. It is passed pointers to the Scaling Cross-Reference Table (SXT) in its call list. Appendix A describes in detail the tables shown in Figure 3.2.1.3-1.

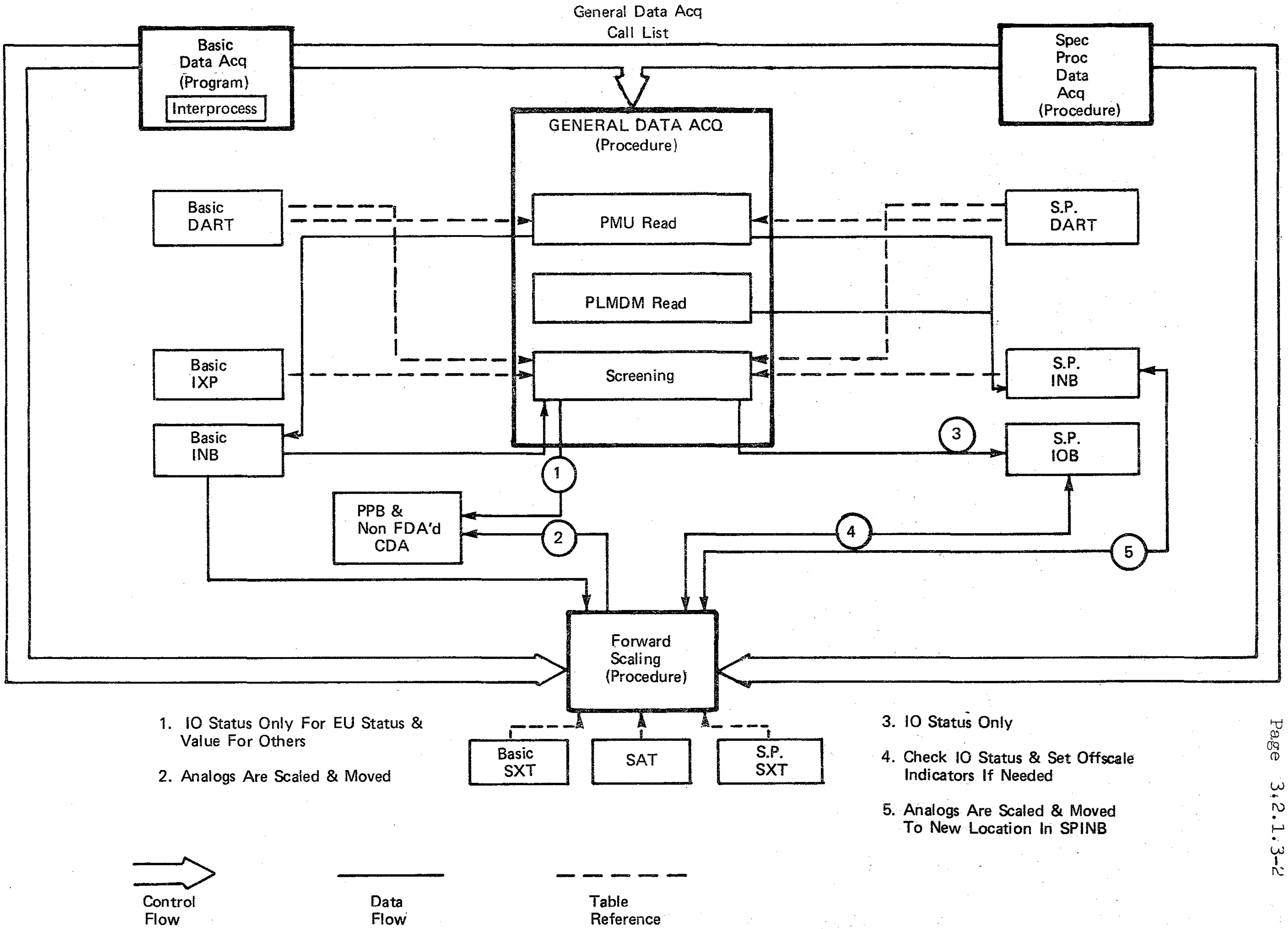

Figure 3.2.1.3-1. SM Data Acquisition Overview

3.2.1.3.1 Basic Data Acquisition (SDA_DATA_ACQ)

The Basic Data Acquisition module controls the cyclic acquisition of data for display only, Subsystem Configuration Management, precondition, and fault detection processing from the PCM Master Unit (PMU), payload MDM's (includes Midbody MDM), and Special Processes COMPOOL's (Interprocess Data). Data not acquired due to I/O failure is flagged invalid. All subsequent references to Payload MDM data are intended to include Midbody MDM data.

a. Control Interface - Data Acquisition is SCHEDULE'd by the SM OPS Control Segment to execute 5 times per second.
Invocation: SCHEDULE SDA_DATA_ACQ AT PHASE SDA PRIORITY (PRIO_SDA), REPEAT EVERY TIME_SDA

b. Inputs - There are two types of input data to Data Acquisition

1. External data which is acquired from the PMU, Payload MDM's, and Interprocess COMPOOLs. Once this data is retrieved and moved to either the PPB or CDA, it becomes input to the other SM functions.

2. Internal tables (structures) which describe the external data or control processing (see Table 3.2.1.3.1-1).

c. Process Description - The control flow for this module is shown in Figures 3.2.1.3.1-1 thru 3.2.1.3.1.-3. Data Acquisition first determines whether that portion of the Parameter Processing Buffer (PPB) for the second of data to be acquired has been freed from processing by the PM Control module. If the PPB buffer half is not available, control is returned to the system. Otherwise, the read cycle to be processed (1 through 10) is determined and the appropriate entry in the Data Acquisition Read Table (DART) accessed. The DART section for each read cycle has an entry for each read to be issued. Each entry consists of a device address, device indicator (PCM Master Unit or Payload MDM), INB displacement and a read length (number of contiguous 16-bit parameter words to be acquired). All DART entries representing read requests for the PMU are at the beginning of the section followed by PLMDM and PMU BITE. If there is any 5 sample per second data for the Payload MDM a flag is set for General Acquisition to read Payload MDM data this cycle. The General Data Acquisition procedure is called to read and screen the data. All Payload MDM data is read at least once per second via FCOS Fixed BCE Programs, if any Payload MDM data is required at 5 S/S then all Payload MDM data is read at 5 S/S. PMU and Payload MDM data is moved from the Input Buffer (By General Acquisition) at the required rate.

Any interprocess data (and their I/O Status) required by Precondition Processing and Fault Detection and Annunciation (FDA) is moved from the Interprocess COMPOOLs to either the PPB (for FDA) or the Current Data Array (for data input to Precondition Processing only). The interprocess IXP contains a section for each read cycle. Each interprocess data word to be processed by SM is represented by an IXP entry. Each IXP entry contains information necessary to move the data word and its status flag from a Special Process's COMPOOL to the PPB/CDA. Since this data is simply moved from a Special Process COMPOOL to either the CDA or PPB, no error processing is required.

After all data is acquired the Forward Scaling module is called to scale and move the following parameters to the PPB or CDA:

1. All analog parameters requiring second and third order scaling.
2. All SCM only analog parameters (to non FDA CDA).
3. All first order analog parameters with negative slopes that are to be processed by Fault Detection and Annunciation.

The read cycle is updated for the next cycle. On the fifth and tenth read cycles the Payload MDM read flag is turned on for the next cycle and the correct PPB ready indicator is set so that PM Control may begin processing the data. Also, at the end of the tenth cycle, if no read errors were encountered in cycles one through ten, the error count is reset to zero. The error count is used by General Data Acquisition in its determination to annunciate PMU failures.

d. Outputs - Outputs from this module are specified in Table 3.2.1.3.1-1.

e. Module References -

Process	Section	Reference
General Data Acquisition	3.2.1.3.2	CALL (Call List)
PM Control	3.2.1.4	EVENT
Forward Scaling	3.2.1.7	CALL (Call List)

f. Module Type and Attributes

Type: Program
Attributes: N/A

g. Template References -

D INCLUDE CSADART	Basic Processes Data Acquisition Read Table (DART)
D INCLUDE PFMDMACS	FCOS IO Declarative Replaces
D INCLUDE CSAIXP	Input Buffer to PPB Cross Reference Table (IXP)
D INCLUDE IDMACS	FCOS IO MACRO
D INCLUDE CSASXT	Basic Processes Scaling Cross Reference Table (SXT)
D INCLUDE CSAPPB	Parameter Processing Buffer (PPB)

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Template References (continued)

D INCLUDE CSACDA	Current Data Array (CDA)
D INCLUDE TEMPLATE SFS_FOR_SCALE	Forward Scaling
D INCLUDE TEMPLATE CSA_SM_CMT	Basic Processes CMT
D INCLUDE TEMPLATE SGA_GEN_ACQ	General Data Acquisition
D INCLUDE SGADUMST	DUMMY Structures used by all Data Acquisition
D INCLUDE TEMPLATE CSA_INB	Input Buffer (INB)
D ICLUDE TEMPLATE FCMCOM	FCOS Compool Containing Error Count

h. Error Handling - Reference General Data Acquisition, Section 3.2.1.3.2.

i. Constraints and Assumptions - Data is not acquired from serial channels for Basic Data Acquisition; however, data which has been acquired from serial channels for Special Processes can be moved to either the PPB or Non-FDA CDA via interprocess if it is required by other Basic SM processes.

TABLE 3.2.1.3.1-1 Basic Data Acquisition MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	General Data Acquisition Call List	E	O	SGA	SDA_CALL_LIST		
2	DART Index	E	O	SGA	SDA_DART_HDR		
3	DART Address	E	O	SGA	SDA_DART_ADDR		
4	IO/STAT Address	E	O	SGA	SDA_IOB_ADDR		
5	INB Address	E	O	SGA	SDA_INB_ADDR		
6	(Deleted)						
7	PLMDM IOLST Address	E	O	SGA	SDA_IOLST_ADDR		
8	PLMDM READ Flag	E	O	SGA	SDA_PLREAD		
9	SP CALL Flag	E	O	SGA	SDA_SP_CALL_FLG		
10	READY FLAG1	A.2.11,D.1	I/O	SPM,S2I,SDA/SPM,SDA	CSAB_CMT_READY_FLAG1		
11	READY FLAG2	A2.11,D.1	I/O	SPM,S2I,SDA/SPM,SDA	CSAB_CMT_READY_FLAG2		
12	ERROR Count	E,D.2	O	SGA	CSAV_ CMT_ERROR_COUNT	V92J0105C	
13	Forward Scaling Call List	E.3.2.1.7	O	SFS	SFS_CALL_LIST		
14	READ Cycle Counter	A.2.11	I/O	SDA/SDA	CSAV_CMT_CC		
15	DATA Cycle Error Ind.	A.2.11	I/O	SGA/SDA	CSAV_CYC_ERROR		
16	FDA IND	A.2.4	I	IXP	N/A		
17	PL 5 S/S	A.2.3	I	DART	CSAS_DART_PL5SS		
18	# PARMS TO AQUIRE	A.2.4	I	IXP	CSAS_IXP_PROC_NUM_ENTRIES		
19	PPB/CDA Index	A.2.4	I	IXP	CSAS_IXP_PROC_PNTR		
20	PLMDM Read Flag	A.2.11	O	SGA			

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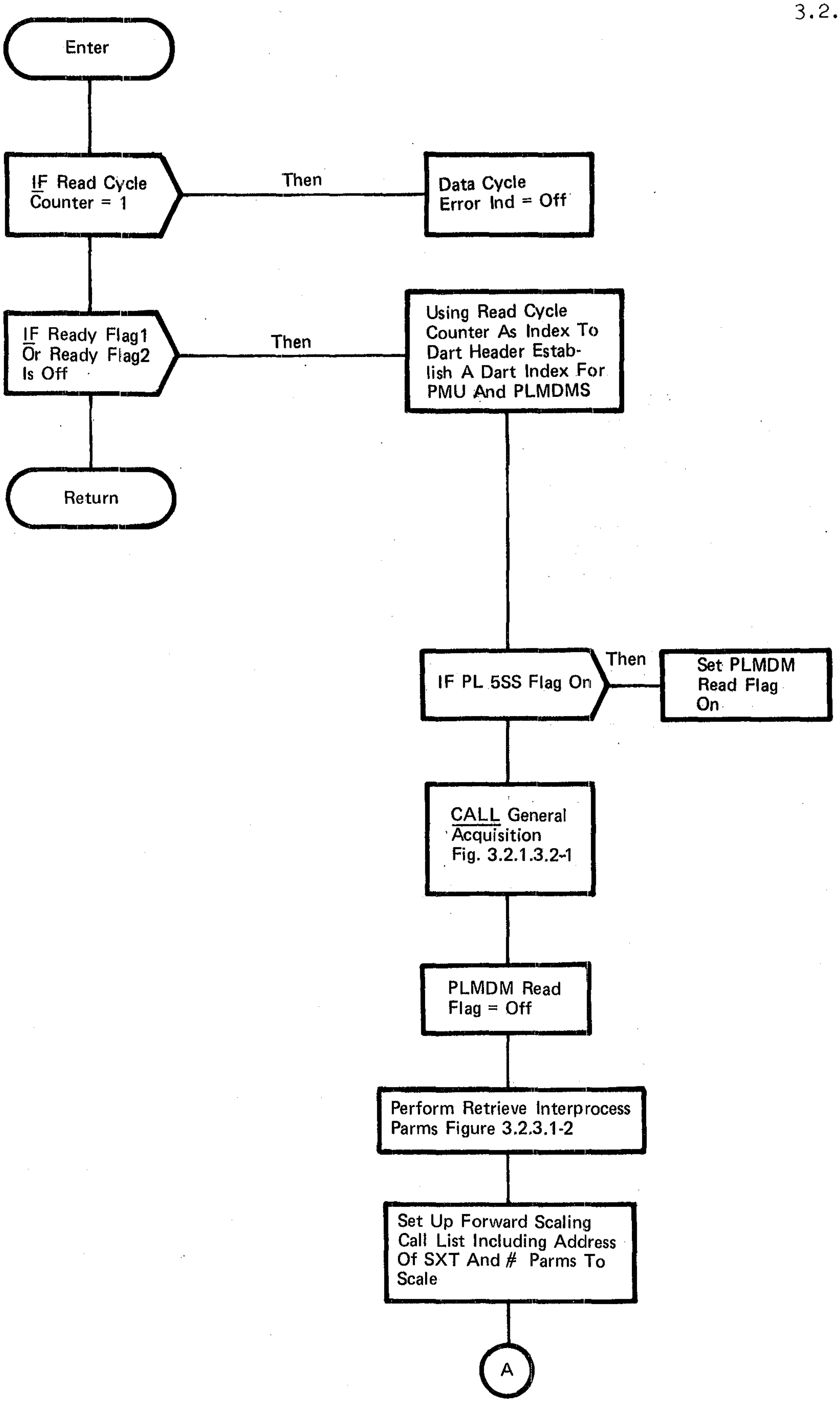

Figure 3.2.1.3.1-1. Basic Data Acquisition

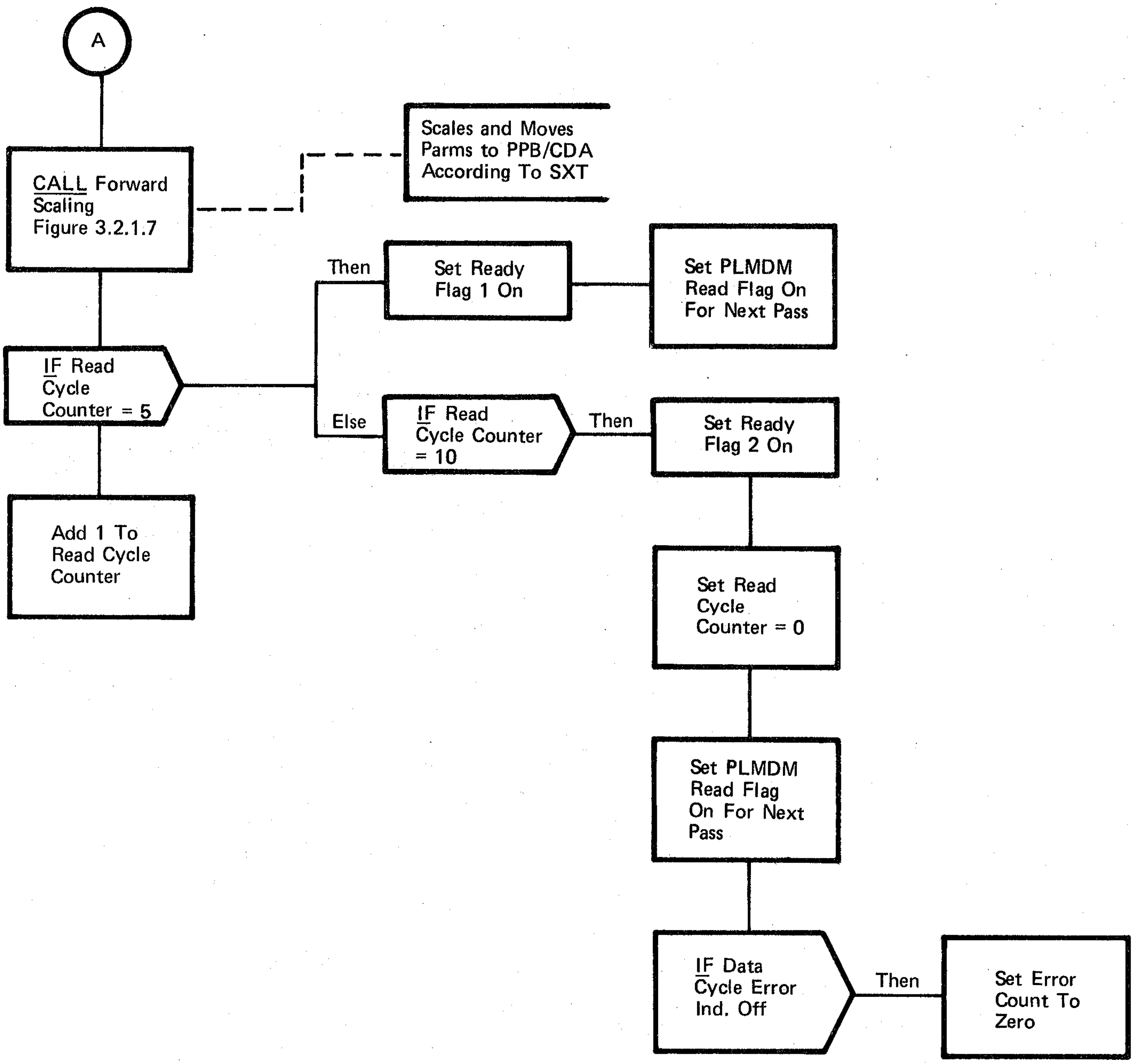

Figure 3.2.1.3.1-1. (Cont'd) Basic Data Acquisition

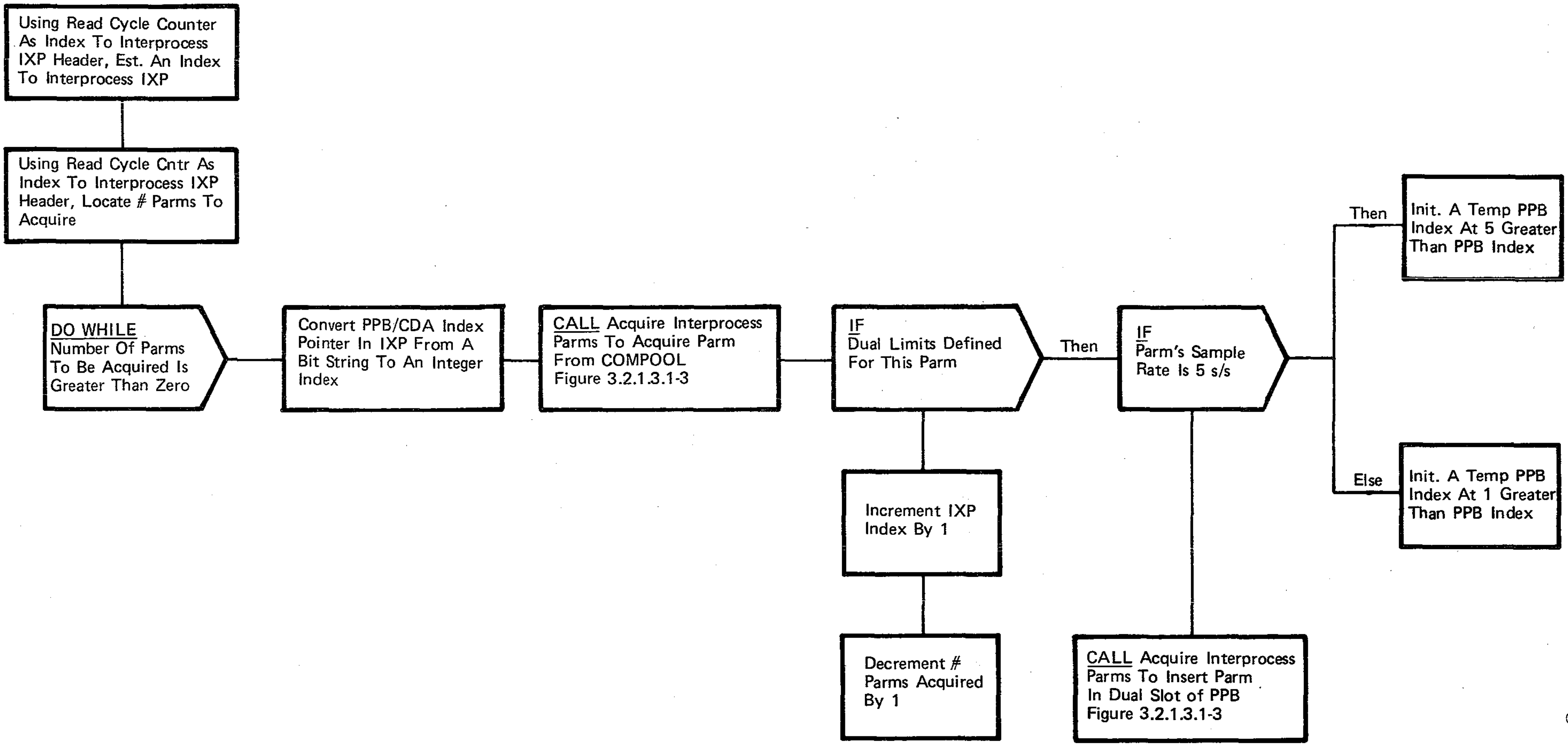

Figure 3.2.1.3.1-2. Retrieve Interprocess Parms

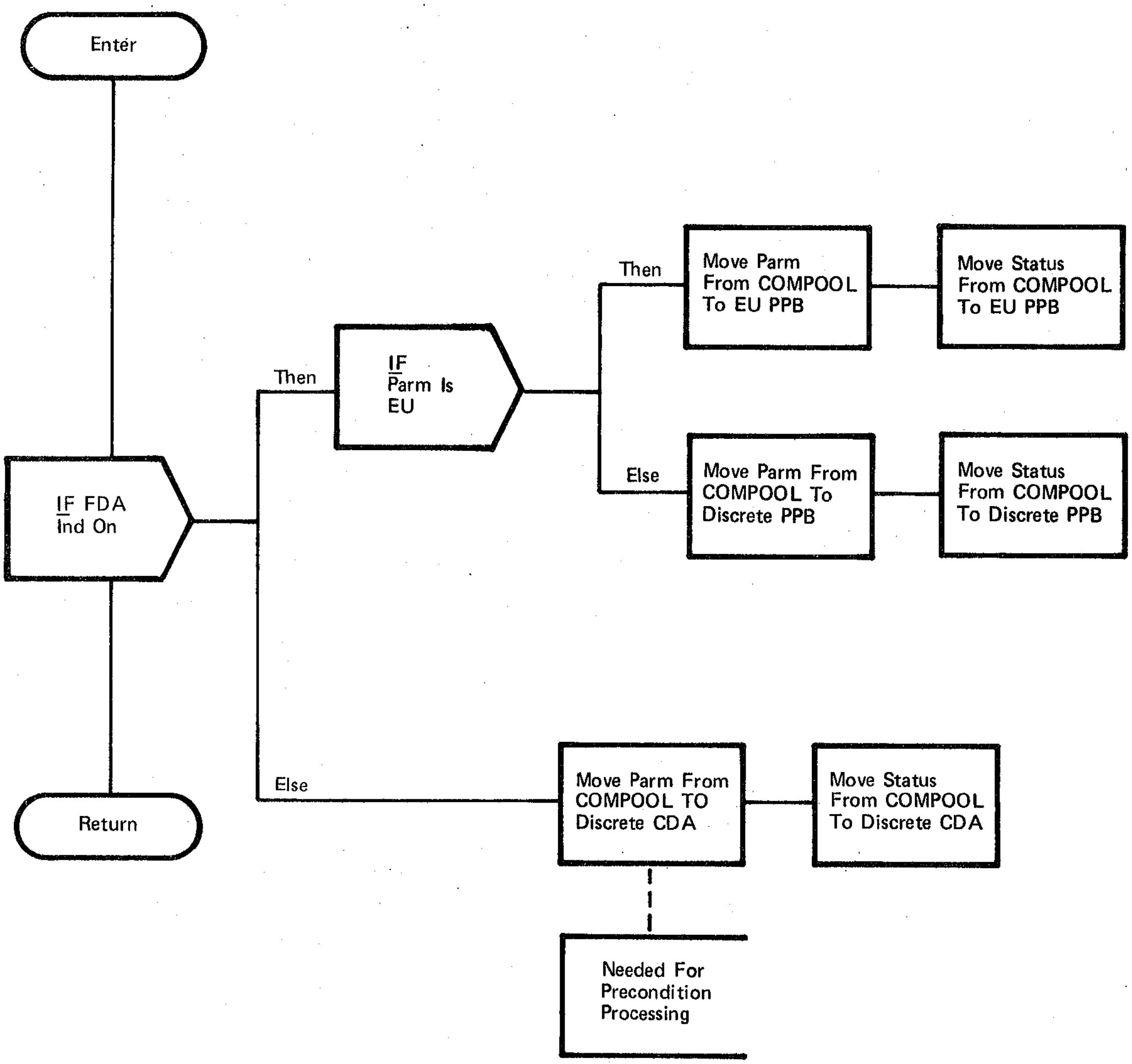

Figure 3.2.1.3.1-3. Acquire Interprocess Parms

3.2.1.3.2 General Data Acquisition (SGA_GEN_ACQ)

General Data Acquisition (GEN ACQUISITION) acquires and screens data from the PCM Master Unit (PMU) and payload MDM's (PL MDM) for Basic Data Acquisition and Special Processes Data Acquisition.

a. Control Interfaces - GEN Acquisition is CALL'ed by Basic Data Acquisition and Special Processes Data Acquisition. The specific data to be acquired and screened is controlled by tables passed via the call list. INVOCATION: CALL SGA_GEN_ACQ(SGA CALL)

b. Inputs - There are two types of input data to GEN Acquisition

1. External data which is acquired from the PMU, Payload MDM's and Interprocess COMPOOLS. Once this data is retrieved, and moved if needed, to either the PPB or CDA, it becomes input to the other SM functions.

2. Internal tables (structures) which describe the external data or control processing (see Table 3.2.1.3.2-1).

c. Process Description - The control flow for this module is shown in Figures 3.2.1.3.2-1 through 3.2.1.3.2-11. Data acquisition is separated into 3 groups of data.

1. PMU data is acquired from the PMU and transferred to the INB (a temporary staging area for all parameters acquired) by pointing the FCOS to the PMU DART entries and issuing the FCOS I/O macro (IOMAC). The FCOS uses the DART information to build PMU I/O tables prior to initiating data transfer. Since the I/O tables are fixed length, FCOS accepts a limited number of entries (the maximum number of allowable entries is maintained in the CMT). Transfer of data is performed at the same priority as the GEN Acquisition task. GEN Acquisition issues the FCOS read macro and waits until control is returned before continuing.

After data transfer is complete, Data Screening interrogates each word group in the input buffer to determine if all data was successfully transferred. (A word group is defined as being the response to a read command.) If no data transfer error occured parameters for Basic Data Acquisition that are required and not scaled are moved to the PPB or non-FDA CDA and their I/O status flags are set to valid. The current read cycle's section of the Device Input Buffer to PPB Cross Reference Table (IXP) is referenced to determine where a parameter is to be moved. Each IXP entry consists of parameter control indicators and either a PPB or CDA.

index pointer. The control indicators contain a flag indicating whether or not the parameter is to be limit sensed. Parameters that are to be scaled remain in the input buffer, but a valid I/O status is set in the correct table for each parameter (forward scaling converts and moves the parameter to correct table). Parameters that are to be limit sensed are moved to the PPB. Parameters with dual limit sets are moved to two locations in the PPB (reference section A.2.2). Parameters that are "display only," SCM only, or input to Precondition Processing only are moved to the CDA.

Analog parameters are 10 bit measurements residing in bits 1 through 10 of the 16 bit field with the first bit indicating arithemetic sign of the value. A zero bit indicates a positive value and a 1 bit indicates a negative value. When these parameters are moved, they are shifted to bits 7 through 16 of the target field and the vacated bit locations, 1 through 6, are filled with the sign bit.

Parameters successfully acquired for Special Processes remain in the input buffer (SPINB) and their I/O status is placed in the I/O status area at the end of the SPINB.

If data screening reveals a transfer error, the I/O status flags for all parameters within the word group are set to invalid. The PMU I/O error counter is updated and the error is annunciated if it is the third error.

The PMU read chain is modified to skip acquired data (and the failing command if there was an error). This is done by pointing the FCOS to the next PMU dart entry after the failing entry. This procedure is repeated if there is more PMU data to be read and 2 errors have not occured.

2. Payload data is acquired from the payload MDM's and transferred to the input buffer by means of fixed BCE programs. These programs utilize automatic element bypass and error annunciation.

Comfault bits are interrogated and if ON the I/O error log Ptr in the input buffer is set for use in screening. Comfault bits are set by FCOS to indicate I/O errors for reads utilizing fixed BCE programs. Each bit represents one BCE element (i.e., one read request). See FCOS User's Guide paragraph 4.2 for more information.

Parameters are moved from the input buffer in the same manner as PMU data. Since error annunciation and bypass is done by FCOS, the I/O status flags for parms not acquired are flagged invalid but no annunciation or retry is attempted by General Acquisition.

3. PLMDM reads are issued for all parms from the first requested parm to the last requested parm within a channel. The extra 'Dummy' parms are not moved from the input buffer. This is done to make the PLMDM reads more efficient.

   If there is a PMU bite read requested it is done in the same manner as the PMU read except there is no error retry attempted.

d. Outputs - Outputs from this module are specified in Table 3.2.1.3.2-1.

e. Module References - Process

Process	Section	References
DMA_MAC	A System Software external procedure called when parameter fault annunciation is enabled by FMP_STAT macro.	

f. Module Type and Attributes -

Type: External Procedure
Attributes: Exclusive

g. Template References -

D INCLUDE CSAPPB	Parameter Processing Buffer (PPB)
D INCLUDE CSACDA	Current Data Array (CDA)
D INCLUDE CSAIXP	INB to PPB XREF Table (IXP)
D INCLUDE SMSTAT	Replaces for IO Status
D INCLUDE SGADUMST	Dummy Structures for Call List
D INCLUDE DMA#MACS	Systems Services Error Annunciation Macro Replace Statements
D INCLUDE TEMPLATE CZ1_COMMON	Systems Services Common Compool
D INCLUDE TEMPLATE CSA_SM_CMT	Communications Table (CMT)
D INCLUDE TEMPLATE DMA_MAC	Systems Services Annunciation Routine
D INCLUDE TEMPLATE CDL_ANNUN	Systems Services Annunciation Compool
D INCLUDE TEMPLATE ANTMACS	Systems Services SM PL Fixed Read Replace Statements
D INCLUDE TEMPLATE PFMDMACS	Systems Services SM PL Mission Dependent Read Replace Statements
D INCLUDE TEMPLATE PMUMACS	Systems Services PMU I/O Parameter Lists
D INCLUDE TEMPLATE IOMACS	System Services I/O Macro Replace Statements
D INCLUDE TEMPLATE FCMCOM	FCOS Compool Containing Error Count

h. Error Handling - When an error is indicated during a chained read of the PMU two additional attempts are made to acquire untransferred parameters. For read errors the chain is temporarily modified to skip acquired data and the failing command before the read is retried. This is done by pointing the FCOS to the next PMU DART entry after the failing entry.

i. Constraints and Assumptions - All discretes within an acquired word are acquired at the highest rate required for GPC processing of any discrete within the word.

TABLE 3.2.1.3.2-1 General Data Acquisition **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Gen Data Acquisition Call List	E	I/O	SDA, SSP, SGA/SGA	SGA_CALL_LST		
2	Dart Index	E	I/O	SDA, SSD, SGA/SGA	SGA_DART_HDR		
3	Dart Address	E	I/O	SDA, SSD, SGA/SGA	SGA_DART_ADDR		
4	IO STAT Address	E	I/O	SDA, SSD, SGA/SGA	SGA_IO_ADDR		
5	INB Address	E	I/O	SDA, SSD, SGA/SGA	SGA_INB_ADDR		
6	(deleted)						
7	PLMDM IO List Address	E	I/O	SDA, SSD, SGA/SGA	SGA_IOLST_ADDR		
8	PLMDM Read Flag	E	I/O	SDA, SSD, SGA/SGA	SGA_PLREAD		
9	SP Call Flag	E	I/O	SDA, SSD, SGA/SGA	SP_CALL_FLG		
10	Error Count	E,D2	I/O	SDA/ CRT, DL	CSAV_CMT_ERROR_COUNT	V92J0105C	
11	Parameter Values	A.2.2, D.3, A.2.7, D.4, A.2.16	O	SPP, SFD, SPM, SFS, CRT	N/A		
12	Parameter I/O Status	A.2.2, D.3, A.2.7, D.4, A.2.16	O	SPP, SFD, SPM, SFS, CRT	N/A		
13	Max Chain Length	E	I	INIT	CSAK_MAX_CHAIN		
14	Data Cycle Error Ind.	A.2.11	O	SDA	CSAV_CYC_ERROR		
15	#CWS This Chain	E	LOCAL		SGA_NUM_CWS		
16	I/O ERROR LOG Ptr	E	I/O	FCOS	N/A		
17	Error Retry Counter	E	LOCAL		SGA_ERR_RETRY		
18	# Dart Entries	E	LOCAL		SGA_NUM_ENT		
19	# Parms	E	LOCAL		SGA_NUM_PARMS		
20	# PMU Entries	A.2.3	I	SGA	CSAS_DART_NUM_PMU_ENTRIES		
21	# PLMDM BUS1 Entries	A.2.3	I	SGA	CSAS_DART_NUM_PLMDM1_ENTRIES		
22	# PLMDM BUS2 Entries	A.2.3	I	SGA	CSAS_DART_NUM_PLMDM2_ENTRIES		
23	Read Length	A.2.3	I	SGA	CSAS_DART_READ_LENGTH		

TABLE 3.2.1.3.2-1 (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
24	I/O Status Ind	A.2.10	I/O	SGA/SGA	N/A		
25	FCOS I/O Parm List	E	LOCAL	FCOS	SGA_I/O_PARM_LIST		
26	Comfault Bits	E	I	FCOS	CZEB_COMM_FAULT		
27	Invalid Status Flag	E	LOCAL		SGA_INVAL_STAT		
28	Number Of Comfault bits	E	LOCAL		SGA_NUM_COMFAULT_BITS		
29	IOB Index	E	LOCAL		SGA_IOB_INDEX		

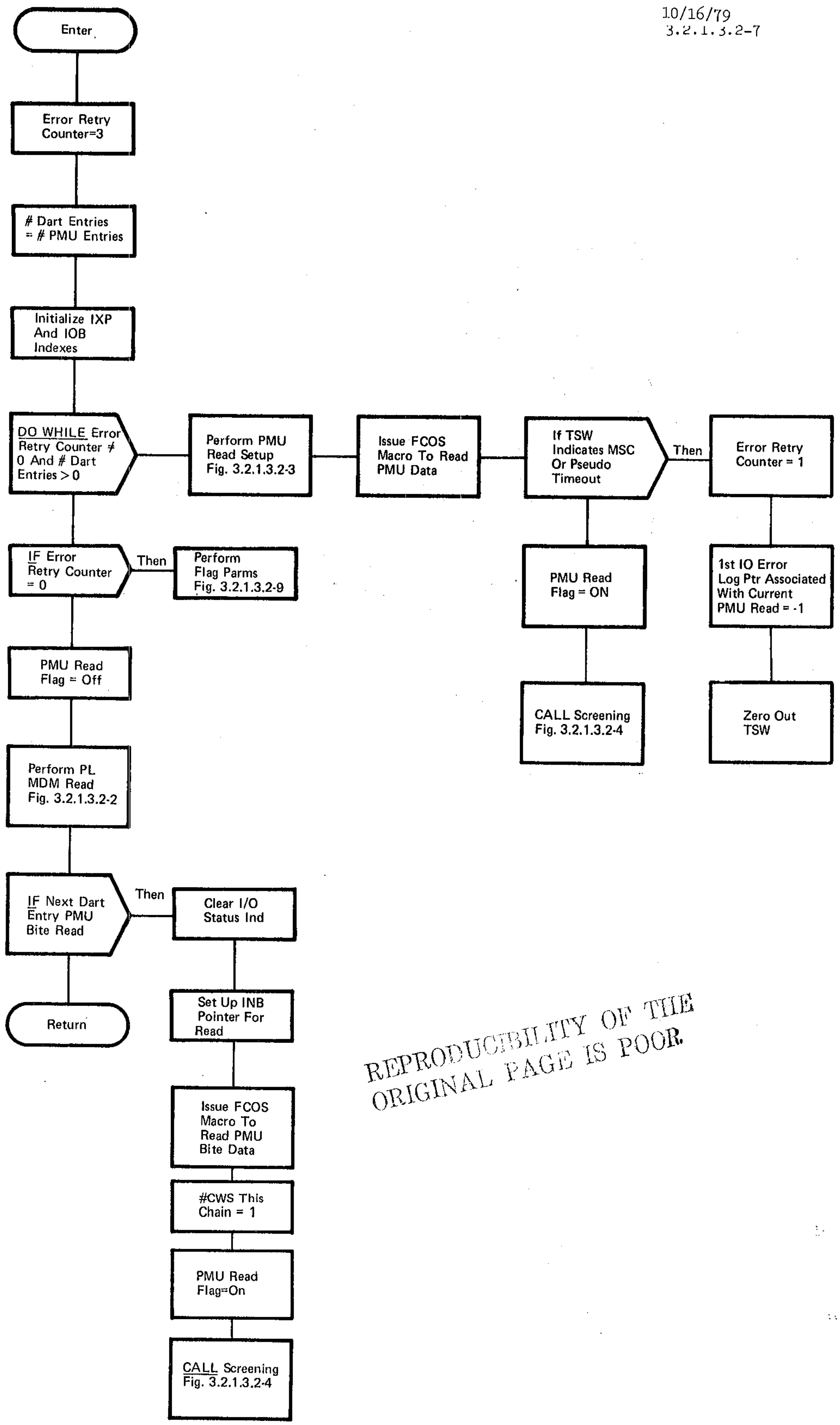

Figure 3.2.1.3.2-1. General Acquisition

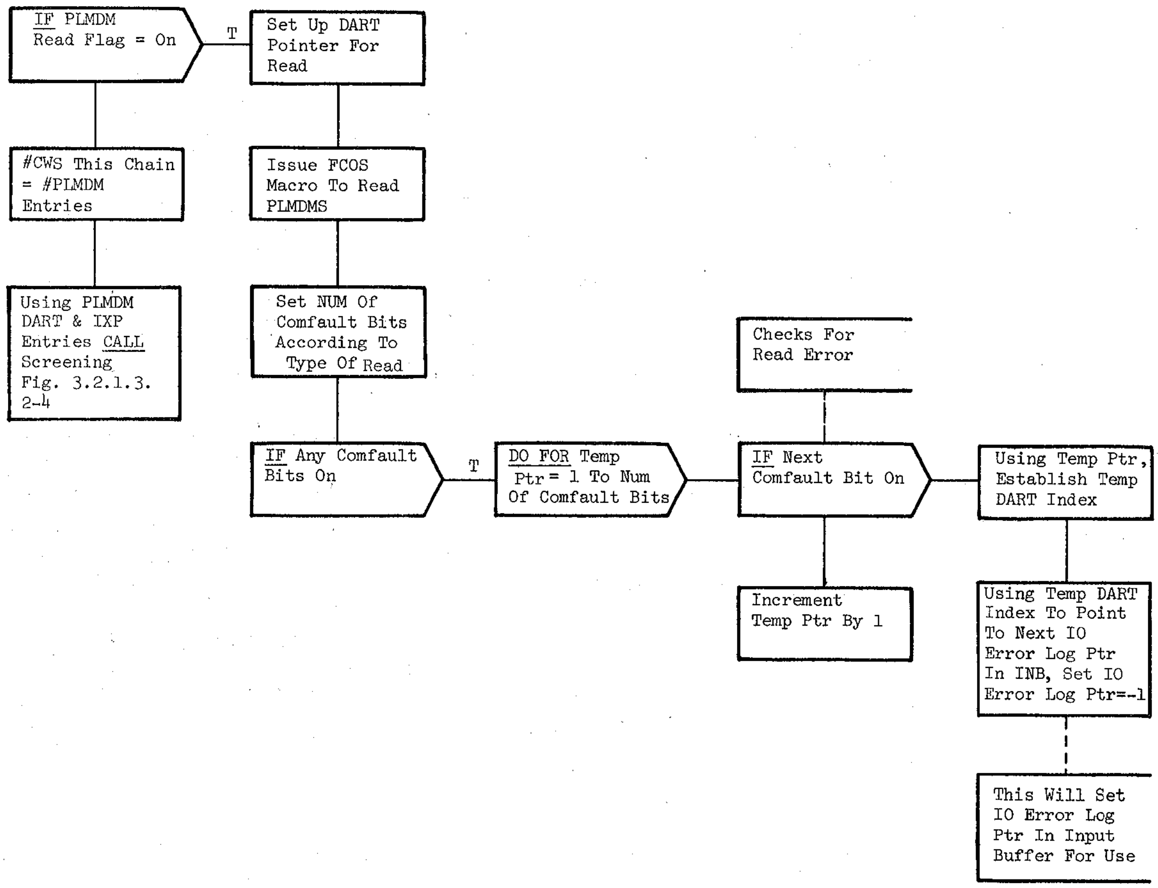

Figure 3.2.1.3.2-2. PLMDM Read

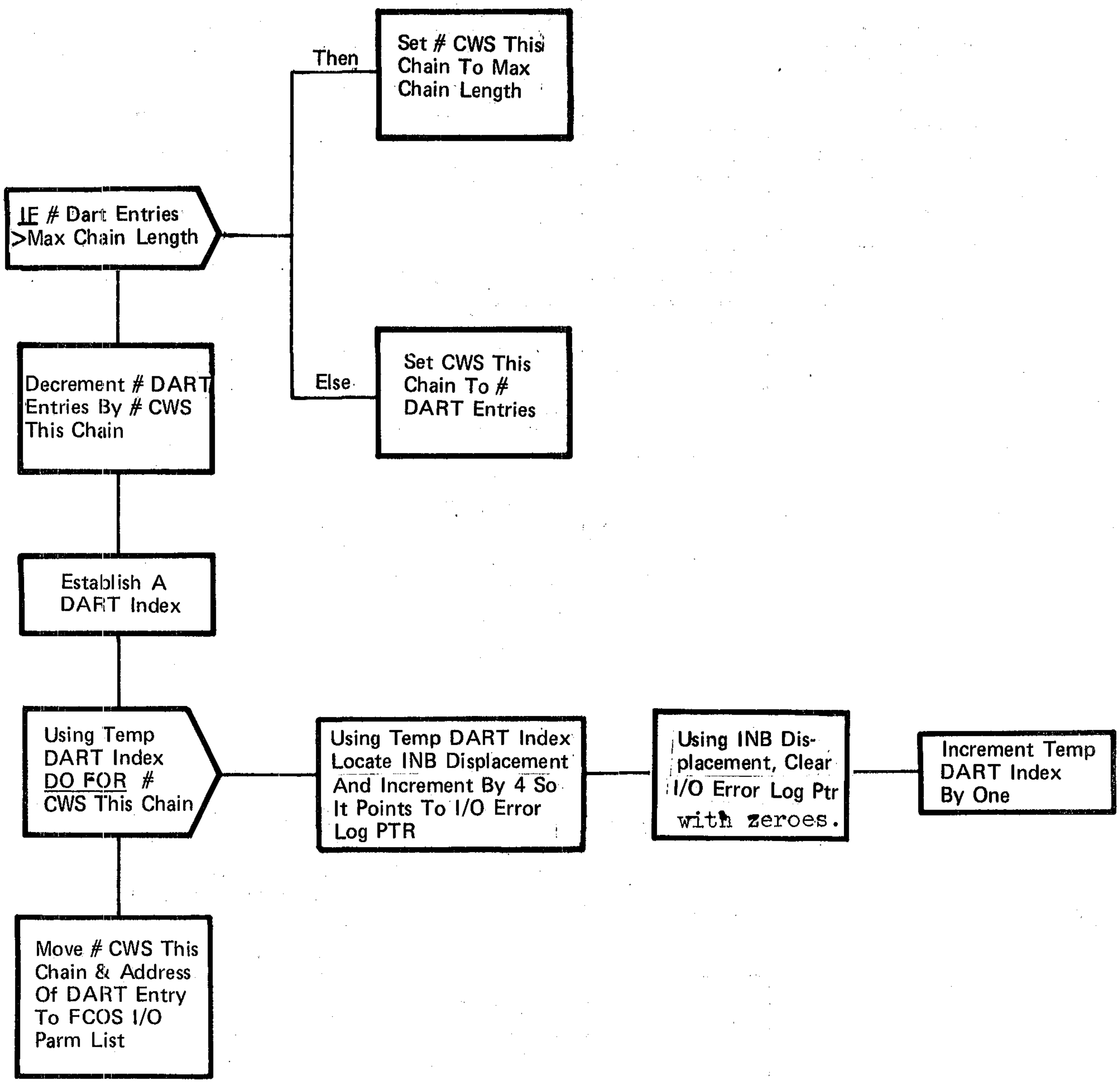

Figure 3.2.1.3.2-3. PMU Read Setup

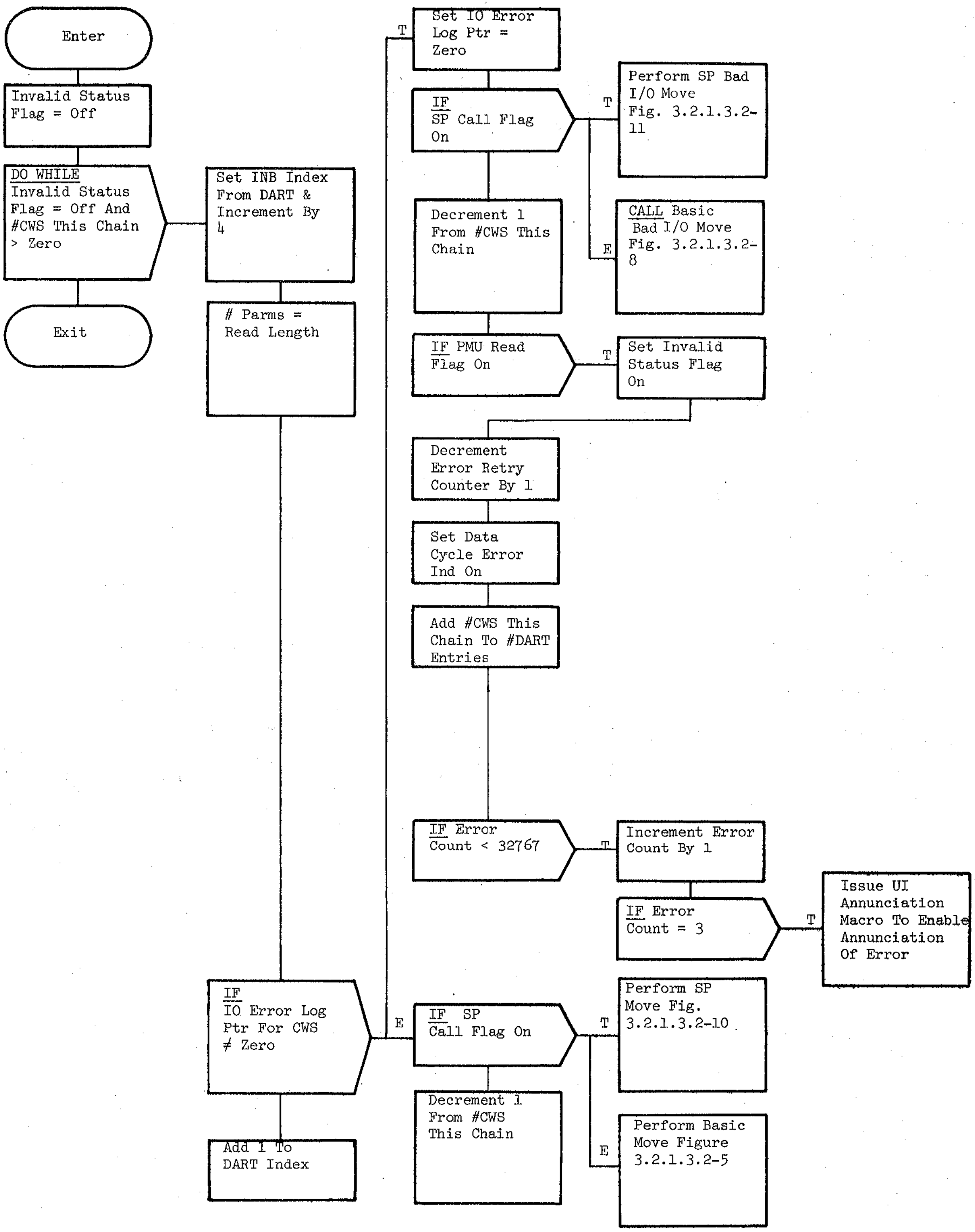

Figure 3.2.1.3.2-4. Screening

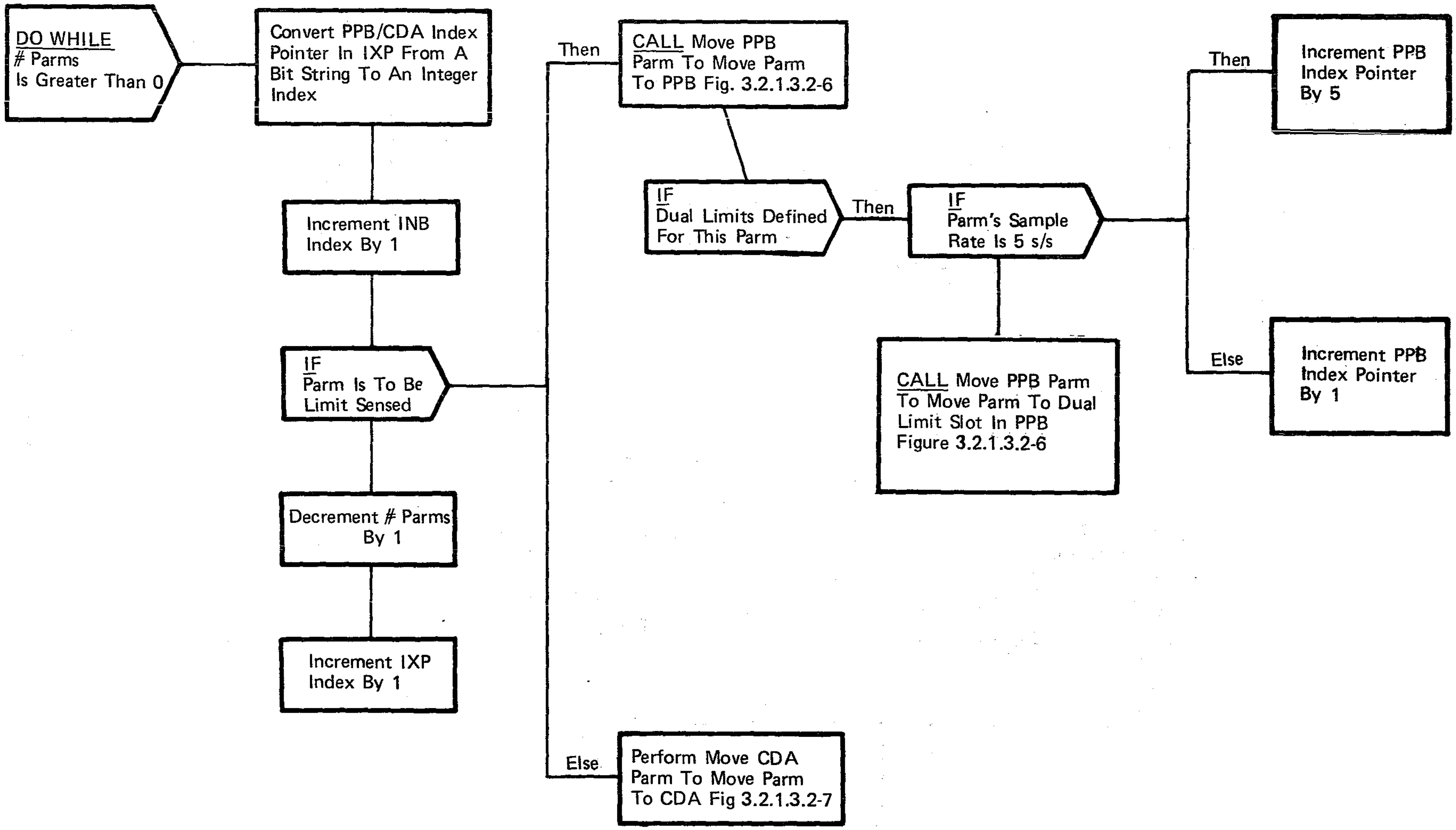

Figure 3.2.1.3.2-5. Basic Move

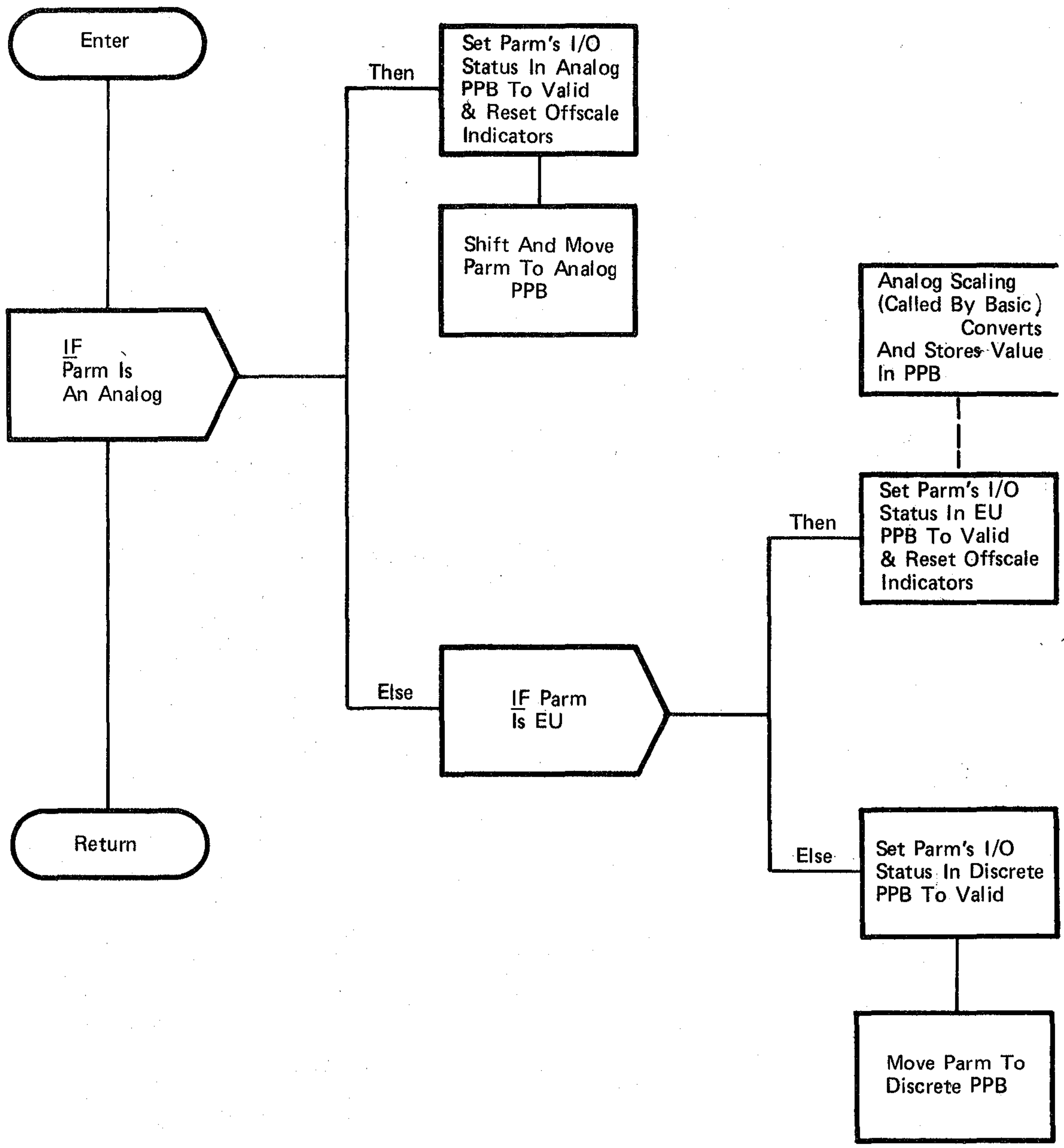

Figure 3.2.1.3.2-6. Move PPB Parm

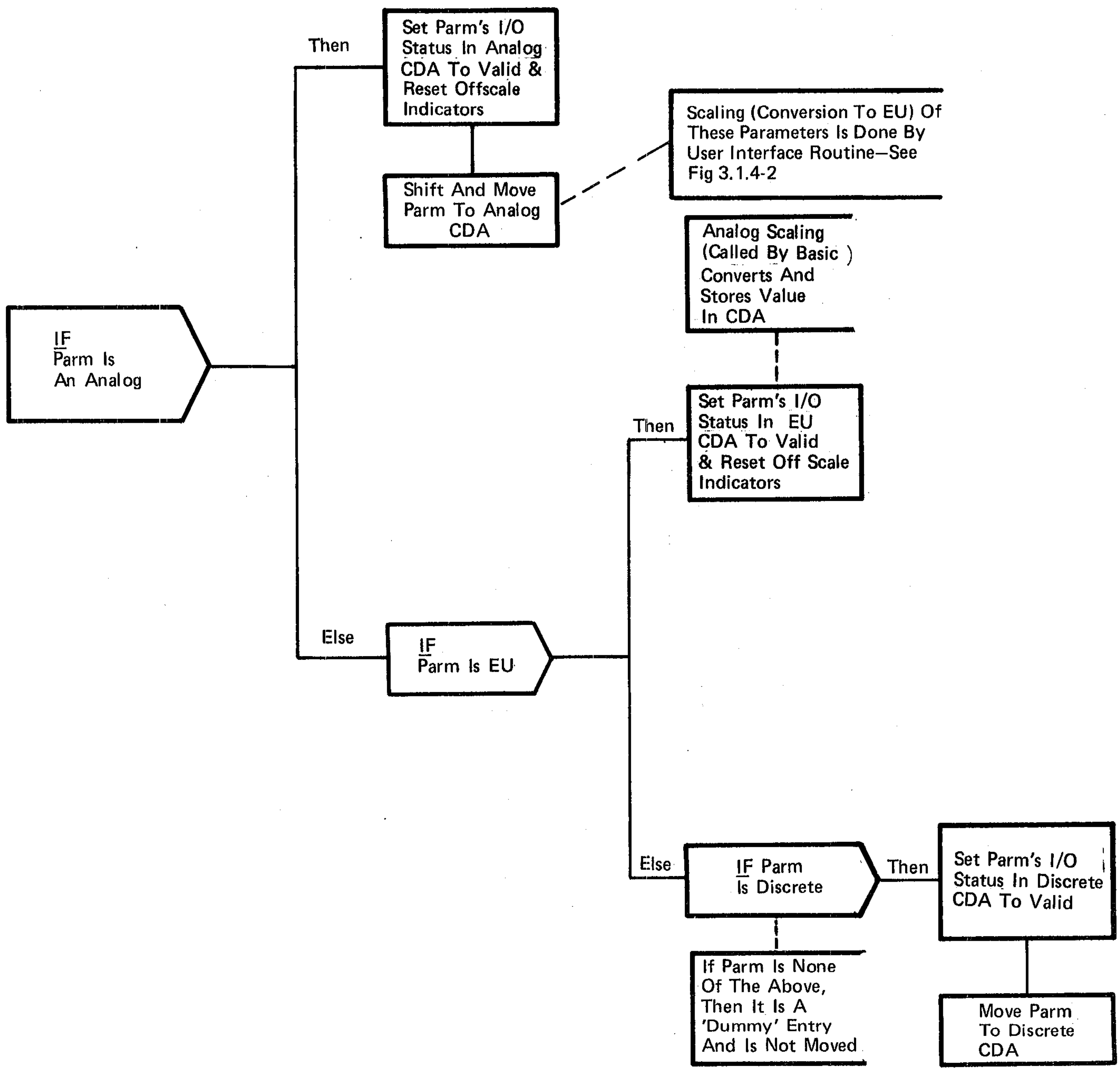

Figure 3.2.1.3.2-7. Move CDA Parm

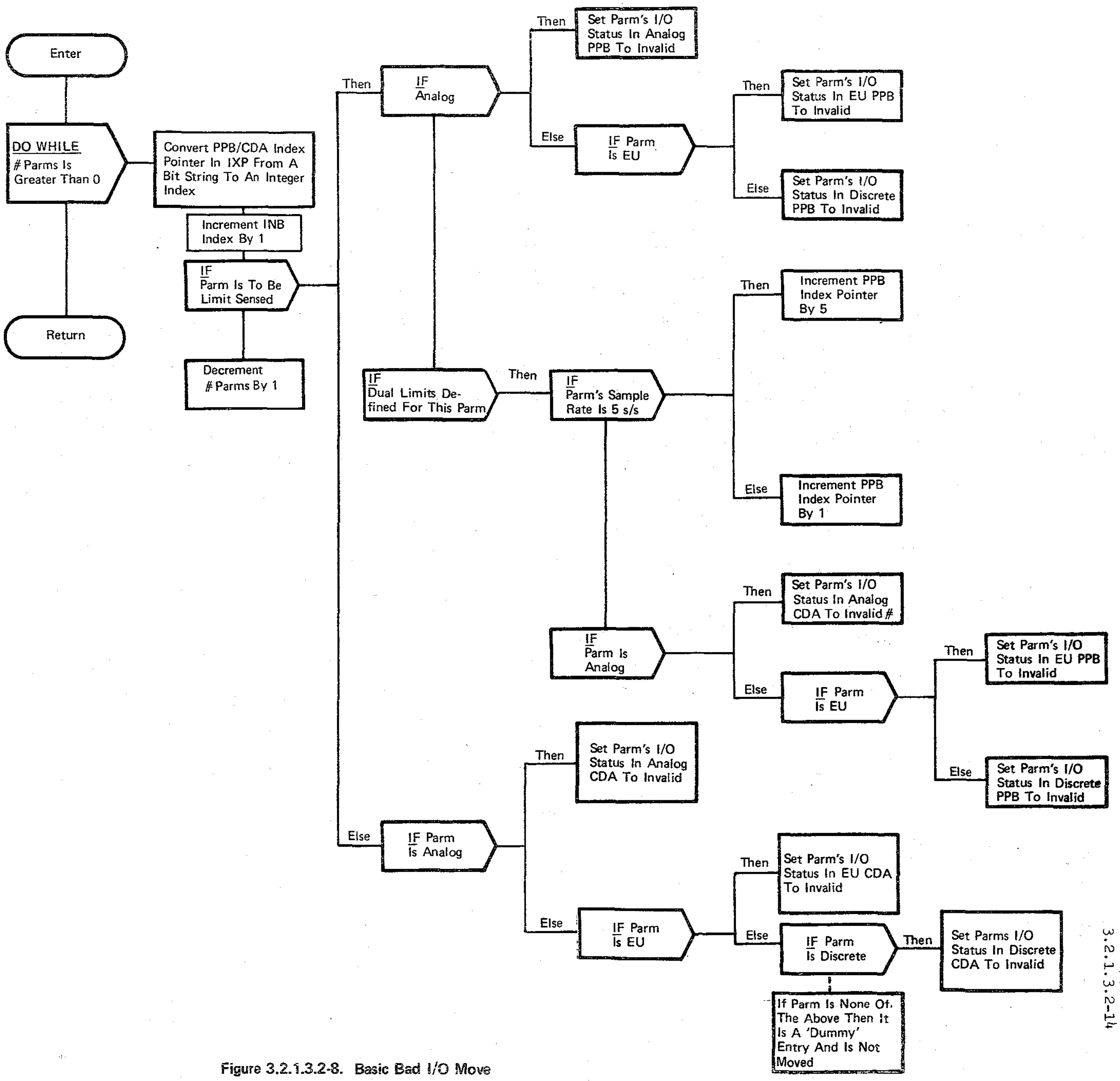

Figure 3.2.1.3.2-8. Basic Bad I/O Move

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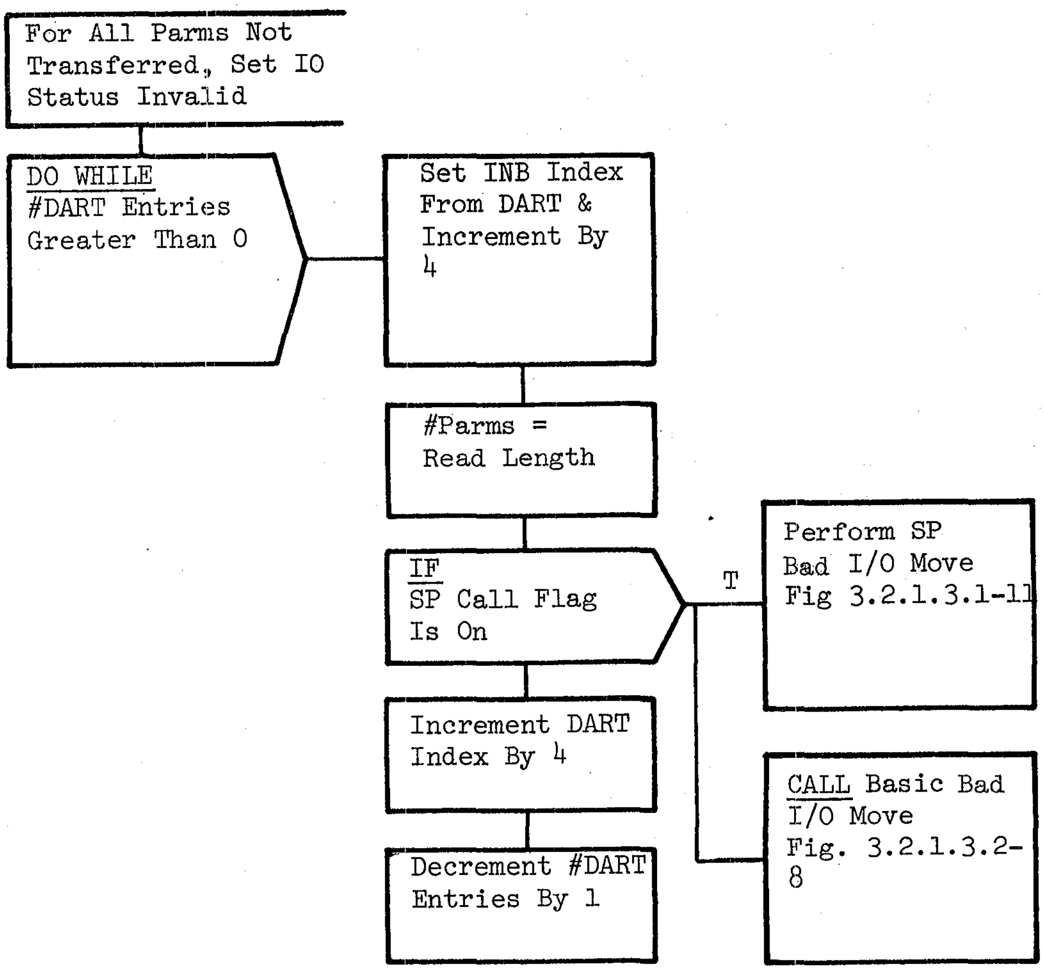

Figure 3.2.1.3.2-9. Flag Parms

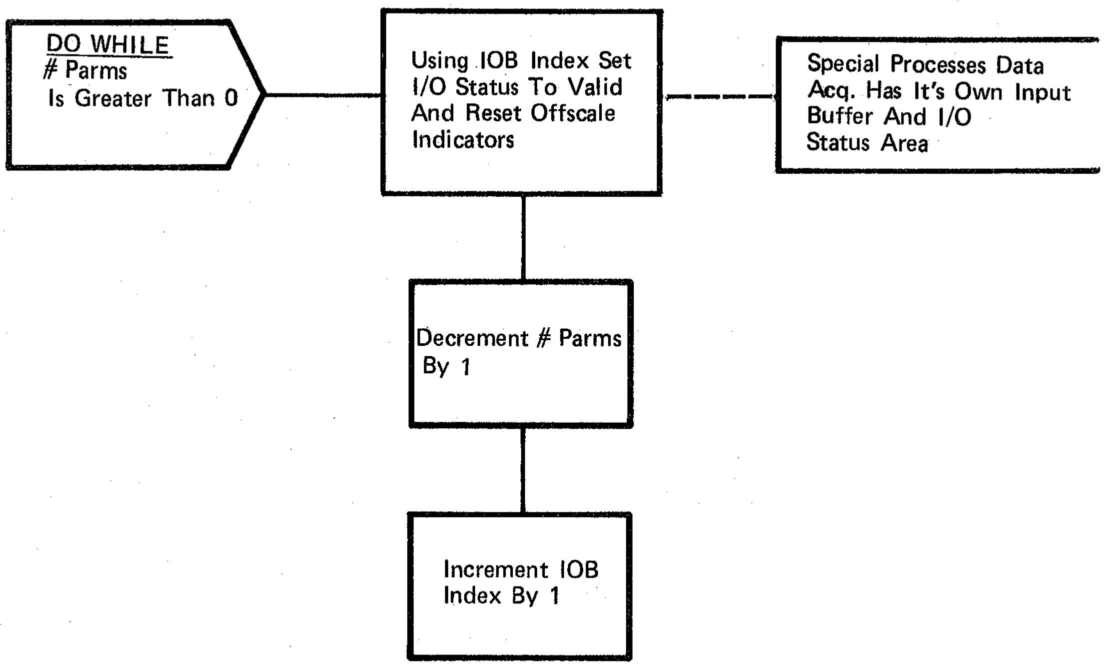

Figure 3.2.1.3.2-10. SP Move

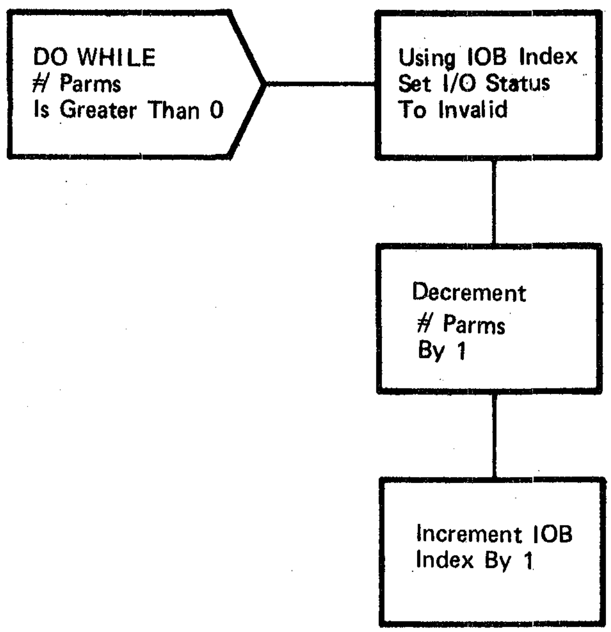

Figure 3.2.1.3.2-11. SP Bad I/O Move

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3.2.1.4 Performance Monitor Control (SPM_CONTROL)

The Performance Monitor (PM) Control module directs execution of the following SM functions: Precondition Processing and Fault Detection and Annunciation.

a. Control Interface - The PM Control module is SCHEDULE'd by the SM OPS Control Segment and runs continuously while the OPS sequence is active.

   Invocation: SCHEDULE SPM_CONTROL PRIORITY (PRIO_SPM)

b. Inputs - Inputs to this module are specified in Table 3.2.1.4-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.4-1 through 3.2.1.4-6. The PM Control module determines which Parameter Processing Buffer half to process by checking the PPB buffer half indicator. A "WAIT" is then issued on the appropriate ready flag until Data Acquisition (Section 3.2.1.3.1) completes updating of that buffer half. This results in an effective execution rate of once per second.

   When the buffer half is available, the FDA inhibit indicator in the Communications Table is checked. This indicator is set as a result of an item entry from the Table Maintenance SPEC function to disable FDA processing. When FDA is disabled, PM Control updates the FDA Current Data Array (CDA) with the latest sample of each measurement in the PPB half being processed. If FDA is not suspended, PM Control calls Precondition Processing and Fault Detection and Annunciation (FDA).

   After FDA returns control, PM Control resets the appropriate ready flag in the Communications Table which indicates that the PPB half has been processed. This makes it available to Data Acquisition for use. The PPB buffer half indicator is then updated to point to the other PPB buffer half. Control then returns to the top where PM Control either begins processing the next PPB buffer half or "WAIT"s for Data Acquisition to complete its processing. This process continues in such a fashion until the Performance Monitor (PM) Control cancel flag is set by OPS cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.2.1.4-1.

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e. Module References - Process

Process	Section	Reference
Precondition Processing	3.2.1.5	CALL
Fault Detection and Annunciation	3.2.1.6	CALL(Call List)

f. Module Type and Attributes:

Type: Program
Attributes: N/A

g. Template References:

```
D INCLUDE CSAPPB   Parameter Processing Buffer (PPB)
D INCLUDE CSACDA   Current Data Array (CDA)
D INCLUDE TEMPLATE CSS_SM_CMT   Basic Processes CMT
D INCLUDE TEMPLATE SFD_FAULT_DETECT_ANNUN  Fault Detection and
                                           Annunciation
D INCLUDE TEMPLATE SPP_PRECON_PROCESS  Precondition Processing
```

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.4-1 PM CONTROL MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	PPB Buffer Half Indicator	A.2.11 D.19	I	S2I	CSAB_CMT_BUF_HALF		
2	Parameter Values	A.2.2 D.3	I	SDR, SDS, SFS	CSAS_PPBA_VALUE CSAS_PPBE_VALUE CSAS_PPBP_VALUE		
3	Parameter I/O Status	A.2.2 D.3	I	SDA, SDS	CSAS_PPBA_STATUS CSAS_PPBE_STATUS CSAS_PPBP_STATUS		
4	Ready Flag1 and Ready Flag2	A.2.11 D.1	I/O	SDA, S2I/SDA	CSAB_CMT_READY_FLAG1 CSAB_CMT_READY_FLAG2		
5	FDA Enable/ Inhbit Indicator	A.2.11	I	STM	CSAB_CMT_FDA_INHIBIT		
6	Parameter Values	A.2.7 D.5	O	CRT, DL	CSAS_FCDAA_VALUE CSAS_FCDAE_VALUE CSAS_FCDAP_VALUE		
7	Parameter I/O Status	A.2.7 D.5	O	CRT, DL	CSAS_FCDAA_STATUS CSAS_FCDAE_STATUS CSAS_FCDAP_STATUS		
8	PM Cancel Flag	A.2.11 D.20	I	S2I	CSAB_CMT_PM_CANCEL		
9.	Fault Detection and Annunciation CALL LIST	E.3.2.1.6	L		SPM_PPBA_INDEX SPM_PPBE_INDEX SPM_PPBP_INDEX		
10.	CDA Indexes	E.3.2.1.4	L		SPM_CDAA_INDEX SPM_CDAE_INDEX SPM_CDAP_INDEX		
11	PPB Indexes	E.3.2.1.4	L		SPM_PPBA_INDEX SPM_PPBE_INDEX SPM_PPBP_INDEX		

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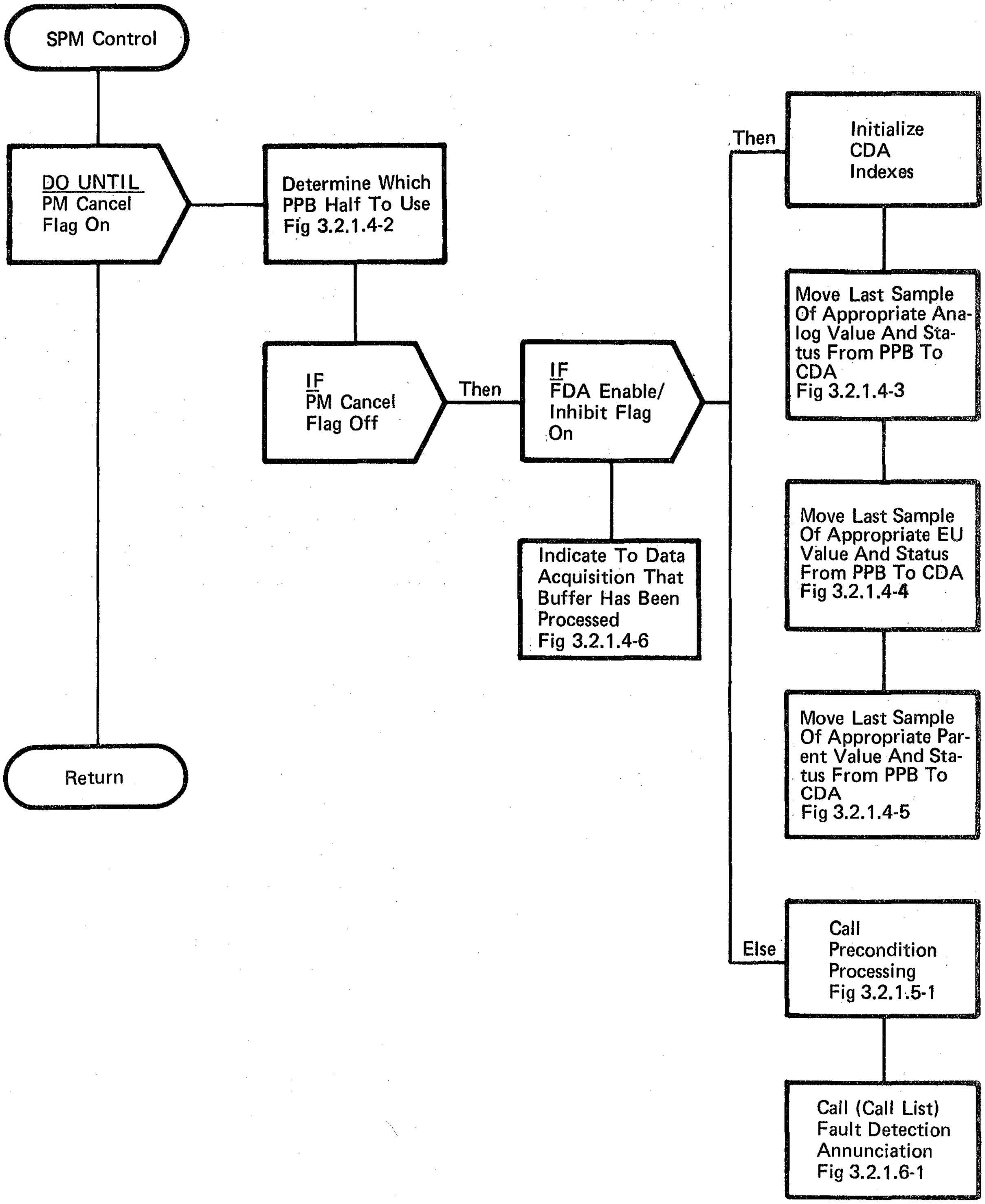

Figure 3.2.1.4-1. PM Control

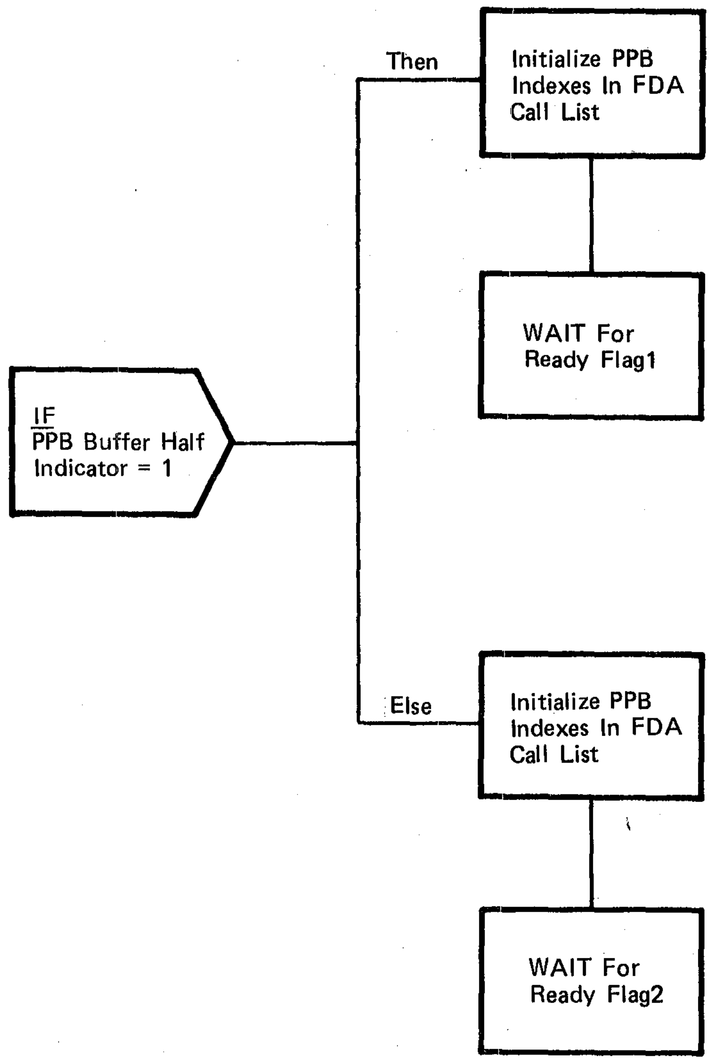

Figure 3.2.1.4-2. Determine PPB Buffer Half

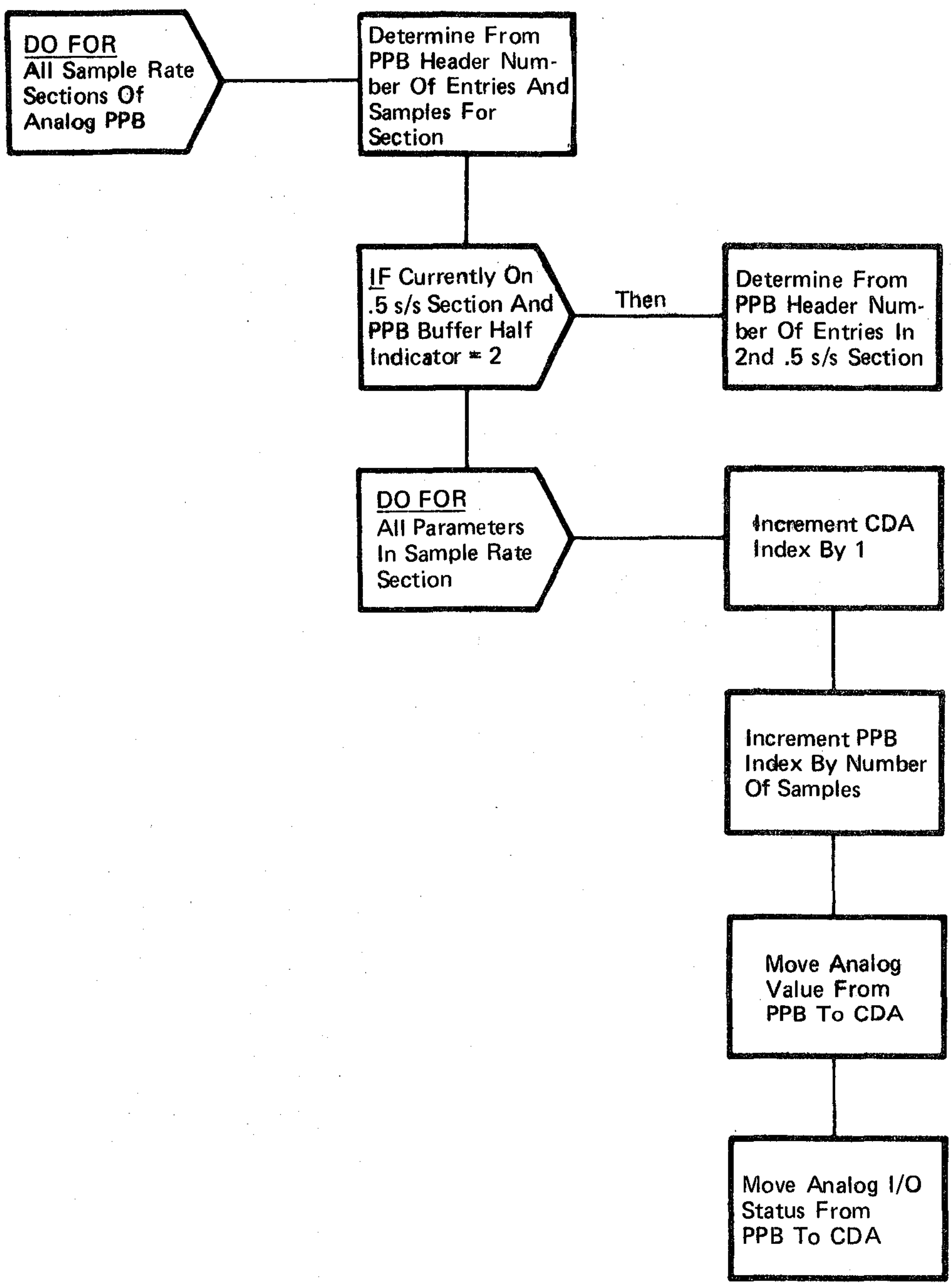

Figure 3.2.1.4-3. Analog Move

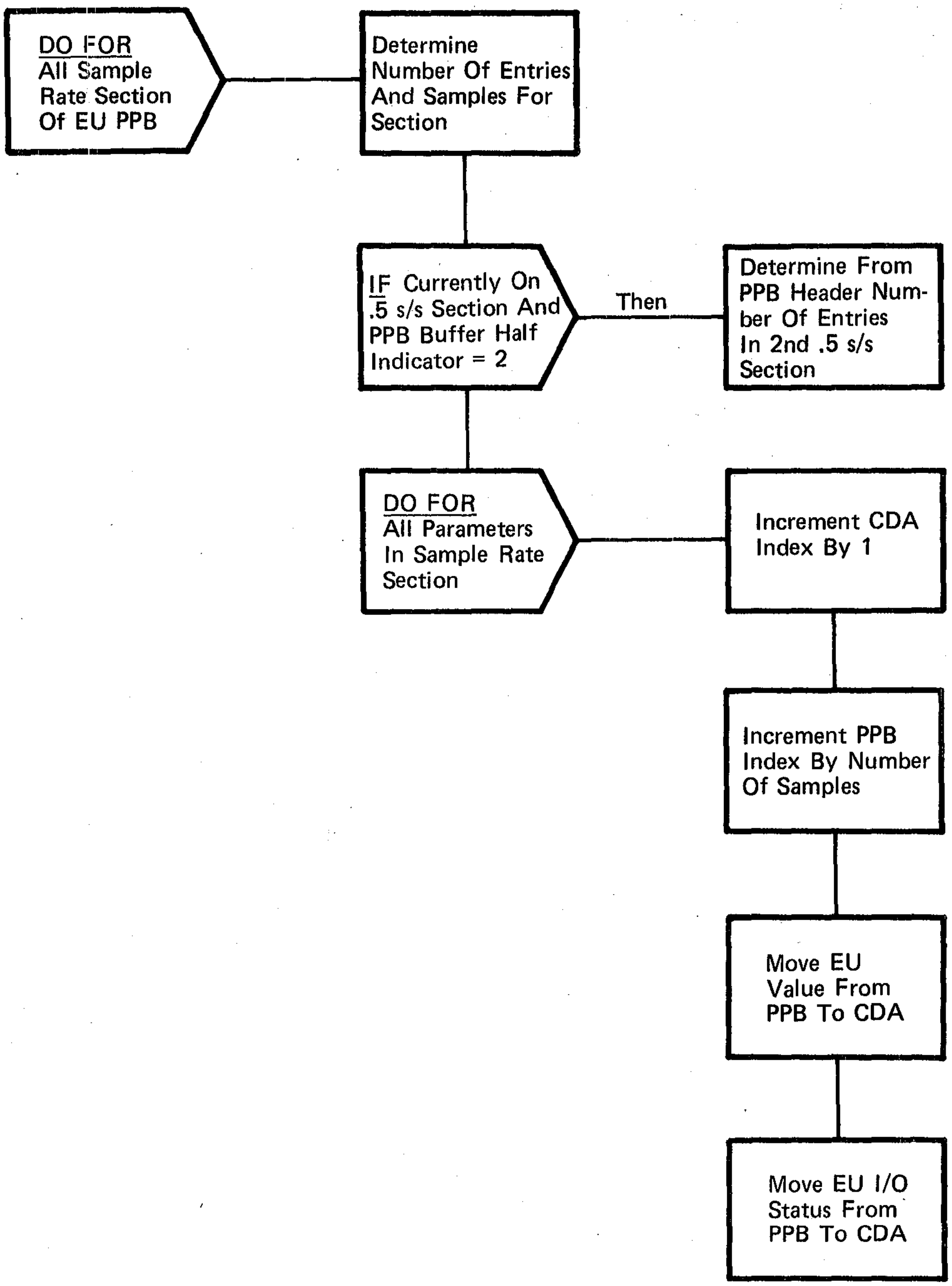

Figure 3.2.1.4-4. EU Move

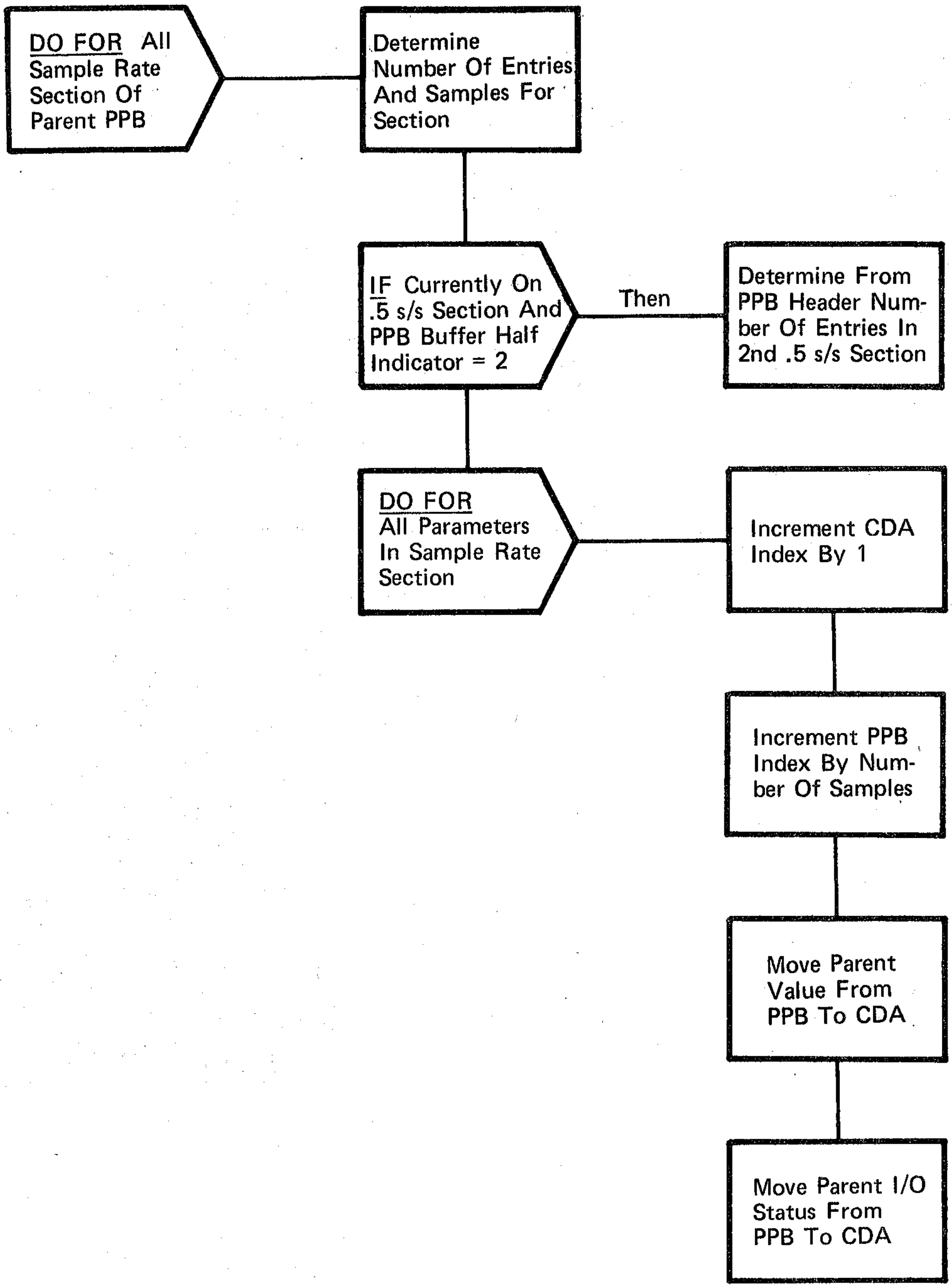

Figure 3.2.1.4-5. Parent Move

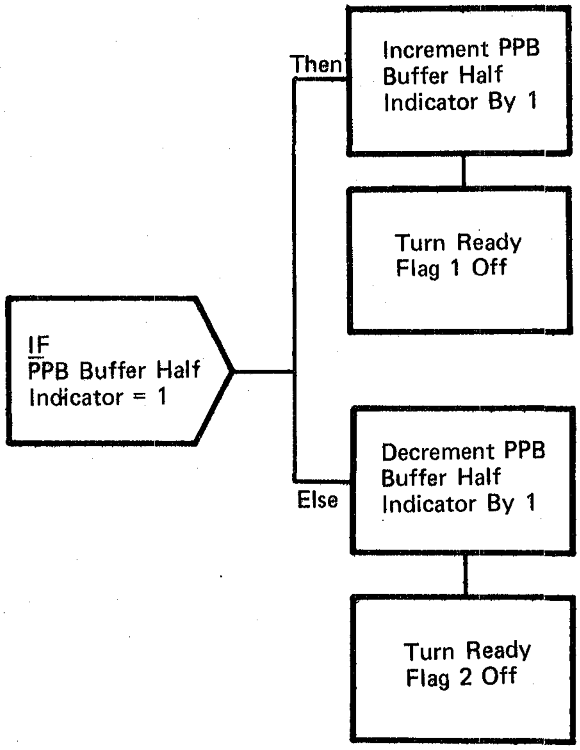

Figure 3.2.1.4-6. Data Acquisition Indication

3.2.1.5 Precondition Processing (SPP_PRECON_PROCESS)

The Precondition Processing analyzes parameter values and statuses (precondition inputs) to determine which limit set to use for those parameters with multiple limit sets. Limit set selection may be for a single parameter or a group of parameters. The selected limit set is used in subsequent FDA processing.

a. Control Interface - Precondition Processing is CALL'ed by the PM Control module (SPM_CONTROL) once per second while FDA is enabled.

    INVOCATION: CALL SPP_PRECON_PROCESS

b. Inputs - Inputs to this module are specified in Table 3.2.1.5-1. Input data are contained principally in the Parameter Information Table (PIT), the Precondition Control Table (PCT), the Precondition Group Table (PGT), and the Current Data Array (CDA).

c. Process Description - The control flow for this module is shown in Figure 3.2.1.5-2. When invoked, Precondition Processing sequentially processes all precondition groups as described below.

    The warm-up count for each precondition group is initially set to the max warm-up value by the SM Preprocessor. When a new limit set is selected, the warm-up count is set to 1. This count incremented by 1 each time precondition is called, until the warm-up count is equal to the max warm-up value. Then the number of sets for the preconditoin group being processed is calculated and saved. The index to the set solution block is saved. The subject parameters are checked for validity (no input errors) and if they are determined to be valid, processing continues; otherwise, processing of this precondition solution is inhibited. The prime limit set (No. 1) is selected for the affected group of parameters and a one is ascribed to the number of limit sets selected. An interpreter technique is utilized to solve precondition solutions. The final limit set selection is made based on the precondition solutions. This procedure is repeated for all precondition groups.

    The input parameter validity check (Figure 3.2.1.5-3) records input errors for parameters contained in each set. The number of parameters in each set, the parameter type, and CDA index are saved. Depending on the parameter type, the appropriate I/O status flag from the CDA is stored in the invalid indicator.

    The interpreter technique (Figure 3.2.1.5-4) is utilized to perform the actual precondition solution. This technique uses a generalized routine including predefined parameter and logical operation codes found in the PCT to arrive at the precondition solution. For the analog and EU parameter types, the status flag is set equal to the combined high and low limit sense flags. For the discrete type, the status flag is set equal to the discrete value. A parameter condition flag is turned on or off depending on the parameter operation code and the status flag (see Figure 3.2.1.5-5). The parameter condition flag is set to 1 if the parameter value agrees with the parameter Op Code. Otherwise it is set to a zero. For instance, if the Parameter Op Code is in-limit then the parameter condition flag is set to one. The Precondition Grouping (Figure 3.2.1.5-6) actually provides the precondition solutions. The Parm Op Code indicates which test (=0, =1 in-limits, out-of-limits) should be performed on each input parameter. The logical Combination (COMB) Op Code indicates that logical combination (and, or) should be performed on the results of the parameter tests.

In the case of precondition expressions of the form, ('A=1' or 'B=0') and ('C=0' or 'D=1') where the operators are parenthetically grouped and where solution of the expression would result in a different result were the grouping attribute not recognized, those components of the expression within the groups are solved first, then the entire expression is solved, left to right. The following example demonstrates precondition grouping and the algorithm for obtaining a set solution. Assume A and B are discrete parameters, C is an analog parameter, and D is an EU parameter. Furthermore, the set solution expression is 'A=0' or ('B=1' and 'C=IL') and 'D=OL' where IL is in limits and OL is out of limits. A=0 assumes a value of 1 if discrete A has a value of 0. Similarly, in-limit value, 'C=IL' will have a binary value of 1. The set solution expression will be coded as follows.

Parameter	Parm Op Code	Definition	Comb of Code	Position in Parenthesized Group
A	1	=0	Or	
B	2	=1	Or	First
C	3	Analog, In Limit	And	Last
D	6	EU, Out of Limit	And	

The sequential steps for the above set solution expression follows.

BOOK: OFT SM Detailed Design Specification

Step 1	Operations	
1	S1=0	Partial Set Solution
2	S=1	Set Solution
3	S=S or [A=0]	
	S=0 or [A=0]	
	S= [A=0]	
4	OPSAVE=OR	
5	S1= [B=1]	
6	S1= [B=1] and [C=IL]	
7	S=S OPSAVE S1	
	S='A=0' or ('B=1' and 'C=IL')	
8	S=S and [D=OL]	
	S= [A=0] or ([B=1] and [C=IL]) and [D=OL]	

Symbology

S1	Partial Set Solution
S	Set Solution
( )	Grouping
[ ]	Parameter Op Code Expressed as a Logical Statement. (Enclosed).
OR	'OR' Combination Op Code
AND	'AND' Combination Op Code
IL	In Limits
OL	Out of Limits

The final limit set selection is made as shown in Figure 3.2.1.5-7. If the result of the precondition solution for a particular set is true, an indicator is stored in the PCT indicating the set selected for this precondition group. If the precondition operation indicates that more than one solution was satisfied, the prime limit set is selected for the affected group of parameters. Then the Precondition Group Table is referenced so that the limit set selected may be changed for all parameters contained in the affected group.

If no limit sets are resolved by the Precondition Process, the prime limit set is selected.

If the limit set selected from the precondition solution changes from the last selection and the max warm-up time is ended, the active limit set number in the PIT for each affected analog or EU parameter must be updated. The current noise count is reset to zero and the hard fail indicator and FDA bypass indicator are reset to off.

If the parameter affected by the precondition solution is a discrete, the current noise count is reset to zero, the active limit set is updated, and the hard fail indicator and FDA bypass indicator for that parameter are reset to Off in the Discrete Measurement Subentry Table (DMST - a subset of the discrete parent word PIT). The parent word entry for that discrete is then located in the PIT and the 'MASK2' portion of that entry is changed and the parameter count field (if that parameter is currently in a max good or fail state) is updated. (Mask 2 contains the limit status of the parent while parameter count is an internal indicator used by the limit sense routine to determine if it is necessary to perform limit sensing on the discretes.)

If the limit set selected from the precondition solution changes from the last solution for the first time (no warm-up time expired), the warm-up time is set to one. FDA is disabled for all parameters in the group by setting the FDA bypass flag to ON in the PIT. Also, the limit sense indicators are disabled (set off). Finally the last set selected is set to 0, indicating the start of warm-up time.

d. Outputs - Outputs from this module are specified in Table 3.2.1.5-1. Outputs affected by the Precondition Processing routine consist of the last solution indicator in the PCT and other items contained in the PIT. The PIT fields, as updated by Preconditioning, control later processing by the FDA routine.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism)

g. Template References

D INCLUDE CSAPCT	Precondition Tables (PCT and PGT)
D INCLUDE CSAPIT	Parameter Information Table (PIT)
D INCLUDE CSACDA	Current Data Array (CDA)

h. Error Handling - Precondition Processing performs the following types of error detection/processing:

- If any parameter input to any set of that precondition solution is found with an invalid parameter validity indicator, further processing of that solution is inhibited and the prime limit set (limit set 1) is chosen for all parameters affected by that solution.

- If more than one limit set is selected during processing of a particular solution, processing will select the prime limit set for all parameters affected by that solution.

- If no limit set is selected during processing of a precondition solution, the prime limit set is selected.

i. Constraints/Assumptions

- A maximum of three limit sets may be specified for any preconditon solution.
- The prime limit set is always limit set one.
- A maximum of four parameters may be specified in a precondition solution to select a limit set.
- Only one level of parenthesis is permitted for a precondition solution. Below are examples of valid and invalid precondition equations for a single set. Figure 3.2.1.5-1 shows more example precondition relationships.
  - A=1 OR B=1 AND C=1 OR D=OL* Valid
  - (A=1 OR B=1) AND C=1 OR D=OL Valid
  - (A=1 OR B=1) AND (C=1 OR D=OL) Valid
  - A=1 OR (B=1 AND (C=1 OR D=OL)) - Invalid, 2 levels of parentheses

  *OL = Out of Limits

EXAMPLE PARAMETER RELATIONSHIP IN PRECONDITION PROCESS

Precondition Groups		Precondition Set Solutions	Predefined Limit Sets Set #	Low Limit	High Limit
V45T0320A	GRPA	V92X0621X=1	1	175	212
		V92X0622X=1	2	185	222
		V92X0623X=1	3	195	238
V61P2700A	GRPB	(V61S2704E=1 and V61K2711Y=1) or V61S2709E=1	1	50	75
		(V6152709E=0 and V6152704E=0) or (V6152704E=1 and V61K2711Y=0)	2	20	-
V61R2722A		Same as V61P2700A, Set 1	1	550	-
		Same as V61P2700A, Set 2	2	-	20

Set solutions in group A are evaluated in three unique logical expressions to select either limit set 1, 2 or 3 for FDA'd parameter V45T0320A.

Set solutions in group B are evaluated in two unique logical expressions to select either limit set 1 or 2 for FDS'd parameters V61P2700A and V61R2722A.

Figure 3.2.1.5-1

TABLE 3.2.1.5-1 PRECONDITION PROCESSING **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Number of precondition groups	A.2.5	I		CSAS_PCT_PRECONDS		
2	Number of parameters in group	A.2.5	I		CSAS_PCT_PARMS_IN_GROUP		
3	Number of parameters in each set solution	A.2.5	I		CSAS_PCT_NUMPARMS_INSET		
4	Warm-up count	A.2.5	I/O		CSAS_PCT_WARMUP_COUNT		
5	Max warm-up value	A.2.5	I		CSAS_PCT_MAX_WARMUP		
6	Last Limit set selected	A.2.5	I/O		CSAS_PCT_LAST_SOLUTION		
7	CDA index of each pre-condition parameter	A.2.5	I		CSAS_PCT_CDA_INDEX		
8	Index into PGT	A.2.5	I		CSAS_PCT_GROUP_INDEX		
9	PIT index for limit sensed parameters	A.2.6	I		CSAS_PGT_PIT_INDEX		
10	Active Limit set	A.2.1	O	SFD	CSAS_PITA_ACT_LIM_SET CSAS_PITE_ACT_LIM_SET CSAS_PITS_ACT_LIM_SET		
11	Current Noise Count	A.2.1	O	SFD	CSAS_PITA_CUR_N_CT CSAS_PITE_CUR_N_CT CSAS_PITS_CUR_N_CT		
12	Hard Fail Indicator	A.2.1	O	SFD	CSAS_PITA_HARD_FAIL CSAS_PITE_HARD_FAIL CSAS_PITS_HARD_FAIL		
13	FDA Bypass Indicator	A.2.1	O	SFD	CSAS_PITA_FDA_BYPASS_IND CSAS_PITE_FDA_BYPASS_IND CSAS_PITS_FDA_BYPASS_IND		
14	Parameter Values	A.2.7,D.4,D.5	I	SDA,SFD	CSAS_FCDAA_VALUE CSAS_FCDAE_VALUE CSAS_FCDAP_VALUE CSAS_CDAP_VALUE		
15	I/O Validity Flag	A.2.7,D.4,D.5	I	SDA,SFD	CSAS_FCDAA_IO CSAS_FCDAE_IO CSAS_FCDAP_STATUS CSAS_CDAP_STATUS		
16	Number of Limit Sets Selected	E	L		SPP_PRECON_NO_LS_SEL		

TABLE MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
17	Invalid Indicator	E	L		SPP_INVALID_IND		
18	Number of Sets	E	L		SPP_PCT_NUM_SETS		
19	Index into Parm Set blocks (Set Solution (Index))	A.2.5	I		CSAS_PCT_PARM_SET_INDEX		
20	Parm Type	A.2.5	I		CSAS_PCT_TYPE		
21	Status Flag	E	L		SPP_STATUS_FLAG		
22	Parm OP Code	A.2.5	I		CSAS_PCT_PARM_OPCODE		
23	Logical Comb OP Code	A.2.5	I		CSAS_PCT_LOG_COMB_OPCODE		
24	Partial Set Solution	E	L		SPP_PRECON_SET_SOL1		
25	Set Solution	E	L		SPP_PRECON_SET_SOL		
26	Parm Condition Flag	E	L		SPP_PRECON_COND		
27	Max Noise Count	A.2.1	I	SFD	CSAS_PITA_MAX_N_CT CSAS_PITE_MAX_N_CT CSAS_PITS_MAX_N_CT		
28	Limit Set Selected	E	L		SPP_PRECON_LS_SEL		
29	DMST Parent Position	A.2.6	I		CSAS_PGT_DMST_POS		
30	Discrete Position in Parent	A.2.6	I		CSAS_PGT_POSITION		
31	Discrete Limit Sets	A.2.6	I		CSAS_PITP_LIM_STATUS		
32	Parm Count	A.2.1	O		CSAS_PITP_PARM_CT		

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
33	MASK 2	A.2.1	I/O		CSAS_PITP_MASK2		
34	Limit Sense High Indicator	A.2.1	O	SFD	CSAS_PITA_LIMHI		
35	Limit Sense Low Indicator	A.2.1	O	SFD	CSAS_PITE_LIMLO		

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C-2

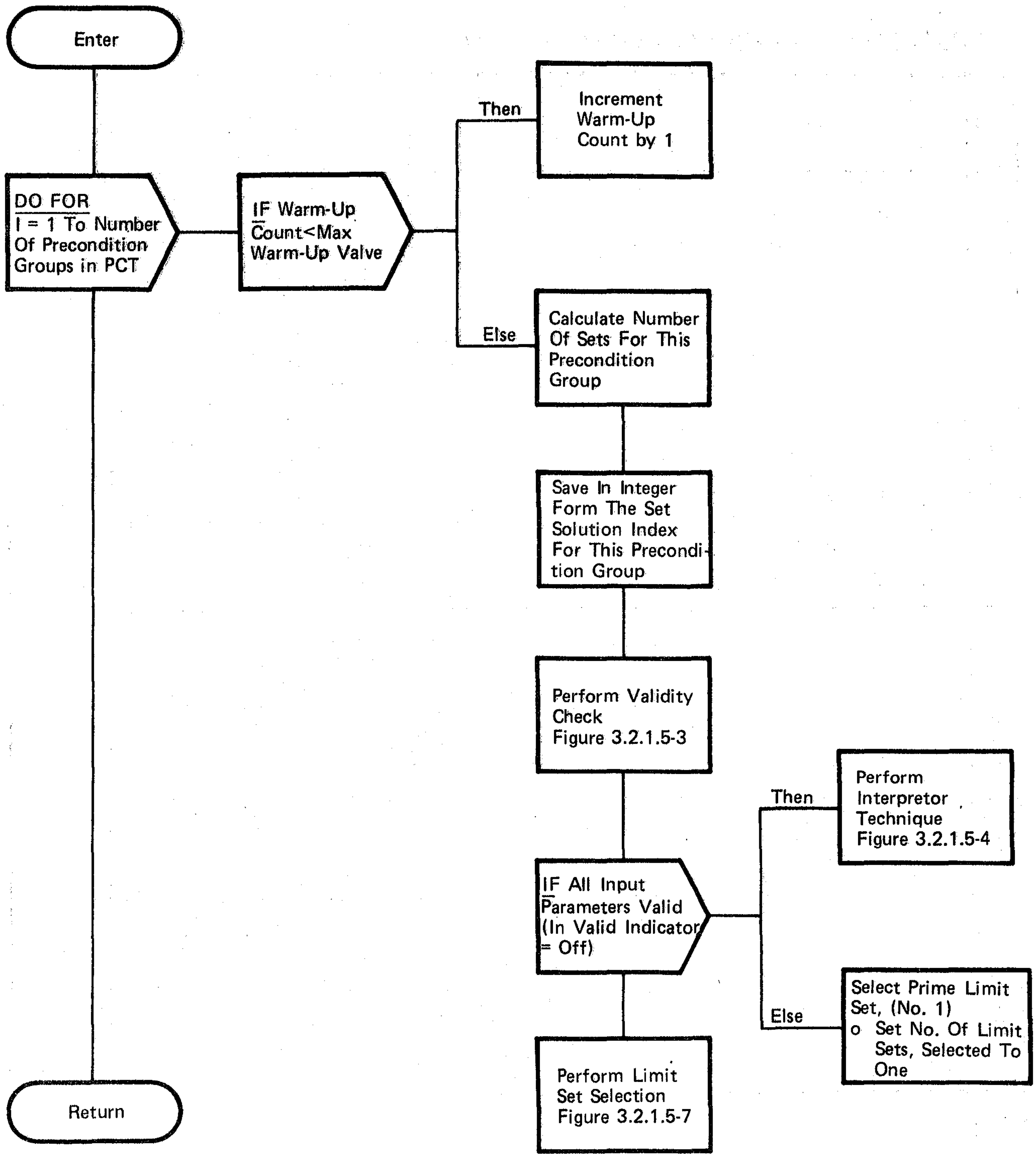


Figure 3.2.1.5-2. Precondition Processing

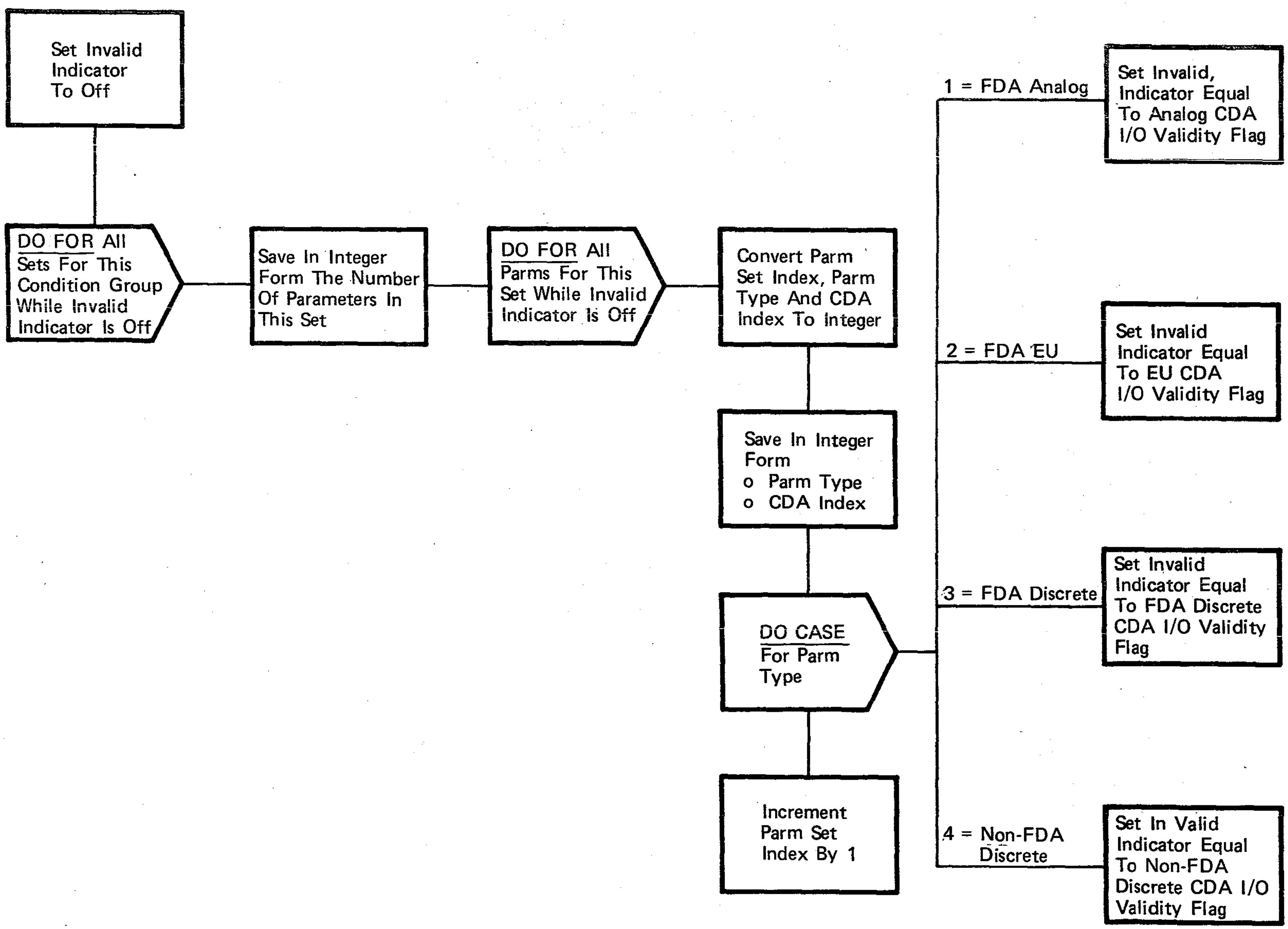


Figure 3.2.1.5.3. Validity Check

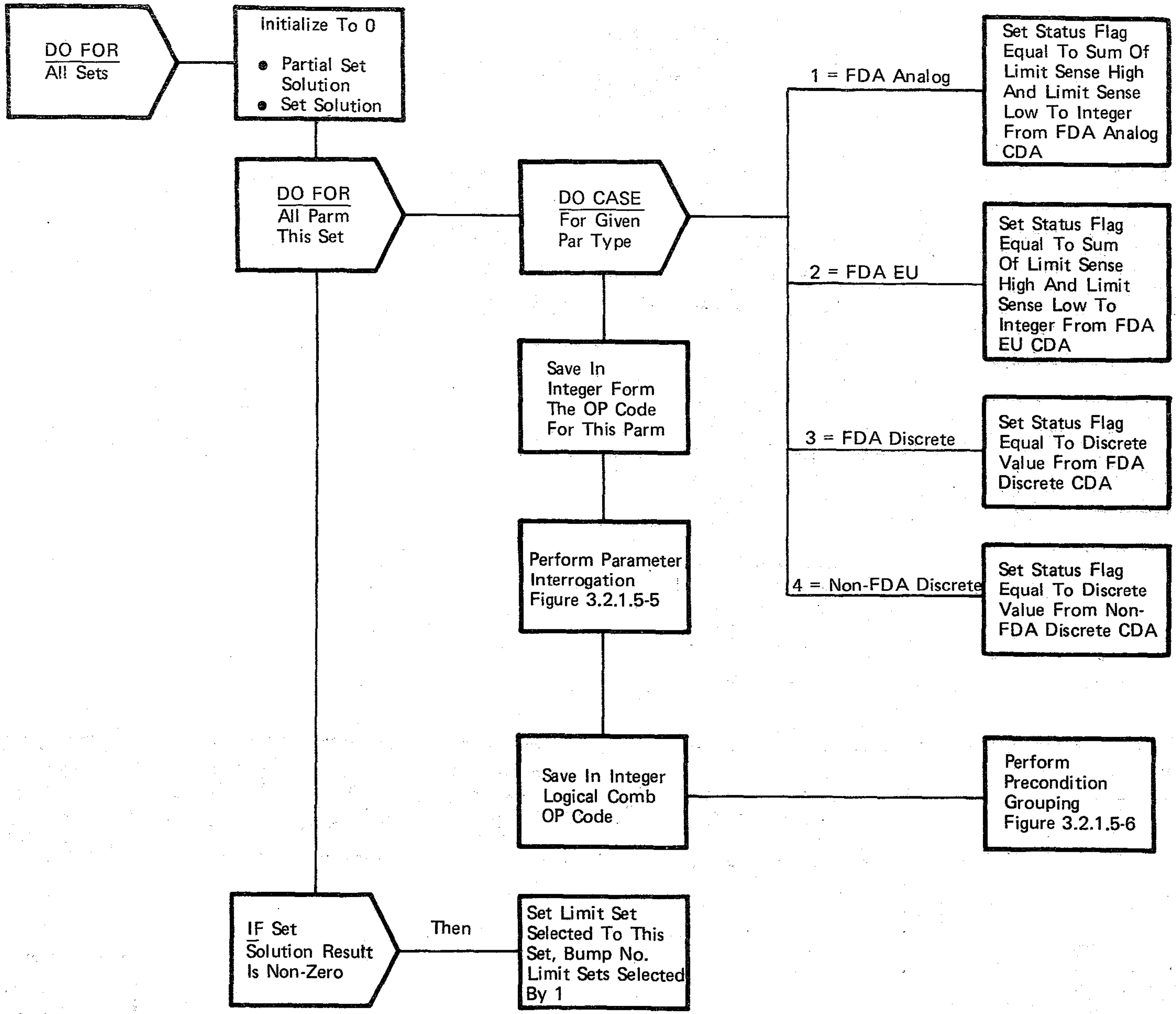
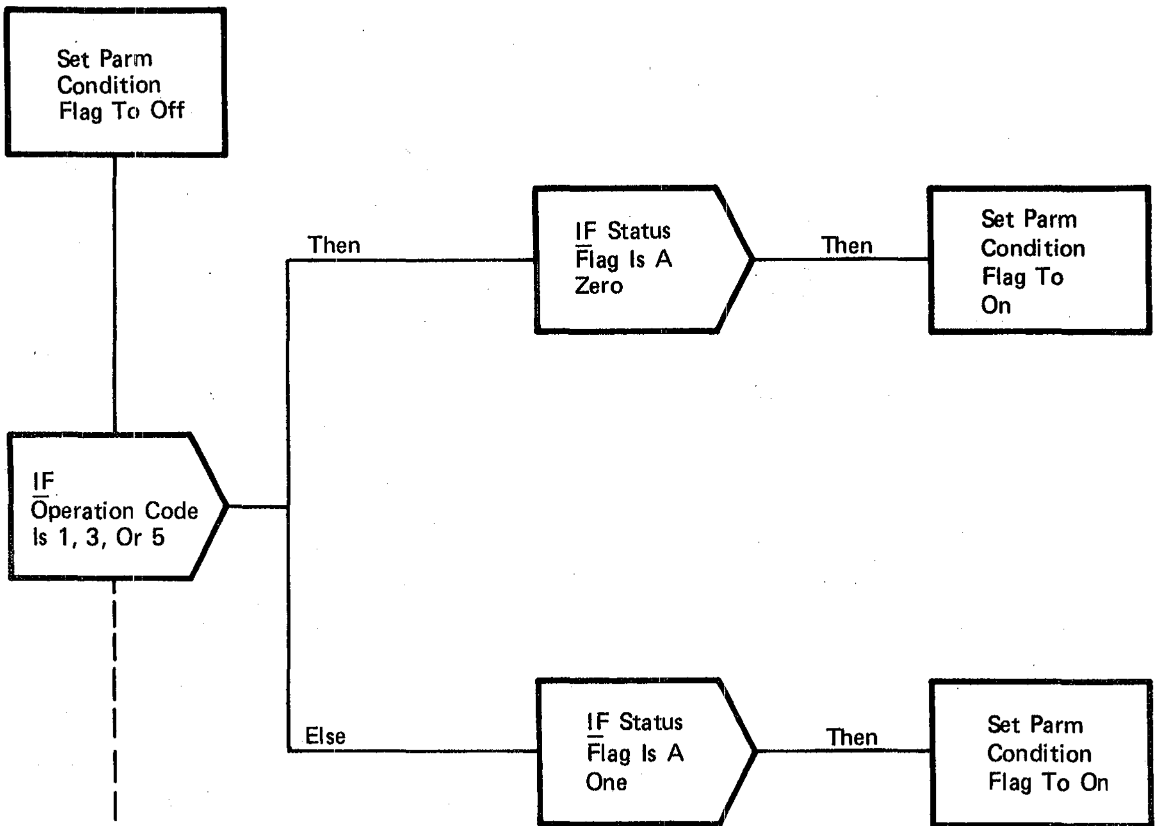


Figure 3.2.1.5-4. Interpreter Technique



OP Code	Definition
1	Discrete = 0
2	Discrete = 1
3	Analog In Limits
4	Analog Out Of Limits
5	EU In Limits
6	EU Out Of Limits

Figure 3.2.1.5-5. Parameter Interrogation

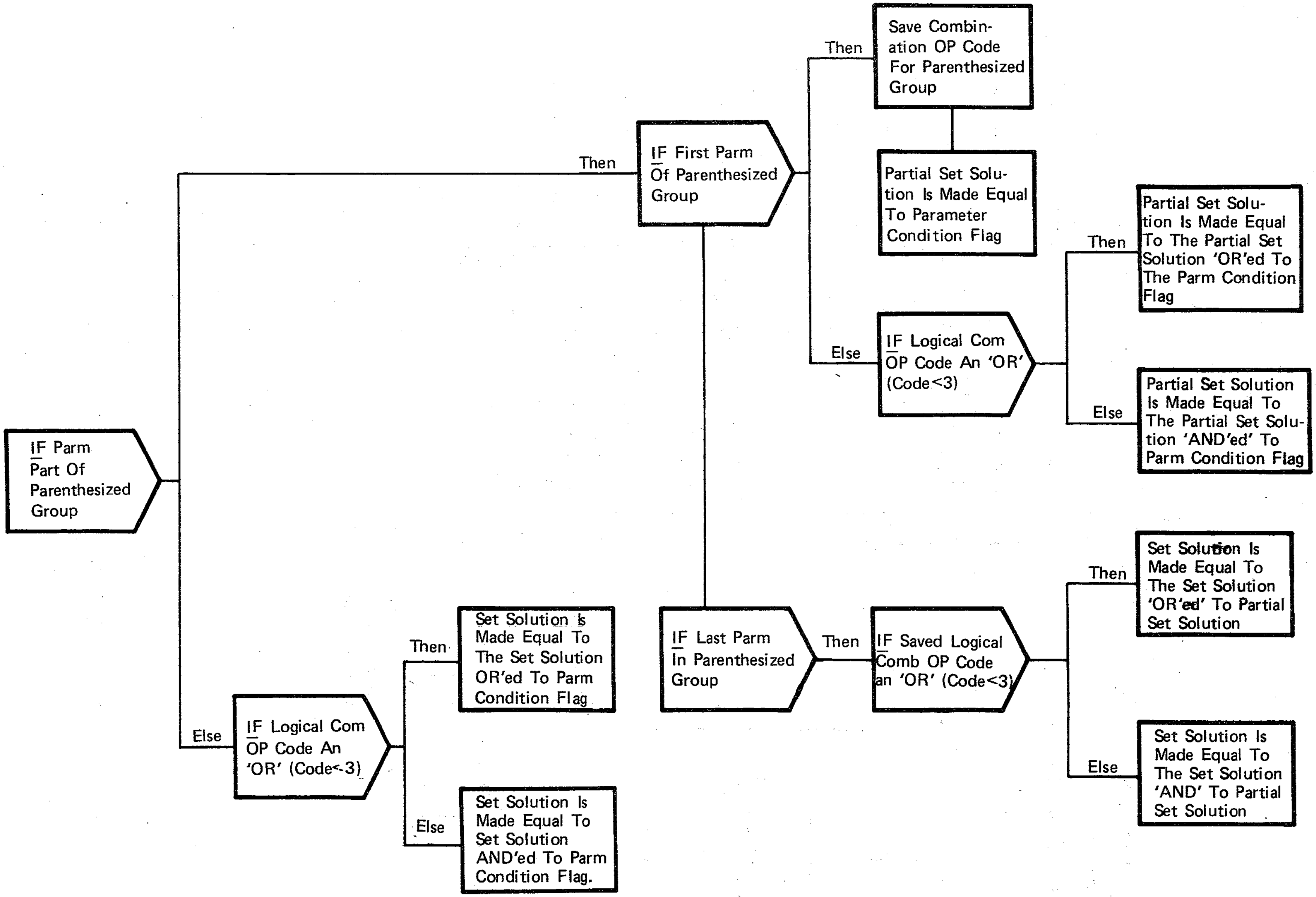


Figure 3.2.1.5-6. Precondition Grouping

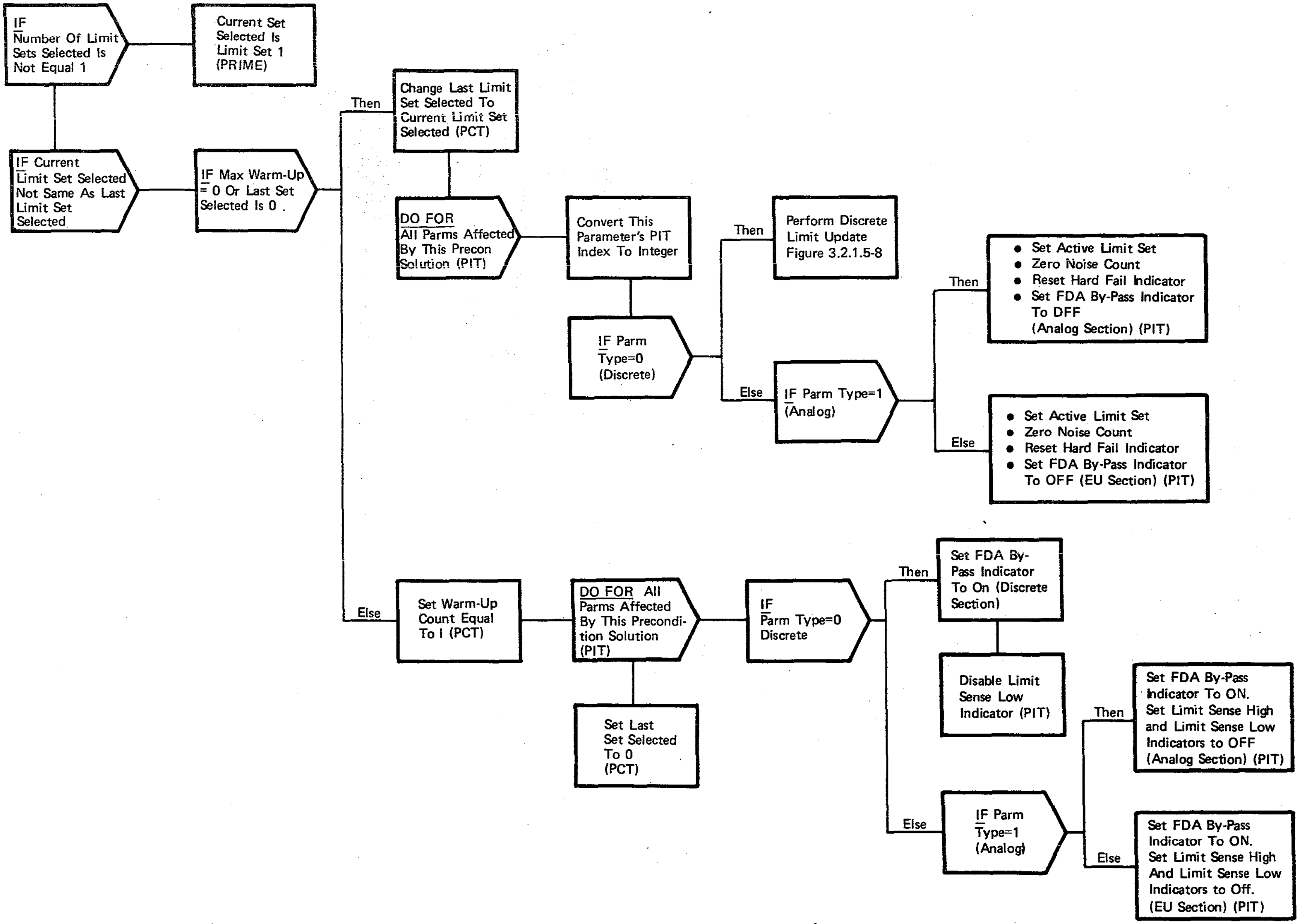


Figure 3.2.1.5-7. Limit Set Selection

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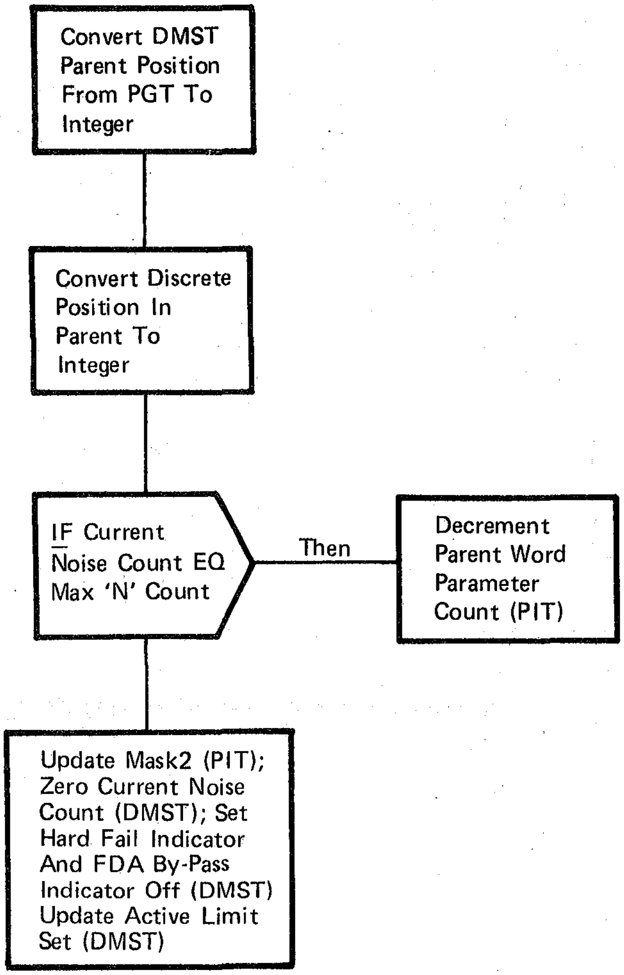

Figure 3.2.1.5-8. Discrete Limit Update

3.2.1.6 Fault Detection and Annunciation (SFD_FAULT_DETECT_ANNUN)

The Fault Detection and Annunciation (FDA) function executes cyclically, when enabled, to perform the limit sense and false alarm avoidance functions on parameters that have limits defined and to initiate the annunciation process for those which have failed.

a. Control Interface - FDA is CALL'ed by the PM Control Module (SPM_PERFORM_MON_CONTROL) while FDA is enabled.

   Invocation: CALL SFD_FAULT_DETECT_ANNUN (Analog PPB Pointer,EU PPB Pointer, Discrete Parent PPB Pointer)

b. Inputs - Inputs to FDA are PPB pointers passed in the Call list as discussed above and various table entries of information needed to perform fault detection and annunciation on each parameter. Parameter values and corresponding I/O statuses are located in the Parameter Processing Buffer (PPB). Other information such as noise counts, limit status flags, limit values for discrete parameters, pointers to various tables and annunciation information is located in the Parameter Information Table (PIT). Limit values for analog and EU parameters reside in the Limit Sense Table (LIT). All such table information resides in COMPOOL and is further described in Table 3.2.1.6-1.

c. Process Description - The control flow is presented in Figures 3.2.1.6-1 through 3.2.1.6-7. The Fault Detection and Annunciation (FDA) module is a table driven processor. When initiated from PM Control, FDA accesses the Parameter Information Table (PIT) and initiates processing on the first entry in the PIT. Every sample of a parameter is processed. Parameter samples are buffered by the Data Acquisition module in the Parameter Processing Buffer (PPB).

   Access into the PPB is gained through the PIT. This accessing is not done by means of an index in the PIT for each parameter, but rather a mapping scheme which relates the location of a parameter in the PIT to its location in the PPB. The PIT is organized into 9 sections - 3 blocks (a block each for analogs, EU, discretes) of 3 groups each (5 s/s, 1 s/s, .5 s/s). The .5 s/s group if further subdivided into two sections - one for those parameter samples acquired in Data Acquisition cycles 1-5 and one for those acquired in Data Acquisition cycles 6-10. The PPB is also organized into 9 blocks with the same arrangement; however, the PPB is further subdivided such that parameter samples acquired in Data Acquisition cycles 1-5 are located in the 1st half of the PPB and samples acquired in Data Acquisition cycles 6-10 are located in the 2nd half of the PPB. On any entry to FDA, data is processed from either the 1st half of the PPB or the 2nd half as determined by PPB pointers passed to FDA in the CALL list.

Parameters that have both ALARM CLASS 0,3 or 4 and ALARM CLASS 2 limits specified have two PIT entries and respective PPB entries such that the ALARM CLASS 2 limit entry follows the ALARM CLASS 0,3 or 4 limit entry. Thus, all FDA processing is performed on both entries, as if they were different parameters.

FDA processing is performed serially on all analog parameters, all EU parameters, then all discrete parent words (Figure 3.2.1.6-1). The logic and control of analog and EU processing is identical and thus discussed but once. Applicable control flows are Figures 3.2.1.6-2, 3.2.1.6-3 and 3.2.1.6-4. It should be noted that the processes use a unique portion of the tables - PPB, LIT, PIT and CDA. The HAL/S NAMECOPY facility is utilized to manipulate table pointers such that portions of both the analog and EU tables (PIT and PPB) may be referenced by the same identifiers. This allows usage of the same routine to process both analog and EU parameters. In some instances, unique identifiers must be used since the table entries are different data types. For example, analog parameter values in the PPB are integer whereas EU values are scalar.

Discrete processing is unique and thus discussed separately. Applicable control flows are Figures 3.2.1.6-5, 3.2.1.6-6 and 3.2.1.6-7.

<u>Analog/EU Processing (Figure 3.2.1.6-2)</u>

FDA interrogates the "FDA BYPASS" indicator in the PIT entry for each parameter to determine if FDA processing is bypassed for that parameter. The "FDA BYPASS" indicator is set on by precondition processing for each parameter of a group during group "warmup" and reset by precondition processing when "warmup" is completed (ref. Section 3.2.1.5). In any case, parameters with the "FDA BYPASS" flag enabled do not undergo FDA processing; however, the last sample and associated I/O status are moved from the PPB to the CDA, and the limit status indicators are cleared. FDA processes successive PIT entries similarly until a parameter that is not bypassed is found. All samples from one second of data are processed for that parameter as follows (see Figure 3.2.1.7-3):

> Status flags in the PPB are checked to determine if the parameter sample is valid. If a sample is invalid, further FDA processing of that sample is skipped. Limit sense processing is thus performed on all valid samples of that parameter. FDA obtains the current sample from the PPB and the current limit values from the Limit Table (LIT). An indicator of the current limit set is found in the PIT entry for this parameter. The current value is compared to the high limit, then the low limit. If either of these comparisons results in an indication that the current value is beyond one of the limits, the parameter is determined to be out of limits. Noise filtering is then performed (see Figure 3.2.1.6-4).

If the limit status for this parameter has changed from in limits to out of limits (or vice versa), the current noise (n) count is reinitialized and the limit status for this parameter is updated in the Analog/EU portion of the PIT. Checks are then made on the parameter's n count and the limit status and annunciation status to determine if annunciation should be enabled. A limit failure is annunciated only if three conditions have been met:

1. This parameter has failed limit sense processing n (maximum noise count) consecutive times.

2. Annunciation for this parameter is not inhibited (Annunciation Inhibit indicator in PIT is off).

3. This parameter is not currently in a "hard fail" state - i.e., it has not previously been out of limits or it was out of limits and subsequently came into limits 'n' consecutive times. (Hard Fail Indicator in PIT)

Annunciation is enabled by issuing a User Interface Macro. Inputs to the Macro are an index to a system Fault Message Parameter Table (FMPT) and a limit status indicator. The FMPT index resides in the PIT entry of each parameter. Annunciation for ALARM CLASS 0 parameters causes no alarms or fault messages to be generated.

When the last sample of a parameter has been processed, FDA moves that sample and its associated I/O status to the FDA CDA. Processing continues on all analog/EU parameters (PIT entries) until all have been processed.

Discrete Parent Processing (Figure 3.2.1.6-5)

Discrete FDA processing of parent words is similar to analog/EU processing except there is no "FDA BYPASS" logic with discrete parents. A "FDA BYPASS" indicator is associated with each parameter within a parent and is discussed later. All samples from one second of data are processed for each discrete parent as follows (see Figures 3.2.1.6-5 and 3.2.1.6-6):

I/O Status flags in the PPB are checked to determine if the parent word sample is valid. If the sample is invalid, further FDA processing of that sample is skipped. Limit sense processing is thus performed only on all valid samples of that parameter (Figure 3.2.1.6-6).

The FDA parameters within a parent word are isolated by using MASK 1 in the parent word PIT entry and the parent word is limit sensed. If any parameter within the parent word is out of limits, or the

Parameter Count (number of parameters within the parent that have reached max 'n' count) does not equal the number of FDA parameters within the parent, limit sensing is performed on each discrete within the parent. The Discrete Measurement Subentry Table (DMST) is used to control limit sensing and noise filtering for the discrete parameters. The parent word's PIT entry contains a pointer to the sequential DMST entries for the parent word.

The "FDA BYPASS" indicator in the DMST is interrogated to determine if this discrete parameter is to be FDA processed. If the parameter is to be FDA processed, Discrete Measurement Limit Sensing and Noise Filter is performed (Figure 3.2.1.6-7). The current value of this parameter sample is compared to its "expected" limit in the MASK 2 entry in the PIT to determine the current limit state. The 'expected' state of MASK 2 can either be set to the 'should be' or 'should not be' state according to the state of the discrete described below. The SM Offline Preprocessor initializes discrete limits to the 'should be' state. If the current limit status differs from the last sample of this parameter, the 'n' count is reinitialized and the limit status for this parameter is updated in the limit status field of the PIT. If this parameter changed from a maximum good state (has been within limits 'n' consecutive times) to a fail state or from a hard fail state to an in limits state, the Parameter Count of this parent word is decremented. Once the parameter's current noise count equals the maximum noise count, the 'Parent Word Parameter count' is incremented. If a fail state has occurred, the User Interface Annunciation Macro is issued provided the 'Annunciation Inhibit Indicator' and the 'hard fail indicator' are off. The hard fail indicator is then turned on and the 'should be' state in MASK 2 is changed to the 'should not be' state. This is done to avoid limit sense processing on individual discretes once they reach a hard fail state.

If the parameter has reached a maximum good state, a check is made to see if the hard fail indicator is on. If so, the 'should not be' state in MASK 2 is changed back to the 'should be' state and the hard fail indicator is reset.

When the last sample of a parent word has been processed, that sample and its associated I/O status are moved from the PPB to the CDA. The limit status is moved from the PIT to the CDA. Processing continues on all parent words (PIT entries) until all have been processed. When Discrete Parent processing is complete, FDA returns control to the CALLing function (PM Control).

d. Outputs - Outputs from this module are specified in Table 3.2.1.6-1.

e. Module References -

Process	Section	Reference
DMA_MAC		A System Software external procedure called when parameter fault annunciation is enabled by FMP_STAT macro.

f. Module Type and Attributes

Type: External Procedure
Attributes: Default (serially resusable with no protective mechanism).

g. Template References

D INCLUDE TEMPLATE CDL_ANNUN - Systems Services Annunciation Compool
D INCLUDE CSACDA - Current Data Array (CDA)
D INCLUDE CSAPIT - Parameter Information Table (PIT)
D INCLUDE CSAPPB - Parameter Processing Buffer (PPB)
D INCLUDE CSALIT - Limit Sense Table (LIT)
D INCLUDE DMA#MACS - Systems Services error annunciation macro replace statements
D INCLUDE SMSTAT - Status field replace statements
D INCLUDE TEMPLATE DMA_MAC - Systems Services Annunciation routine

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.6-1 FAULT DETECTION AND ANNUNCIATION MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Analog PPB Pointer	E	I	CALL LIST	SFD_PPBA_HALF		
2	EU PPB Pointer	E	I	CALL LIST	SFD_PPBE_HALF		
3	Discrete Parent PPB Pointer	E	I	CALL LIST	SFD_PPBP_HALF		
4	PIT Index	E	L		SFD_PIT		
5	PPB Index	E	L		SFD_PPB		
6	Parameter Type Indicator	E	L		SFD_PARM_TYPE		
7	Number of Entries in Each Sample/Second Section of PIT	A.2.1	I		CSAS_PITA_NUM_ENTRIES CSAS_PITE_NUM_ENTRIES CSAS_PITP_NUM_ENTRIES		
8	Number of Samples Buffered in PPB for Each Sample/Second Section of PIT	A.2.1	I		CSAS_PITA_NUM_SAMPLES CSAS_PITE_NUM_SAMPLES CSAS_PITP_NUM_SAMPLES		
9	PPB Buffer Half Indicator	A.2.11 D.19	I	S2I, SPM	CSAS_CMT_BUF_HALF		
10	Parameter Values	A.2.2 D.3	I	SDA, SDS, SFS	CSAS_PPBA_VALUE CSAS_PPBE_VALUE CSAS_PPBP_VALUE		
11	FDA Bypass Indicator	A.2.1	I	SPP	CSAS_PITA_BYPASS_IND CSAS_PITE_BYPASS_IND CSAS_PITE_BYPASS_IND		
12	Limit Status Indicators (High/Low)	E	L		SFD_LIMIT_HI SFD_LIMIT_LO		
13	Parameter I/O Status	A.2.7 D.5	O	SPP, CRT	CSAS_FCDAA_STATUS CSAS_FCDAE_STATUS CSAS_FCDAP_STATUS		
14	Parameter Limit Status	A.2.7 D.5	O	SPP, CRT	CSAS_FCDAA_STATUS CSAS_FCDAE_STATUS CSAS_FCDAP_LIM_STATUS		
15	Parameter Values	A.2.7 D.5	O	SPP, CRT	CSAS_FCDAA_VALUE CSAS_FCDAE_VALUE CSAS_FCDAP_VALUE		
16	Current Limit Table Index	E	L		SFD_LIM		

TABLE 3.2.1.6-1 FAULT AND ANNUNCIATION (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
17	Active Limit Set	A.2.1	I	SPP	CSAS_PITA_ACT_LIM_SET CSAS_PITE_ACT_LIM_SET CSAS_PITS_ACT_LIM_SET		
18	Limit Table Index	A.2.1	I		CSAS_PITA_LIM_TAB_INDEX CSAS_PITE_LIM_TAB_INDEX CSAS_PITS_LIM_TAB_INDEX		
19	Parameter I/O Status	A.2.2 D.3	I	SDA, SDS	CSAS_PPBA_STATUS CSAS_PPBE_STATUS CSAS_PPBP_STATUS		
20	Analog/Eu Limit Values	A.2.8	I	STM	CSAS_LIT_ANALOG_LOW_LIMIT CSAS_LIT_ANALOG_HIGH_LIMIT CSAS_LIT_EU_LOW_LIMIT CSAS_LIT_EU_HIGH_LIMIT		
21	Parameter Limit Status	A.2.1	I		CSAS_PITA_LIMIT_HIGH CSAS_PITA_LIMIT_LOW CSAS_PITE_LIMIT_HIGH CSAS_PITE_LIMIT_LOW CSAS_PITP_LIM_STATUS		
22	Current Noise Count	A.2.1 D.10	I	STM, SSP	CSAS_PITA_CUR_N_CT CSAS_PITE_CUR_N_CT CSAS_PITS_CUR_N_CT		
23	Maximum Noise Count	A.2.1 D.11	I	STM	CSAS_PITA_MAX_N_CT CSAS_PITE_MAX_N_CT CSAS_PITS_MAX_N_CT		
24	Annunciation Inhibit Indicator	A.2.1 D.11	I	STM	CSAS_PITA_ALARM_INH_IND CSAS_PITE_ALARM_INH_IND CSAS_PITS_ALARM_INH_IND		
25	Hard Fail Indicator	A.2.1 D.10	I	STM, SPP	CSAS_PITA_HARD_FAIL CSAS_PITE_HARD_FAIL CSAS_PITS_HARD_FAIL		
26	FMPT Index	A.2.1	O		CSAS_PITS_FMPT_INDEX CSAS_PITE_FMPT_INDEX CSAS_PITS_FMPT_INDEX		
27	MASK1 (Mask of FDA'd bits in parent word)	A.2.1	I		CSAS_PITP_MASK_1		

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TABLE 3.2.1.6-1 FAULT DETECTION AND ANNUNCIATION (cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
28	MASK2 (expected Limit States; Mask of Expected Limit Values of Corresponding FDA Bits in a Parent Word)	A.2.1	I	STM	CSAS_PITP_MASK_2		
29	Number of Parameters in Discrete Parent Word	A.2.1	I		CSAS_PITP_NUM_PARMS		
30	Discrete Measurement Subentry Table (DMST) Index	A.2.1	I		CSAS_PITP_DISCRETE_SUB_INDEX		
31	Bit Location of a Discrete Measurement Within Parent Word	A.2.1	I		CSAS_PITS_PARM_ID		
32	Current Limit Status For Discrete	E	L		SFD_DISCRETE_STATUS		
33	Parent Word Parameter Count	A.2.1 D.7	I	STM	CSAS_PITP_NUM_PARMS		

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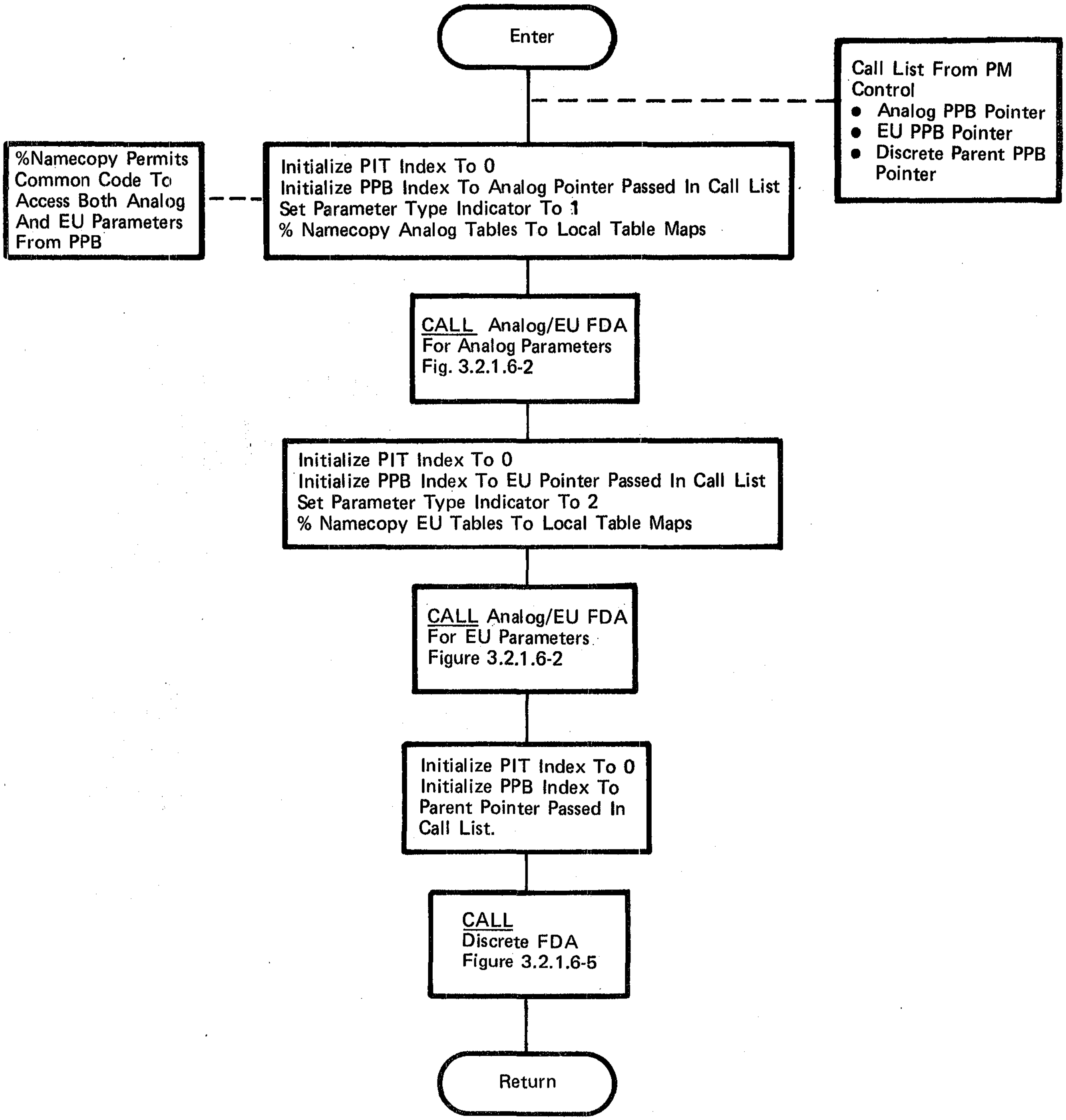

Figure 3.2.1.6-1. FDA

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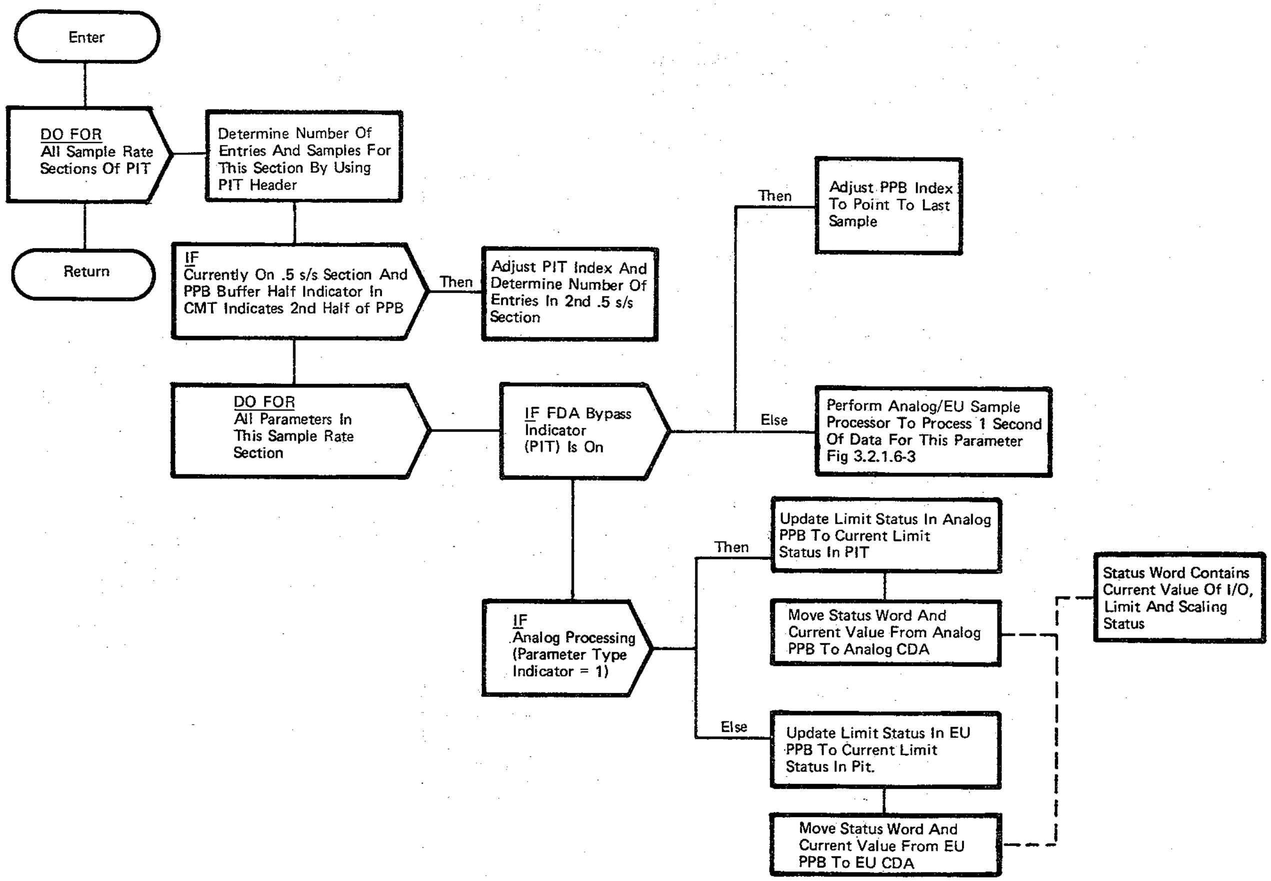

Figure 3.2.1.6-2. Analog/EU FDA

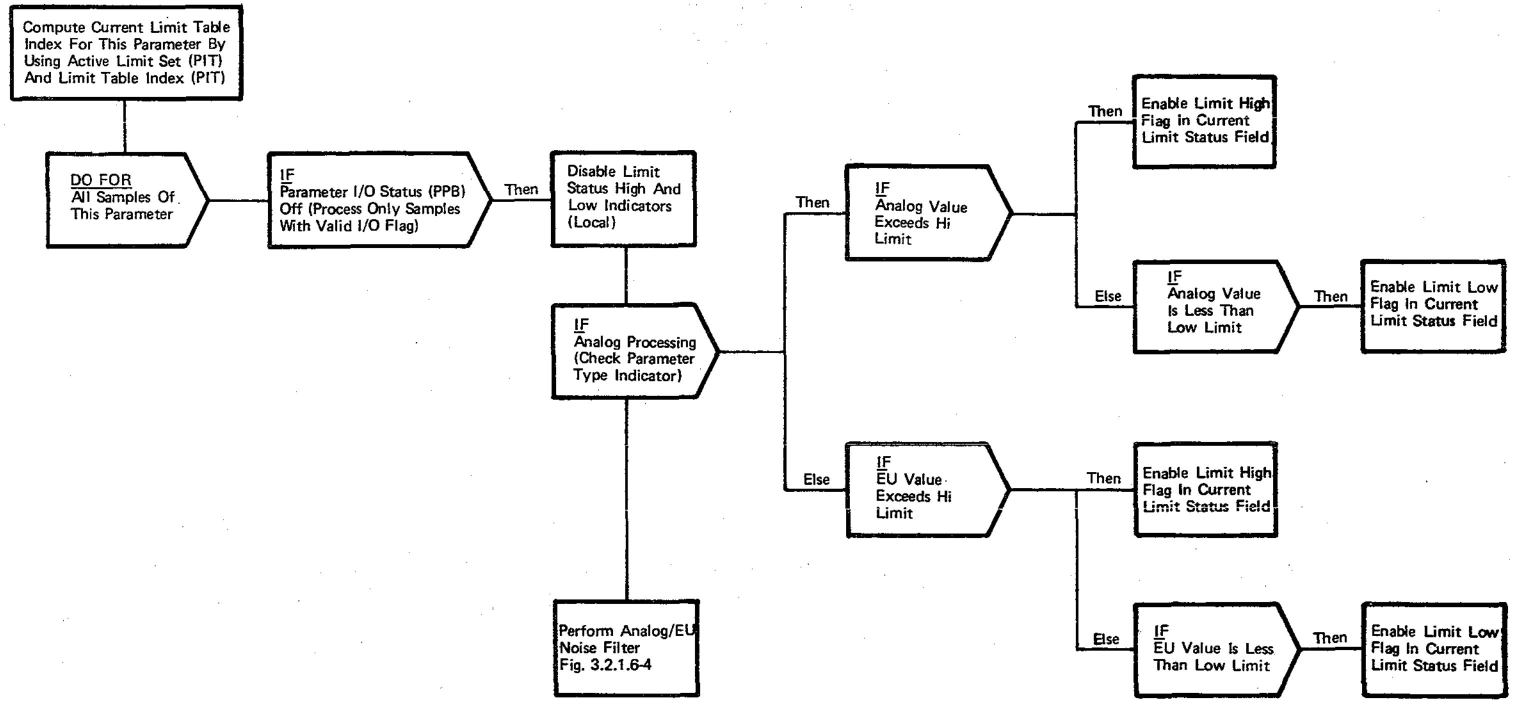

Figure 3.2.1.6-3. Analog/EU Sample Processor

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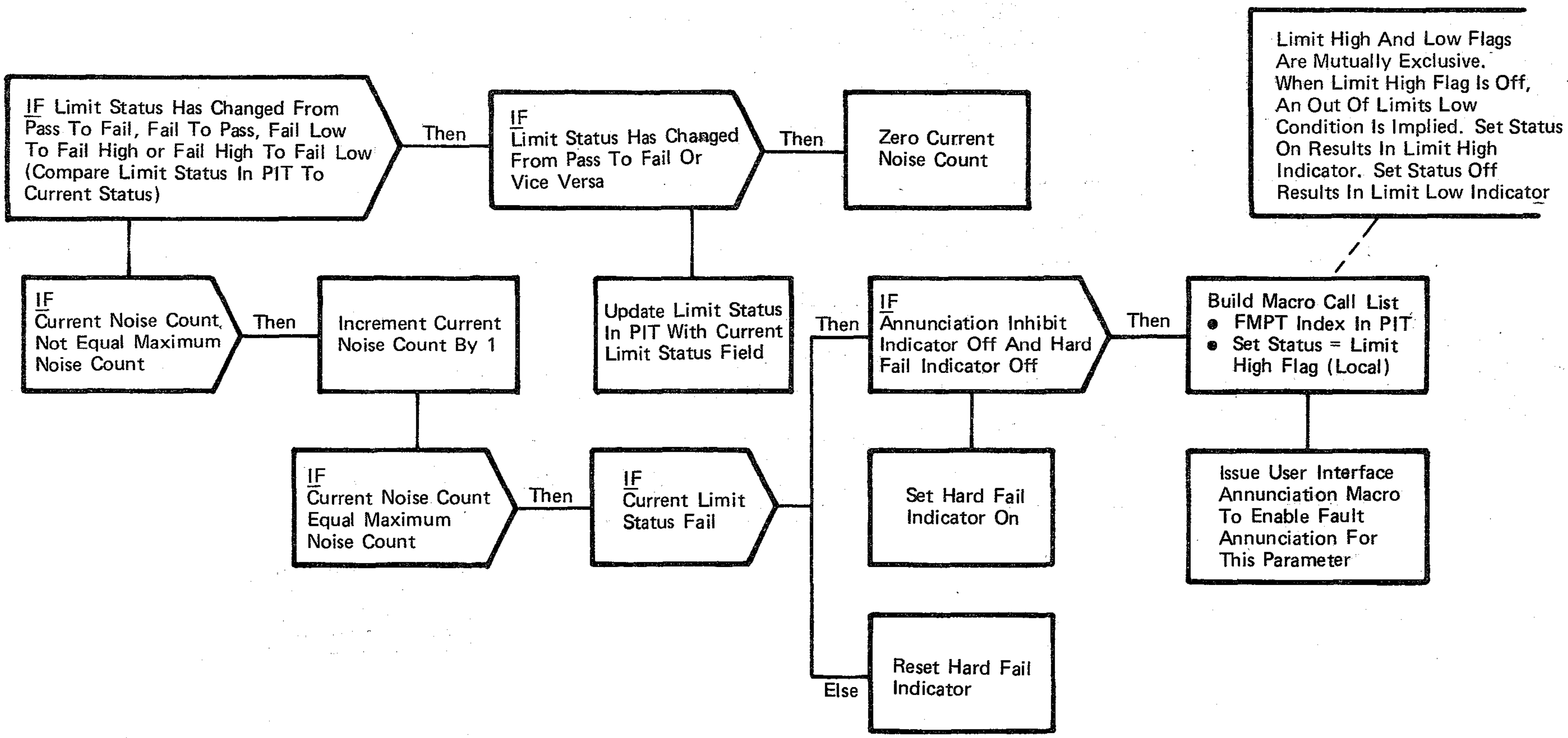

Figure 3.2.1.6-4. Analog/EU Noise Filter

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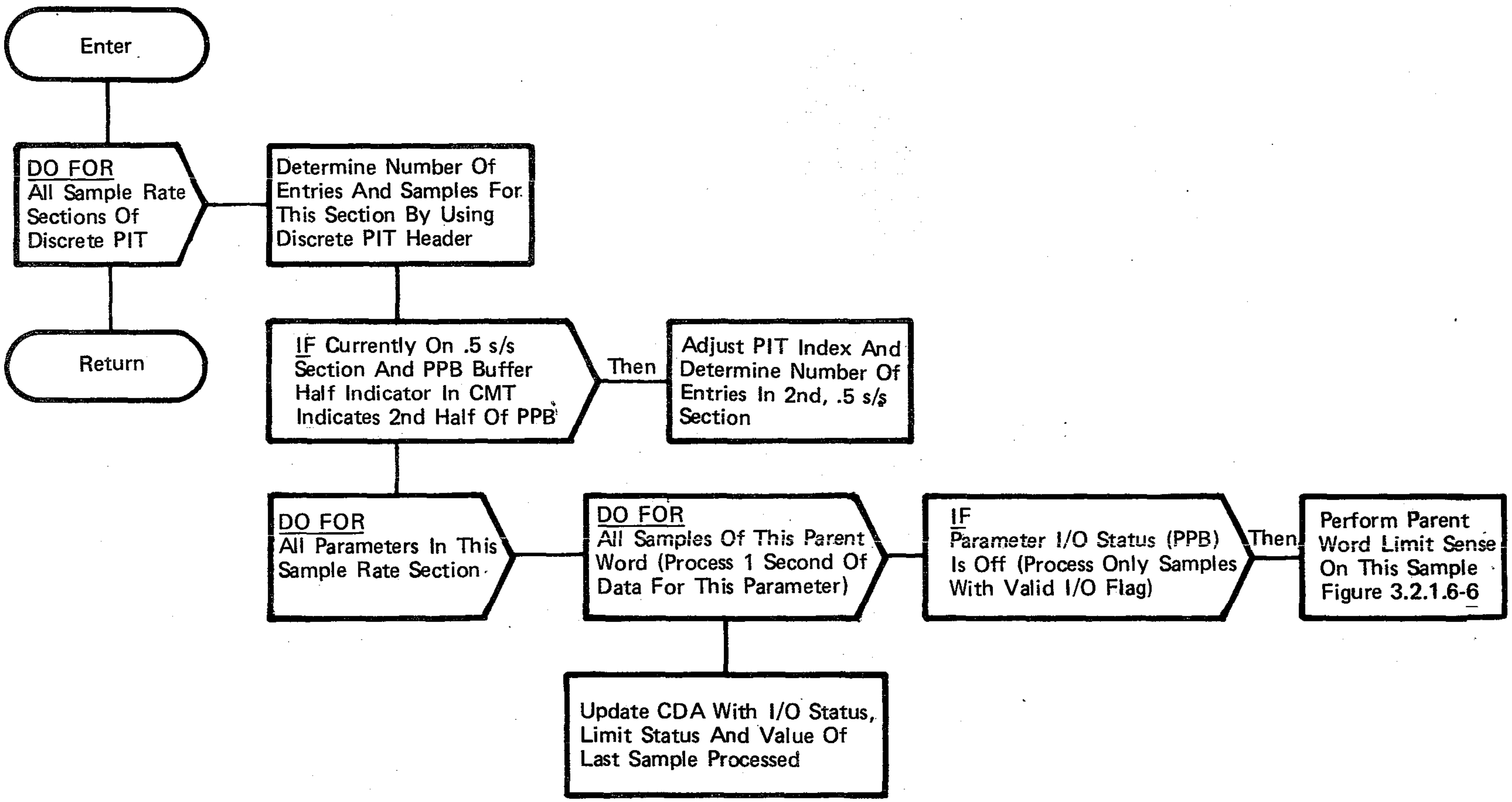

Figure 3.2.1.6-5. Discrete FDA

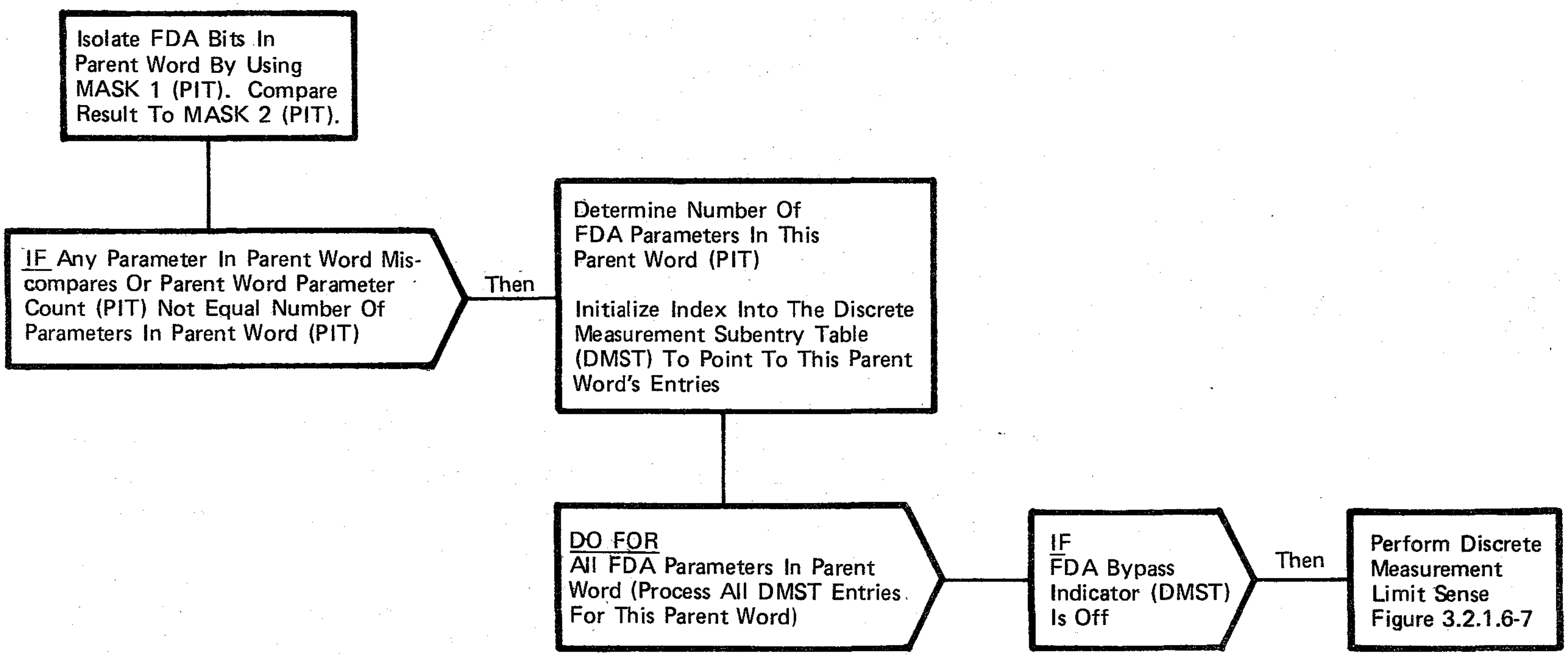

Figure 3.2.1.6-6. Parent Word Limit Sense

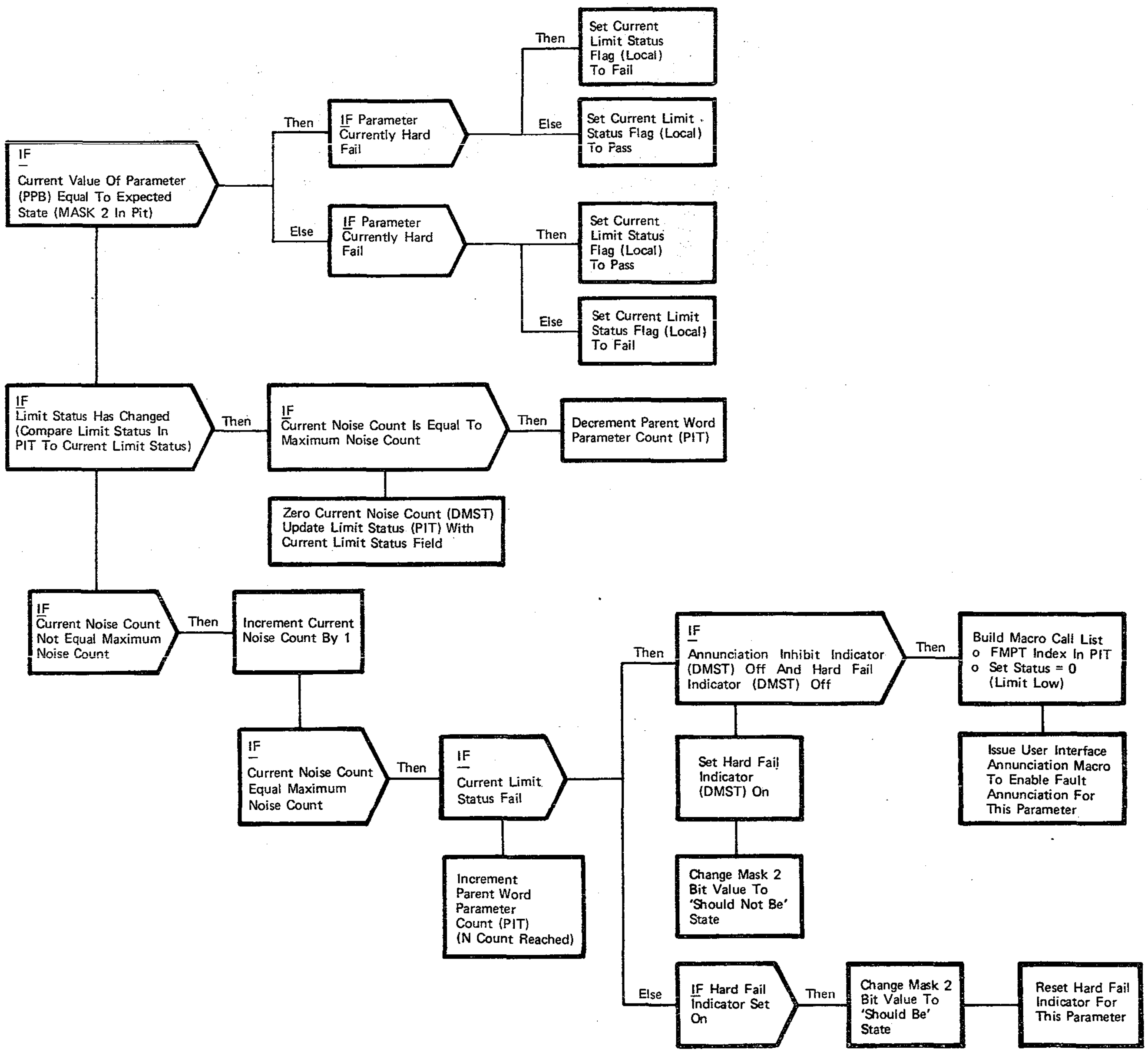

Figure 3.2.1.6-7. Discrete Measurement Limit Sense And Noise Filter

3.2.1.7 Forward Scaling (SFS_FOR_SCALE)

The Forward Scaling function performs the logic necessary to convert parameter values from PCM units to engineering units. Forward Scaling for display purposes is performed by UI and not by this function.

a. Control Interface - The forward scaling module is CALL'ed by any SM function which requires first, second or third order forward scaling solutions. Functions which use this conversion routine are SM Data Acquisition, Special Processes Data Acquisition, Table Maintenance, and Table Maintenance Cyclic Update.

   The Table Maintenance Cyclic Update routine converts analog parameter values to engineering units for display. The Table Maintenance process converts limit values (in analog format) to engineering units for display. Special Processes Data Acquisition converts all special processes analog input parameters to engineering units for processing. SM Basic Data Acquisition converts analog parameters that require 2nd or 3rd order scaling and first order analog parameters with negative slopes that are to be processed by Fault Detection and Annunciation. Those analog parameters (first order non-negative slope) that are processed in analog (integer) format throughout basic SM processes are converted to engineering units for display by the System Software Cyclic Display Processor.

   Invocation: CALL SFS_FOR_SCALE (address pointer into SXT, number of parameters to be scaled);

b. Inputs - Inputs to this module are specified in Table 3.2.1.7-1.

c. Process Description - The control flow for this module is shown in Figures 3.2.1.7-1 through 3.2.1.7-3. Forward scaling converts multiple analog PCM count parameters to engineering units. The calling routine provides, in the Call List, SXT and SAT, information necessary to scale each parameter. This information consists of the number of parameters to be scaled, pointers to the PCM value, coefficients, status word, curve order, and output target location. The acquisition status of each parameters is checked to determine if offscale checking is to be performed. If acquisition status is good, the off-scale checks are made and the value is scaled. If the value is off-scale high or low, an appropriate indicator is set in the status word. The coefficients are obtained from the SAT and the parameter is scaled. The solution is placed in the output target location.

   Forward scaling is performed by the following equations. X is the value (PCM count) to be scaled and A_0, A_1, A_2, and A_3 are the scale coefficients from the SAT.

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Third degree: $EU= A_3X^3 + A_2X^2 + A_1X + A_0$

Second degree: $EU= A_2X^2 + A_1X + A_0$

First degree: $EU= A_1X + A_0$

d. Outputs - Outputs from this module are specified in Table 3.2.1.7-1.

e. Module References _ None

f. Module Type and Attributes

Type: External Procedure
Attributes: Reentrant

g. Template References - None

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.1.2.7-1 FORWARD SCALING

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Forward Scaling CALL LIST	E	I	SDA, SSD			
2	Address Pointer Into SXT	E	I	CALL LIST	SFS_SXT		
3	Number of Parameters To Be Scaled	E	I	CALL LIST	SFS_NUM_PARMS		
4	Pointer to Analog Input Value	E	L		SXT_ANA_VAL		
5	Pointer to EU Output Location	E	L		SXT_EU_VAL		
6	Pointer to Coefficients	E	L		SXT_SAT_PTR		
7	Pointer to Status Word	E	L		SXT_STATUS		
8	Curve Order	E	L		SFS_CO		
9	I/O Status Indicator	E	L		IO		
10	Off-Scale Indicators	E	L		SCALE_HI SCALE_LOW		
11	Coefficients	E	L		SFS_COEF		
12	E.U. Value	E	L		SFS_EU		
13	PCM	E	L		SFS_PCM		
14	PMU Indicator	E	L		PMU_IND		

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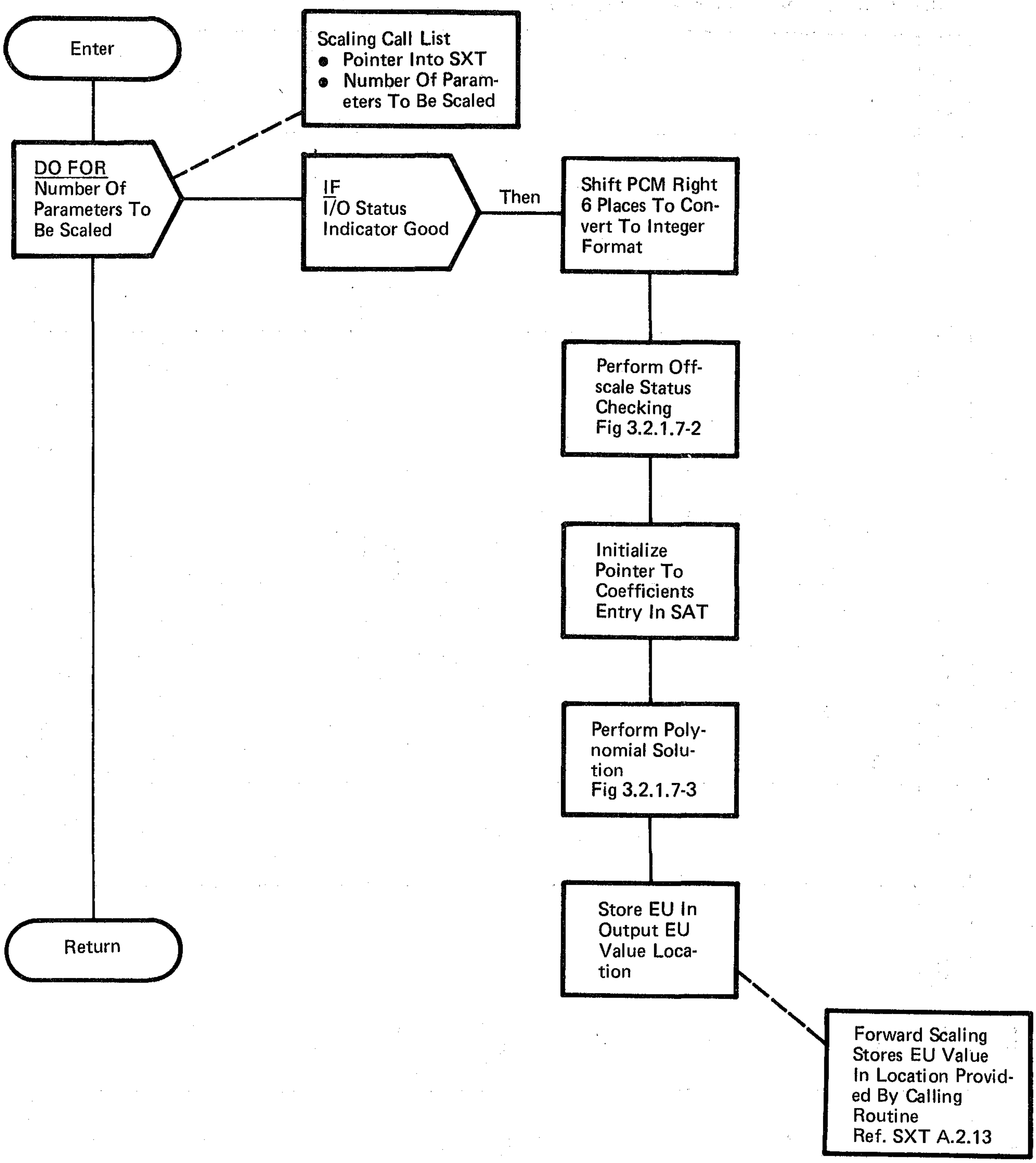


Figure 3.2.1.7-1. Forward Scaling

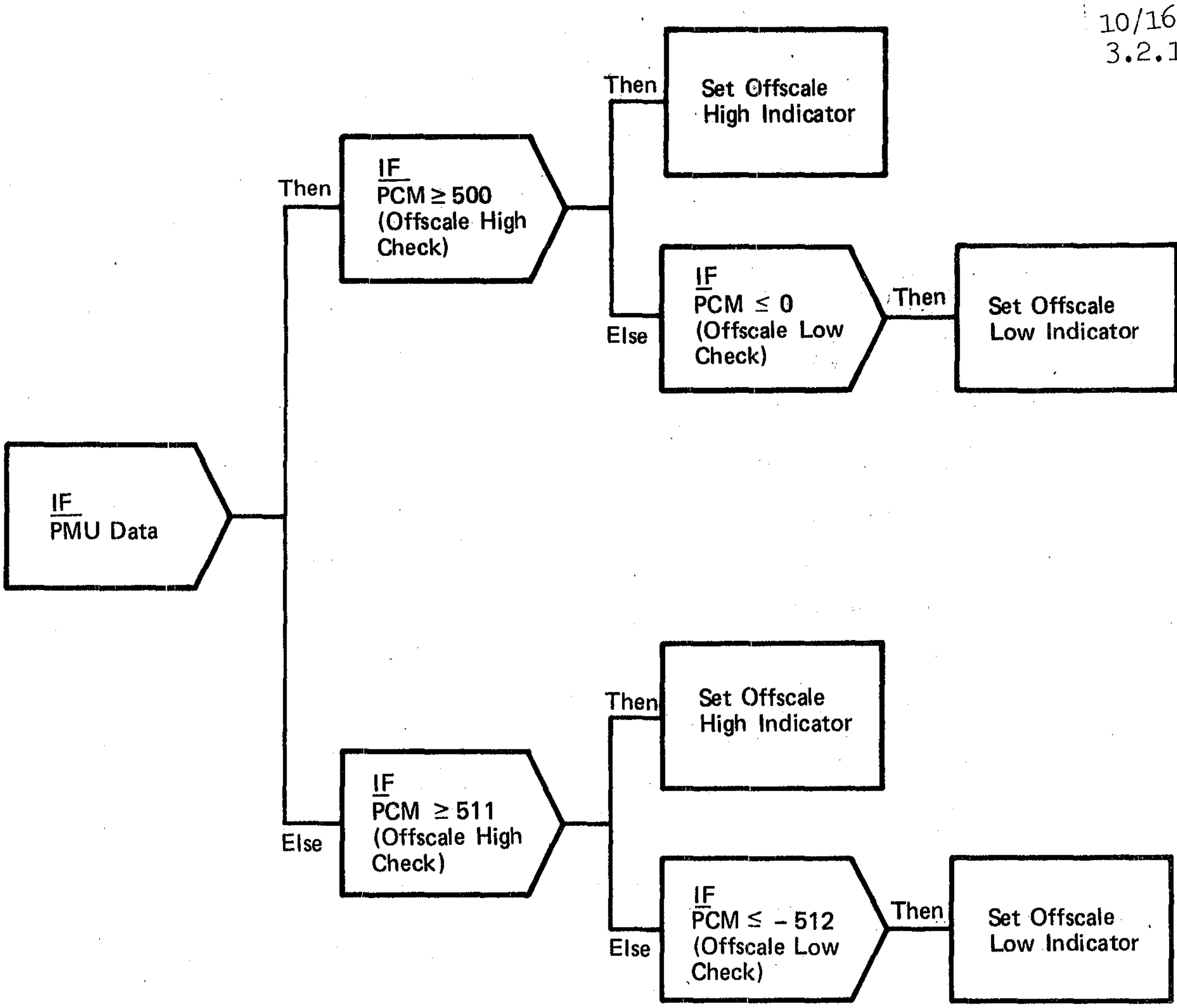
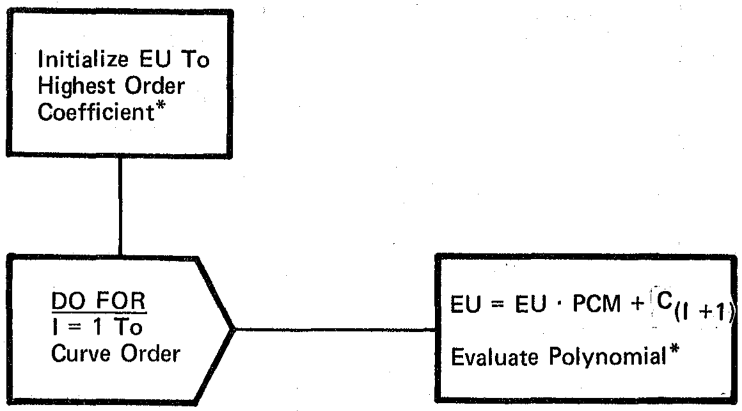


Figure 3.2.1.7-2. Status Check



*Note:

Coefficients stored in reverse order.

1st Order	2nd Order	3rd Order
$C_1 = A_1$	$C_1 = A_2$	$C_1 = A_3$
$C_2 = A_0$	$C_2 = A_1$	$C_2 = A_2$
	$C_3 = A_0$	$C_3 = A_1$
		$C_4 = A_0$

Figure 3.2.1.7-3. Polynomial Solution Routine

3.2.1.8 Backward Scaling (SBS_BACK_SCALE)

The Backward Scaling module performs the logic necessary to convert a first order parameter value from engineering units to an analog PCM value.

a. Control Interface - The Backward Scaling module is CALL'ed by Table Maintenance and Payload Control when they require backward scaling.

Invocation: CALL SBS_BACK_SCALE (pointer to SAT entry, value to be scaled) ASSIGN (off scale flag, PCM value)

b. Inputs - Inputs to this module are specified in Table 3.2.1.8-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.8-1. The analog backward scaling routine uses a call list to obtain the coefficients, status indicator, value to be scaled, and output target location. Once the coefficients are obtained the value is scaled and the PCM result is off-scale checked. If the value is off-scale high or low, an indicator is returned to the calling routine.

Backward scaling is performed by the following equation. (A_0 and A_1 are the scale coefficients).

$$PCM = \frac{EU - Ao}{A_1}$$

d. Outputs - Outputs from this module are specified in Table 3.2.1.8-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure
Attributes: Reentrant

g. Template References - None

h. Error Handling - None

i. Constraints and Assumptions - Only first order parameters are backward scaled.

TABLE 3.2.1.8-1 Backward Scaling

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Backward Scaling Call List	E	L				
2	Coefficient Pointer	E	L	CALL LIST	SBS_SAT_PTR		
3	EU Value	E	L	CALL LIST	SBS_EU_VAL		
4	Off Scale Flag	E	L	CALL LIST	SBS_OFF_SCALE		
5	PCM Value	E	L	CALL LIST	SBS_PCM_VAL		
6	Coefficients	E	L	SAT	COEF		

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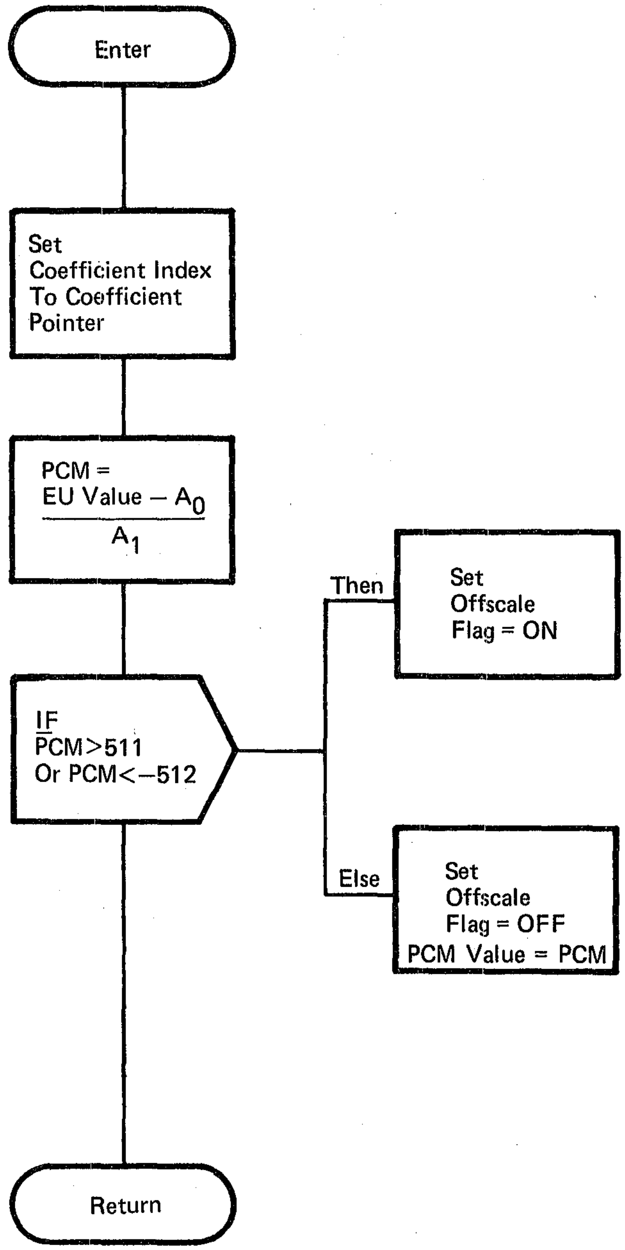

Figure 3.2.1.8-1. Backward Scaling

3.2.1.9 Special Processes Executive (SSP_EXEC)

The Special Processes Executive controls the acquisition, processing and output of data associated with special computations and sequences.

a. Control Interface - The Special Processes Executive is SCHEDULE'd at OPS initialization by the OPS control segment at a rate of five times per second.

Invocation: SCHEDULE SSP_EXEC AT PHASE_SSP PRIORITY (PRIO_SSP), REPEAT EVERY TIME_SSP;

b. Inputs - Inputs to this module are specified in Table 3.2.1.9-1.

c. Process Description - The control flows for the Special Processes Executive is shown in Figures 3.2.1.9-1 through 3.2.1.9-3. The processing performed during each execution of the Special Processes Executive is governed by the Hybrid Dispatcher and Hybrid Dispatch Table. The Hybrid Dispatcher is a HAL/S block of code which facilitates the calling of procedures through the use of a table in this case, the Hybrid Dispatch Table. This table is completely discussed in Appendix A.2.22. One complete executive cycle consists of ten executive executions (two seconds). Data acquisition, special processes (computations and sequences) and data output are assigned to specific cycles to permit load balancing. The current GMT time is obtained in cycle 1 for use in the various special processes.

Data Acquisition is called on assigned cycles as required by the special processes. Based on the phase count, the appropriate special processes are called. On the executive cycles in which Payload Bay Doors is called, the PBD active/inactive flag (set at Mode initialization) is checked to determine if the Payload Bay Doors is to be executed. In executive cycle ten, Antenna Management is called and the Special Processes Data Output module is called to output all special processes commands which are enabled.

d. Outputs - Outputs to this module are specified in Table 3.2.1.9-1.

e. Module References

Process	Section	Reference
Special Processes Data Acquisition	3.2.1.10	CALL
APU Fuel Quantity	3.2.1.12	CALL
Fuel Cell Computations	3.2.1.13	CALL
Hydraulic Water Boiler Quantity	3.2.1.14	CALL
O_2/N_2 Quantity	3.2.1.15	CALL
H_2O Pump Delta Pressure	3.2.1.16	CALL
Recorder Position Tape	3.2.1.17	CALL
Fuel Cell Purge	3.2.1.18	CALL
Hydraulic Fluid On-Orbit Temperature Control	3.2.1.19	CALL
Payload Bay Doors (OPS 202 only)	3.2.1.20	CALL
Standby Water Coolant Loop Temperature Control	3.2.1.21	CALL
Antenna Management	3.2.1.22	CALL
Special Processes Data Out	3.2.1.11	CALL

f. Module Type and Attributes

Type: Program
Attributes: Default (serially reusable with no protective mechanism)

g. Template References

D INCLUDE TEMPLATE SSD_SP_DATA_ACQ	SP Data Acquisition
D INCLUDE TEMPLATE SSO_SP_DATA_OUT	SP Data Out
D INCLUDE TEMPLATE SSA_APU_FUEL_QTY	APU Fuel Quantity
D INCLUDE TEMPLATE SSF_FUEL_CELL	Fuel Cell Comp
D INCLUDE TEMPLATE SSH_HYD_H20_QTY	Hydraulic Water Boiler Quantity
D INCLUDE TEMPLATE SSN_02N2_QTY	O_2/N_2 Quantity
D INCLUDE TEMPLATE SSW_H20_PUMP_P	H_2O Pump Delta Pressure
D INCLUDE TEMPLATE SSR_REC_TAPE	Recorder Position Tape
D INCLUDE TEMPLATE SSC_FUEL_CELL_PURGE	Fuel Cell Purge
D INCLUDE TEMPLATE SST_HYD_FLD_TEMP	Hydraulic Fluid On-Orbit Temperature
D INCLUDE TEMPLATE SSB_PL_BAY_DOORS	Payload Bay Doors
D INCLUDE TEMPLATE SSS_STAND_H20_COOL	Standby Water Coolant Loop
D INCLUDE TEMPLATE SSM_ANT_MGMT	Antenna Management
D INCLUDE TEMPLATE CSS_SP_CMT	Special Processes CMT
D INCLUDE TEMPLATE CGE_DISPATCHER	Contains code for hybrid dispatcher
D INCLUDE TEMPLATE SHD_HYB_DISPATCH	SM Hybrid Dispatch Table

D INCLUDE GEDISP	Contains integer value used by Hybrid dispatcher to index through Dispatcher Table.
D INCLUDE TEMPLATE CSZ_ICC_CMT	ICC Input Buffers and Communications Table.
D INCLUDE DIM_ICC_COLLECTOR	UI ICC Collector routine

h. Error Handling - None

i. Constraints and Assumptions - Special Processes Data Out is called by the Special Processes Executive once every two seconds and assumes no outputs other than PBD are required more frequently than once every two seconds.

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TABLE 3.2.1.9-1. Special Processes Executive MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
	(deleted)						
2	Hybrid Dispatch Table	A.2.22	I		SHD_HYB_DISPATCH		
3	SP Current Time	A.2.11	O	Various Special Processes	CSSV_SP_CURRENT_TIME	V91M1999P	
4	Negmax	E	L		NEGMAX		
5	PBD Active/Inactive Flag	A.2.22 D.25	I	S2I	SHD_HYB_DISPATCH.FREQ$(10;1)		
6	Full Execute Flag	A.2.11	O	SSB, SSD	CSSB_FULL_EX_FLAG		

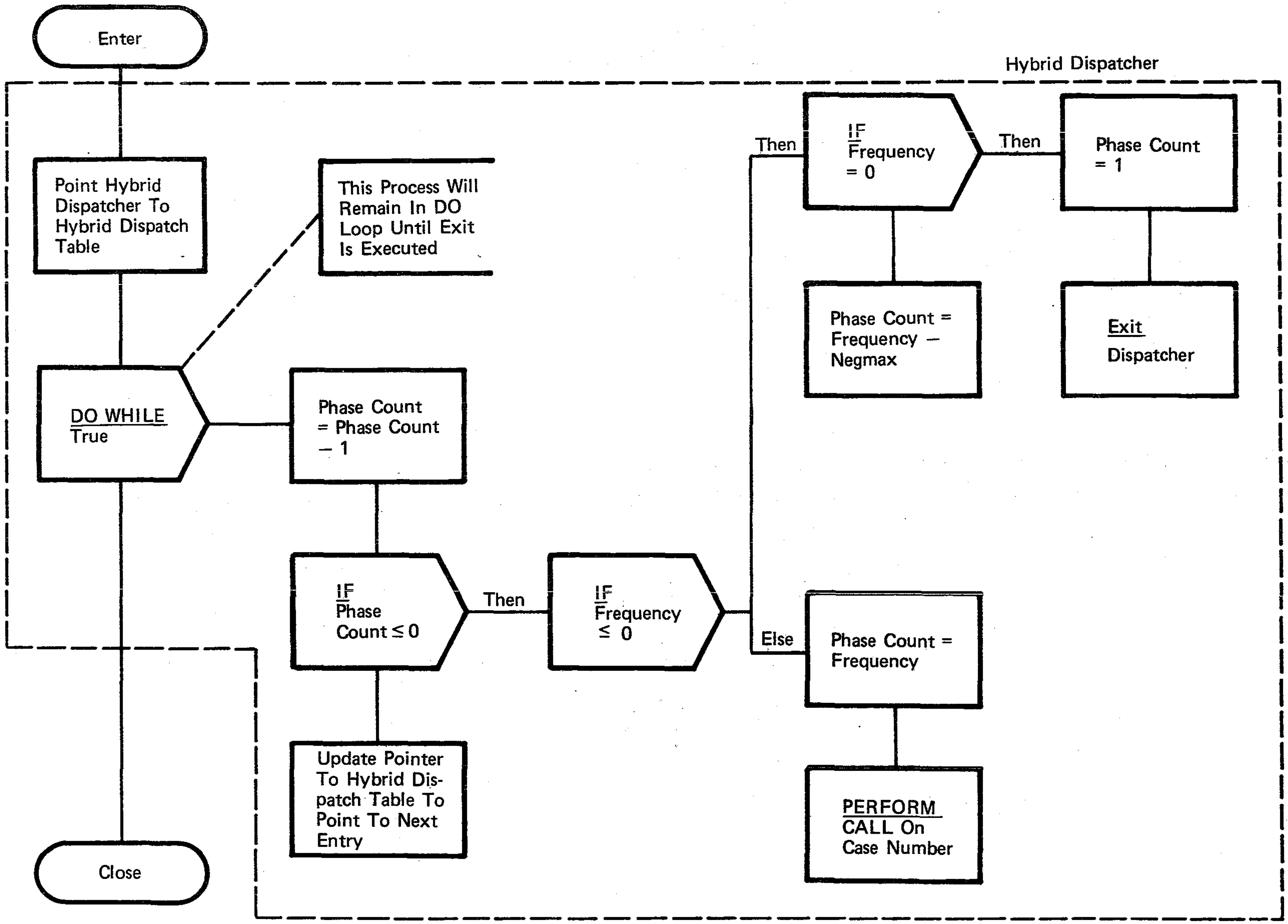

Figure 3.2.1.9-1. Special Processes Executive

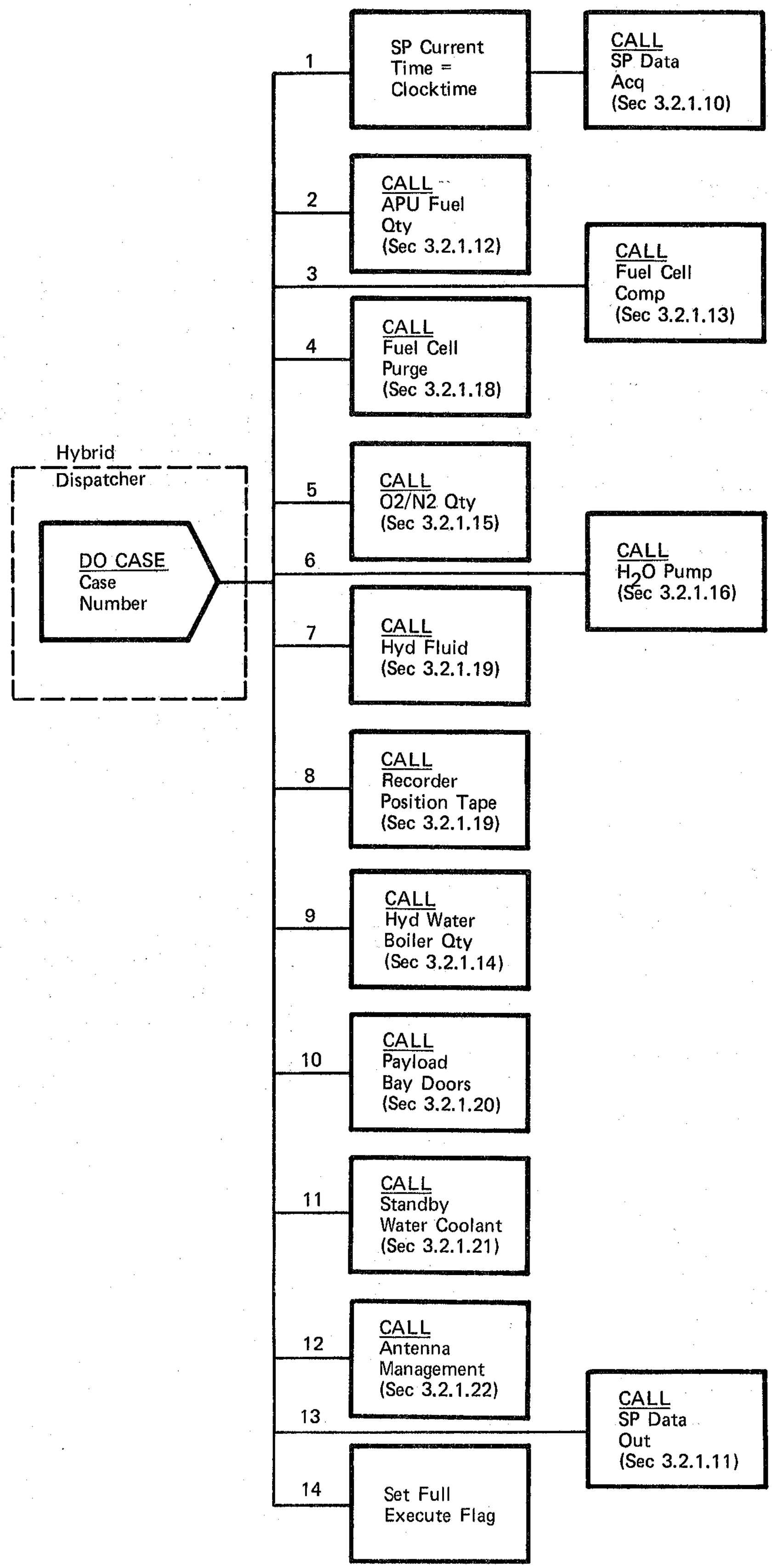

Figure 3.2.1.9-2. CALL On Case Number

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3.2.1.10 Special Processes Data Acquisition (SSD_SP_DATA_ACQ)

The Special Processes (SP) Data Acquisition module causes the acquisition of all data required by Special Processes from the PCM Master Unit (PMU) and/or the payload MDM's. Data not acquired due to I/O failure is flagged invalid.

a. Control Interface - SP Data Acquisition is CALL'ed by the SP Executive once every second in OPS 201 and every 400 MS in OPS 202.

Invocation: CALL SSD_SP_DATA_ACQ

b. Inputs - Inputs to this module are specified in Table 3.2.1.10-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.10-1. The full execution flag is first checked. If off, then the General Data Acquisition call list is set up with a DART header requesting only PLMDM data be acquired and processed (# of PMU entries = 0 and the IOB address is set to the first MDM entry the IOB). General Data Acquisition is CALLed to read PLMDM data into SP Input Buffer (SPINB), screen for transfer errors, and move the I/O status of each parameter to the end of the IOB. The Forward Scaling module is not called.

If the full execution flag is on, then the General Acquisition call list is set up with a DART header requesting both PMU and PLMDM data be acquired and processed and the IOB address is set to the beginning of the IOB. General Data Acquisition is called to read PMU and PLMDM data into the SP Input Buffer (SPINB), screen for transfer errors, and move the IO status of each parameter to the IOB. The foward scaling module is called to scale all analog parameters acquired and place the EU values in the SPINB.

d. Outputs - Outputs from this module are specified in Table 3.2.1.10-1.

e. Module References -

Process	Section	Reference
General Data Acquisition	3.2.1.3.2	CALL(Call List)
Forward Scaling	3.2.1.7	CALL(Call List)

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

D INCLUDE TEMPLATE CSS_SP_CMT	Special Processes CMT
D INCLUDE TEMPLATE CSS_SPINB	Special Processes Input Buffer (SPINB)
D INCLUDE TEMPLATE SFS_FOR_SCALE	Forward Scaling
D INCLUDE TEMPLATE CSS_DART	Special Processes DART
D INCLUDE TEMPLATE SGA_GEN_ACQ	General Data Acquisition
D INCLUDE TEMPLATE CSS_SXT	Special Processes SXT
D INCLUDE SGADUMST	Dummy Structures For Call List
D INCLUDE ANTMACS	Fixed FCOS Read Replaces
D INCLUDE IOMACS	IO Macro Replaces

h. Error Handling - Reference General Data Acquisition, section 3.2.1.3.2.

i. Constraints and Assumptions - None

TABLE 3.2.1.10-1. Special Processes Data Acquisition MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Parameter Values	A.2.17	I/O	SPA, SFS, SSA, SSF, SSH, SSN, SSW, SSR, SSC, SST, SSB, SSM	N/A		
2	Parameter I/O Status	A.2.17	O	SFS, SSA, SSF, SSH, SSN, SSW, SSR, SSC, SST, SSB, SSM	N/A		
3	General Acquisition Call List		O	SGA	SSD_CALL_LIST		
4	Dart Index	E	O	SGA	SSD_DART_HDR		
5	Dart Address	E	O	SGA	SSD_DART_ADDR		
6	IO Stat Address	E	O	SGA	SSD_IO_ADDR		
7	INB Address	E	O	SGA	SSD_INB_ADDR		
8	(deleted)						
9	PLMDM I/O List Address	E		SGA	SSD_IOLST_ADDR		
10	PLMDM Read Flag	E	O	SGA	SSD_PLREAD		
11	SP Call Flag	E	O	SGA	SSD_SP_CALL_FLG		
12	Forward Scaling Call List	E.3.2.1.7	O	SFC	SFS_CALL_LIST		
13	Full Execution Flag	A.2.11.3	I/O	SSD, SSP/SSP	CSSB_FULL_EX_FLAG		
14	IOB	A.2.17	O	SFS, SSA, SSF, SSH, SSN, SSW, SSR, SSC, SST, SSB, SSM			

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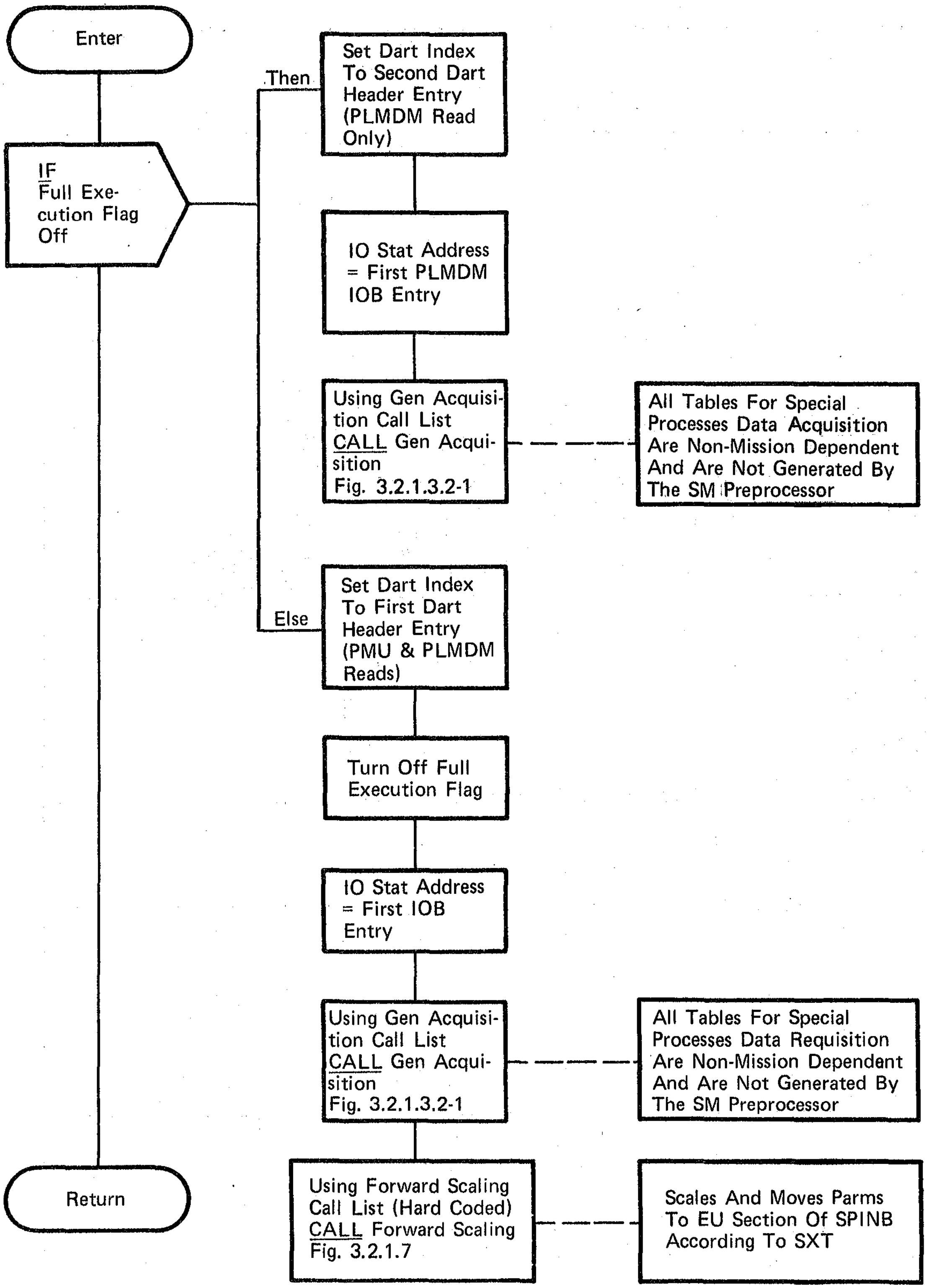

Figure 3.2.1.10-1. SP Data Acquisition

3.2.1.11 Special Processes Data Out (SSO_SP_DATA_OUT)

The Special Processes (SP) Data Out module writes all SP outputs to the payload MDM's and performs all SP annunciation.

a. Control Interface - SP Data Out is CALL'ed by the SP Executive once every two seconds and by the Payload Bay Doors process whenever it has commands to output.

Invocation: CALL SSO_SP_DATA_OUT

b. Inputs - Inputs to this module are specified in Table 3.2.1.11-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.11-1.

If Payload Bay Door (PBD) outputs are indicated, Payload Bay Door reset masks are set up for FCOS output processing and an FCOS macro is issued twice to output all PBD output parameters in the SP Output Buffer twice. Otherwise, reset masks are set up for FCOS output processing and an FCOS macro is issued to output all non-PBD SP output parameters in the SP Output Buffer. Discrete parents common to PBD and the other processes are merged into one word for downlist.

SP annunciation output processing is then performed. All annunciation indicators are scanned. Annunciation is enabled for those indicators that have been set by other SP modules. Once annunciation has been enabled for a particular indicator, it is non re-enabled until that indicator has been reset (and processed by Special Processes Data Out) and subsequently set on again.

d. Outputs - Outputs for this module are specified in Table 3.2.1.11-1.

e. Module References -

DMA_MAC - A System Software external procedure CALL'ed when parameter fault annunciation is enabled by FMP_ENABLE

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

D INCLUDE TEMPLATE DMA_MAC	System Services Annunciation Routine
D INCLUDE DMA#MACS	Systems Services Error Annunciation Macro Replaces
D INCLUDE IOMACS	Systems Services IO Macro Replaces
D INCLUDE TEMPLATE CSB_PBD_CMT	Payload Bay Doors Communication Compool
D INCLUDE TEMPLATE PFFOMACS	Systems Services SM PF Fixed Output Replace Statements
D INCLUDE TEMPLATE CZ1_COMMON	Common Compool
D INCLUDE TEMPLATE CSS_SPOB	Special Processes Output Buffer
D INCLUDE TEMPLATE CDL_ANNUN	Systems Services Annunciation Compool

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.11-1. Special Processes Data Out MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	Analog Output Parameters	A.2.16	I/O	SSA, SSH, SSC, SST, SSB, SSS, SSM/PL MDM	N/A		
2.	PBD Output Indicator	A.2.11	I	SSB	CSBB_PBD_OUTPUT_INDIC		
3.	Current Annunciation Indicator Parent	A.2.16	I	SSC, SST, SSB, SSM	CSSB_CUR_ANN		
4.	Previous Annunciation Indicator Parent	A.2.16	O	CRT,DL	CSSB_PREV_ANN		
5.	Set Mask	A.2.16	I/O	SSO/SSO,FCOS	N/A		
6.	Reset Mask	A.2.16	O	SSO/FCOS	N/A		
7.	Applicable Bit Mask	A.2.16	I	SSO	N/A		
8.	FMPT Pointer Table	A.2.16	I	SSO	CSSV_ANNUN_PNTR		
9.	Downlist Mask	A.2.16	I/O	SSO	N/A		

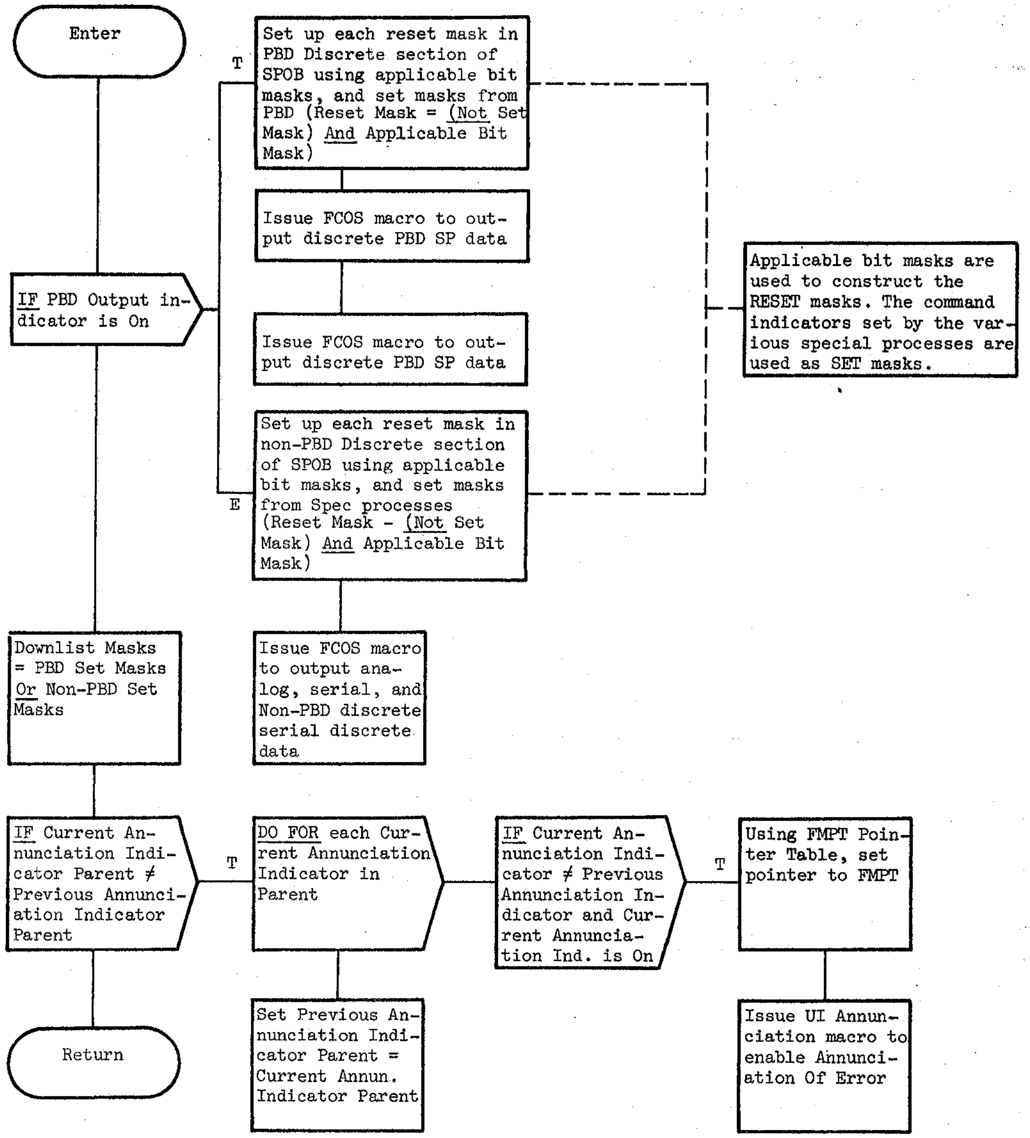

Figure 3.2.1.11-1. SPEC Processes Data Out

3.2.1.12 APU Fuel Quantity (SSA_APU_FUEL_QTY)

The APU Fuel Quantity module executes cyclically to determine the quantity of fuel remaining in the APU fuel tanks.

a. Control Interface - The APU Fuel Quantity module is CALLed once every two seconds by the Special Processes Executive.

INVOCATION: CALL SSA_APU_FUEL_QTY

b. Inputs - Inputs to this module are specified in Table 3.2.1.12-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.12-1. When called, the APU Fuel Quantity module performs the following processing for each of the three APU fuel tanks. The denominator in the computation is computed first. If the denominator is zero, the fuel tank quantity is set to zero. Otherwise, the fuel tank quantity is computed and a check is made to determine if the computed value lies in the range 0 to 100 inclusive. If the value is less than 0, it is set to 0 and if greater than 100, it is set to 100. The status of the input parameters are then checked. If any status is invalid, the output status is set to invalid. Otherwise, it is set to valid. The computed value and its status are then stored in the Display/Downlist table for display. The value is converted to PCM counts and stored in Special Processes Output Buffer (SPOB) for output to the meter and downlist.

d. Outputs - Outputs from this module are specified in Table 3.2.1.12-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References

D INCLUDE TEMPLATE CSS_COT_CONSTANTS TABLE (COT) - Values
D INCLUDE TEMPLATE CSS_SPINB - Special Processes Input Buffer
D INCLUDE TEMPLATE CSS_SPOB - Special Processes Output Buffer
D INCLUDE TEMPLATE CSS_DDT - Display/Downlist Table
D INCLUDE SMSTAT - Status Field Replace Statements

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.12-1 APU Fuel Quantity

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	APU 1 Fuel Tank Pressure	A.2.17	I	SSD	CSQV_APU_FUEL_PRES$(1)	V46P0100A	$P1_1$
2.	APU 1 Fuel Tank Pressure Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_PRESS_STATUS $(1)		
3.	APU 2 Fuel Tank Pressure	A.2.17	I	SSD	CSQV_APU_FUEL_PRESS$(2)	V46P0200A	$P1_2$
4.	APU 2 Fuel Tank Pressure Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_PRESS_STATUS$(2)		
5.	APU 3 Fuel Tank Pressure	A.2.17	I	SSD	CSQV_APU_FUEL_PRESS$(3)	V46P0300A	$P1_3$
6.	APU 3 Fueld Tank Pressure Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_PRESS STATUS$(3)		
7.	APU 1 Fuel Tank Temperature	A.2.17	I	SSD	CSQV_APU_FUEL_TEMP$(1)	V46T0102A	$T1_1$
8.	APU 1 Fuel Tank Temperature Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_TEMP_STATUS$(1)		
9.	APU 2 Fuel Tank Temperature	A.2.17	I	SSD	CSQV_APU_FUEL_TEMP$(2)	V46T0202A	$T1_2$
10.	APU 2 Fuel Tank Temperature Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_TEMP_STATUS$(2)		
11.	APU 3 Fuel Tank Temperature	A.2.17	I	SSD	CSQV_APU_FUEL_TEMP$(3)	V46T0302A	$T1_3$
12.	APU 3 Fuel Tank Temperature Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_TEMP_STATUS$(3)		
13.	APU 1 Fuel Tank Outlet Pressure	A.2.17	I	SSD	CSQV_APU_FUEL_OUTLET$(1)	V46P0105A	$P2_1$
14.	APU 1 Fuel Tank Outlet Pressure Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_OUTLET_STATUS $(1)		
15.	APU 2 Fuel Tank Outlet Pressure	A.2.17	I	SSD	CSQV_APU_FUEL_OUTLET$(2)	V46P0205A	$P2_2$
16.	APU 2 Fuel Tank Outlet Pressure Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_OUTLET_ STATUS$(2)		
17.	APU 3 Fuel Tank Outlet Pressure	A.2.17	I	SSD	CSQV_APU_FUEL_OUTLET$(3)	V46P0305A	$P2_3$
18.	APU 3 Fuel Tank Outlet Pressure Input Status	A.2.17	I	SSD	CSQB_APU_FUEL_OUTLET_ STATUS$(3)		

TABLE 3.2.1.12-1 APU Fuel Quantity (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
19.	Helium Mass Tank 1	A.2.12, D.12	I	STM	CSQV_APU_HELIUM_MASS_TANK $(1)	V92Q2024C	HM_1
20.	Helium Mass Tank 2	A.2.12, D.12	I	STM	CSQV_APU_HELIUM_MASS_ TANK$(2)	V92Q2026C	HM_2
21.	Helium Mass Tank 3	A.2.12, D.12	I	STM	CSQV_APU_HELIUM_MASS_ TANK$(3)	V92Q2028C	HM_3
22.	APU 1 Temperature Constant	A.2.12, D.12	I	STM	CSQV_APU_TEMP_CONSTANT$(1)	V92T2140C	$C2_1$
23.	APU 1 Pressure Flag	A.2.12, D.12	I	STM	CSQB_APU_PRES_FLAG$(1)	V92X2150X	A_1
24.	APU 1 Pressure Out Flag	A.2.12, D.12	I	STM	CSQB_APU_PRES_OUT_FLAG$(1)	V92X2152X	B_1
25.	APU 1 Temperature Out Flag	A.2.12, D.12	I	STM	CSQB_APU_TEMP_OUT_FLAG$(1)	V92X2160X	$C1_1$
26.	APU 2 Temperature Constant	A.2.12, D.12	I	STM	CSQB_APU_TEMP_CONSTANT$(2)	V92T2240C	$C2_2$
27.	APU 2 Pressure Flag	A.2.12, D.12	I	STM	CSQB_APU_PRES_FLAG$(2)	V92X2250X	A_2
28.	APU 2 Pressure Out Flag	A.2.12, D.12	I	STM	CSQB_APU_PRES_OUT_FLAG$(2)	V92X2252X	B_2
29.	APU 2 Temperature Out Flag	A.2.12, D.12	I	STM	CSQB_APU_TEMP_OUT_FLAG$(2)	V92X2260X	$C1_2$
30.	APU 3 Temperature Constant	A.2.12, D.12	I	STM	CSQV_APU_TEMP_CONSTANTS$(3)	V92T2340C	$C2_3$
31.	APU 3 Pressure Flag	A.2.12, D.12	I	STM	CSQV_APU_PRES_FLAG$(3)	V92X2350X	A_3
32.	APU 3 Pressure Out Flag	A.2.12, D.12	I	STM	CSQB_APU_PRES_OUT_FLAG$(3)	V92X2352X	B_3
33.	APU 3 Temperature Out Flag	A.2.12, D.12	I	STM	CSQB_APU_TEMP_OUT_FLAG$(3)	V92X2360X	$C1_3$
34.	Average Value of Specific Gas Constant	E	C		SSA_RGCF		RGCF
35.	Tank Expulsion Efficiency	E	C		SSA_EFF		EFF
36.	Gaging Error	E	C		SSA_GE		GE
37.	Tank Volume	E	C		SSA_VOL		VOL
38.	Mass of Minimum Usable Fuel	E	C		SSA_WPF		WPF

TABLE 3.2.1.12-1 APU Fuel Quantity (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
39.	APU 1 Fuel Tank Quantity For Meter	A.2.16	O	DL,SSO	CSQV_APU_FUEL_METER$(1)	V72Q6001V	WP_1
40.	APU 1 Fuel Tank Quantity For Display	A.2.18	O	CRT	CSQV_APU_FUEL_DISP$(1)	V72Q6001V	WP_1
41.	APU 1 Fuel Tank Quantity Output Status	A.2.18	O	CRT	CSQB_APU_FUEL_STAT$(1)		
42.	APU 2 Fuel Tank Quantity For Meter	A.2.16	O	DL,SSO	CSQV_APU_FUEL_METER$(2)	V72Q6002V	WP_2
43.	APU 2 Fuel Tank Quantity For Display	A.2.18	O	CRT	CSQV_APU_FUEL_DISP$(2)	V72Q6002V	WP_2
44.	APU 2 Fuel Tank Quantity Output Status	A.2.18	O	CRT	CSQB_APU_FUEL_STAT$(2)		
45.	APU 3 Fuel Tank Quantity For Meter	A.2.16	O	DL,SSO	CSQV_APU_FUEL_METER$(3)	V72Q6003V	WP_3
46.	APU 3 Fuel Tank Quantity For Display	A.2.18	O	CRT	CSQV_APU_FUEL_DISP$(3)	V72Q6003V	WP_3
47.	APU 3 Fuel Tank Quantity Output Status	A.2.18	O	CRT	CSQB_APU_FUEL_STAT$(3)		
48.	APU Fuel Quantity (Local)	E	L		SSA_TEMP_APU_FUEL_QUANTITY		
49.	APU Fuel Quantity (Local)	E	L		SSA_TEMP_APU_FUEL_QUANTITY_STAT		

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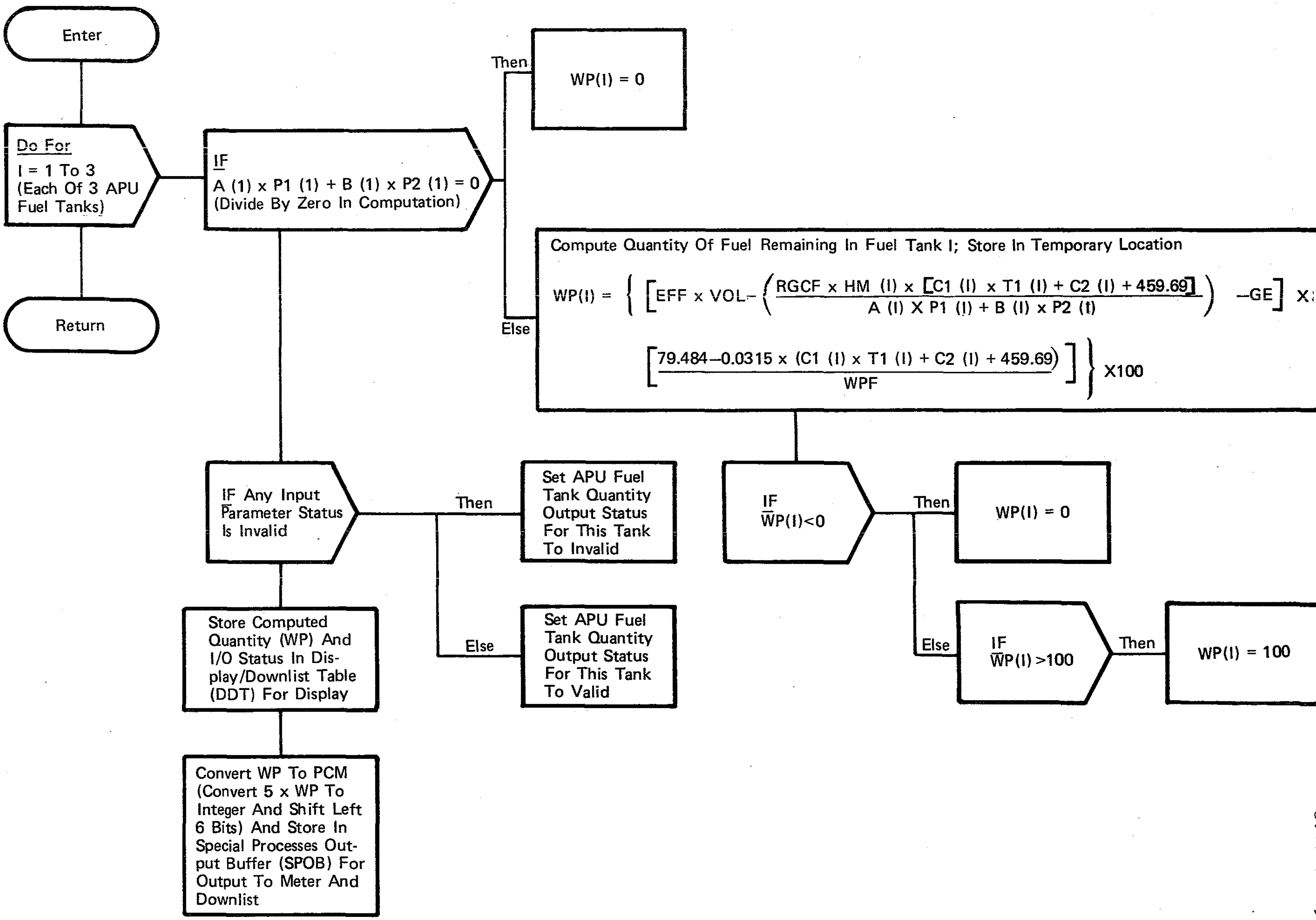

Figure 3.2.1.12-1. APU Fuel Quantity

3.2.1.13 Fuel Cell Computation (SSF_FUEL_CELL)

The Fuel Cell Computation module executes to determine the total current and power of the fuel cells and to set discretes to bracket the power level for each fuel cell.

a. Control Interface - The Fuel Cell Computation module is CALLed once every two seconds by the Special Processes Executive.

INVOCATION: CALL SSF_FUEL_CELL

b. Inputs - Inputs to this module are specified in Table 3.2.1.13-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.13-1. When CALLed, the Fuel Cell Computation module checks the statuses of the input parameters for the fuel cell. If any are invalid, the output status for the precondition discretes is set to invalid. Otherwise, the power level for the fuel cell is computed in kilowatts and compared against two power levels which define the break points between three ranges. Precondition discretes are set indicating the range the computed value lies in. The two power levels can be changed by Table Maintenance. The above is repeated for each of the other fuel cells.

A check is then made to determine if any output status has been set to invalid by the previous computation. If so, the output status for the total fuel cell power is set to invalid. Otherwise, the total fuel cell power is computed by summing the power levels from each individual fuel cell and the output status is set to valid. A status check is then performed on the parameter used to compute the total current. If any are invalid, the output status for total current is set to invalid. Otherwise, the total current is computed by summing the individual currents from each fuel cell and the output status is set to valid.

d. Outputs - Outputs from this module are specified in Table 3.2.1.13-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure

Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

```
D INCLUDE TEMPLATE CSS_COT     -    CONSTANTS TABLE
D INCLUDE TEMPLATE CSS_SPINB   -    SPECIAL PROCESSES INPUT BUFFER
D INCLUDE TEMPLATE CSS_DDT     -    DISPLAY/DOWNLIST TABLE
D INCLUDE SMSTAT               -    STATUS FIELD REPLACE STATEMENTS
```

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.13-1 Fuel Cell Computation

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	Fuel Cell 1 Voltage	A.2.17	I	SSD	CSFV_FC_VOLTAGE$(1)	V45V0100A	E_1
2.	Fuel Cell 1 Voltage Input Status	A.2.17	I	SSD	CSFB_FC_VOLTAGE_INPUT_STATUS$(1)		
3.	Fuel Cell 2 Voltage	A.2.17	I	SSD	CSFV_FC_VOLTAGE$(2)	V45V0200A	E_2
4.	Fuel Cell 2 Voltage Input Status	A.2.17	I	SSD	CSFB_FC_VOLTAGE_INPUT_STATUS$(2)		
5.	Fuel Cell 3 Voltage	A.2.17	I	SSD	CSFV_FC_VOLTAGE$(3)	V45V0300A	E_3
6.	Fuel Cell 3 Voltage Input Status	A.2.17	I	SSD	CSFB_FC_VOLTAGE_INPUT_STATUS$(3)		
7.	Fuel Cell 1 Current	A.2.17	I	SSD	CSFV_FC_CURRENT$(1)	V45C0101A	I_1
8.	Fuel Cell 1 Current Input Status	A.2.17	I	SSD	CSFB_FC_CURRENT_INPUT_STATUS$(1)		
9.	Fuel Cell 2 Current	A.2.17	I	SSD	CSFV_FC_CURRENT$(2)	V45C0201A	I_2
10.	Fuel Cell 2 Current Input Status	A.2.17	I	SSD	CSFB_FC_CURRENT_INPUT STATUS$(2)		
11.	Fuel Cell 3 Current	A.2.17	I	SSD	CSFV_FC_CURRENT$(3)	V45C0301A	I_3
12.	Fuel Cell 3 Current Input Status	A.2.17	I	SSD	CSFB_FC_CURRENT_INPUT_STATUS$(3)		
13.	Power Level 1	A.2.12,D.12	I	STM	CSFV_POWER_LEVEL_1	V92E0630C	
14.	Power Level 2	A.2.12,D.12	I	STM	CSFV_POWER_LEVEL_2	V92E0631C	
15.	Total Fuel Cell Current	A.2.18	O	CRT,DL	CSFV_TOTAL_FC_CURRENT	V92C0311C	I_T
16.	Total Fuel Cell Current Output Status	A.2.18	O	CRT	CSFB_TOTAL_FC_CURRENT_STATUS		
17.	Total Fuel Cell Power	A.2.18	O	CRT,DL	CSFV_TOTAL_FC_POWER	V92E0310C	P_T
18.	Total Fuel Cell Power Output Status	A.2.18	O	CRT	CSFB_TOTAL_FC_POWER_STATUS		

TABLE 3.2.1.13-1 Fuel Cell Computation (Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
19.	Fuel Cell 1 Precondition 1	A.2.18	O	CRT	CSFB_FC_PRECON_1$(1)	V92X0601X	
20.	Fuel Cell 1 Precondition 2	A.2.18	O	CRT	CSFB_FC_PRECON_2$(1)	V92X0602X	
21.	Fuel Cell 1 Precondition 3	A.2.18	O	CRT	CSFB_FC_PRECON_3$(1)	V92X0603X	
22.	Fuel Cell 1 Precondition Output Status	A.2.18	O	CRT	CSFB_FC_PRECON_STAT$(1)		
23.	Fuel Cell 2 Precondition 1	A.2.18	O	CRT	CSFB_FC_PRECON_1$(2)	V92X0611X	
24.	Fuel Cell 2 Precondition 2	A.2.18	O	CRT	CSFB_FC_PRECON_2$(2)	V92X0612X	
25.	Fuel Cell 2 Precondition 3	A.2.18	O	CRT	CSFB_FC_PRECON_3$(2)	V92X0613X	
26.	Fuel Cell 2 Precondition Output Status	A.2.18	O	CRT	CSFB_FC_PRECON_STAT$(2)		
27.	Fuel Cell 3 Precondition 1	A.2.18	O	CRT	CSFB_FC_PRECON_1$(3)	V92X0621X	
28.	Fuel Cell 3 Precondition 2	A.2.18	O	CRT	CSFB_FC_PRECON_2$(3)	V92X0622X	
29.	Fuel Cell 3 Precondition	A.2.18	O	CRT	CSFB_FC_PRECON_3$(3)	V92X0623X	
30.	Fuel Cell 3 Precondition Output Status	A.2.18	O	CRT	CSFB_FC_PRECON_STAT$(3)		
31.	Power Level Computation	E	L		SSF_POWER_LEVEL_COMP_ARRAY		

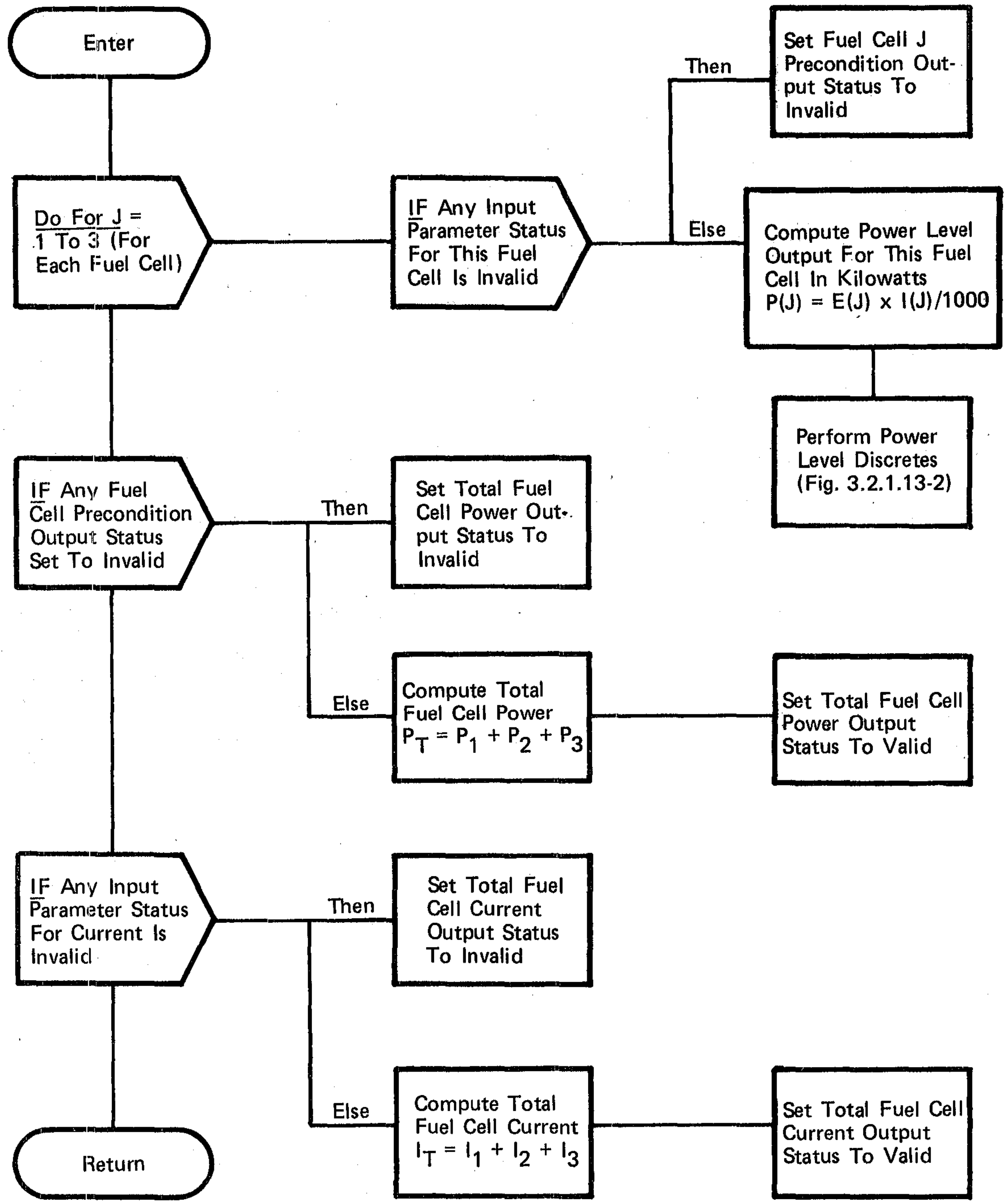

Figure 3.2.1.13-1. Fuel Cell Computation

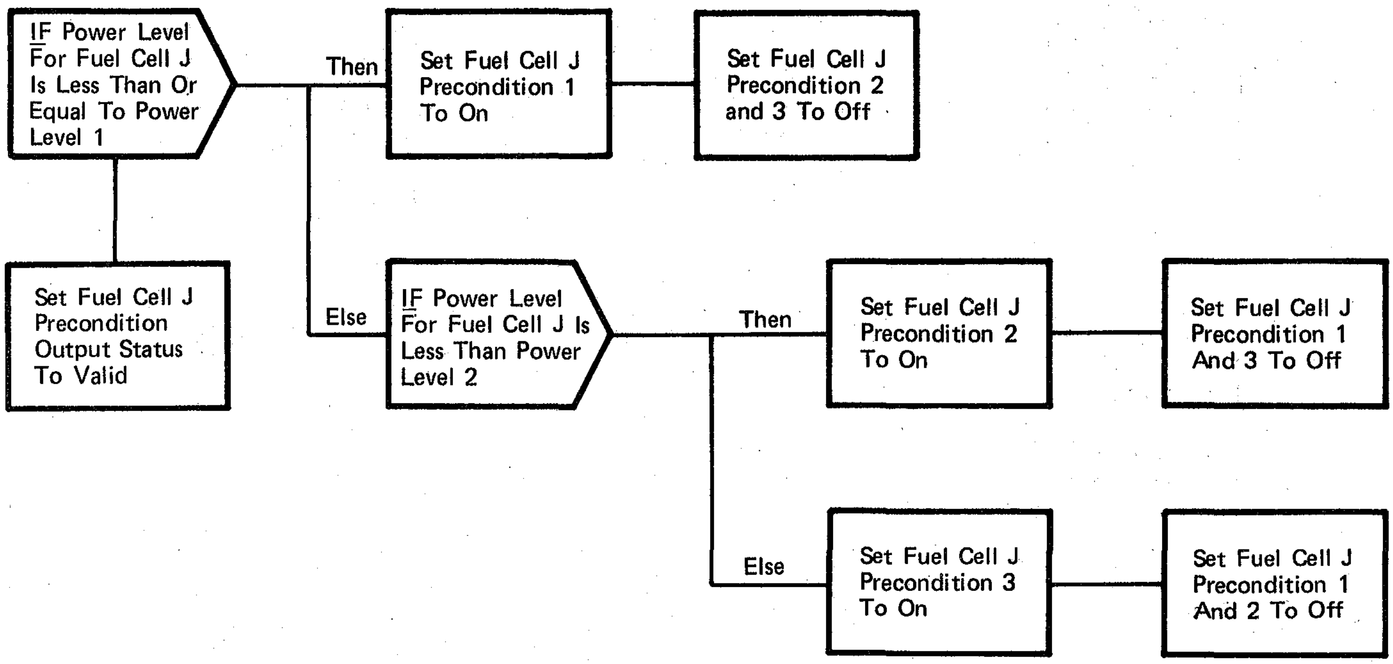

Figure 3.2.1.13-2. Power Level Discretes

BOOK: OFT SM Detailed Design Specification

3.2.1.14 Hydraulic Water Boiler Quantity (SSH_HYD_H20_QTY)

The Hydraulic Water Boiler Quantity calculations module computes the amount of water remaining in the three storage tanks.

a. Control Interface - This module is CALL'ed by the Special Processes Executive (SSP_EXEC) once every two seconds.

INVOCATION: CALL SSH_HYD_H20_QTY

b. Inputs - Inputs to this module are specified in Table 3.2.1.14-1

c. Process Description - The control flow for this module is shown in Figure 3.2.1.14-1. If the inputs needed for the hydraulic water boiler quantity computation for water tank 1 are valid, the hydraulic water boiler quantity remaining is computed using a pressure - volume - temperature (PVT) equation. The GN2 outlet pressure is analyzed to see if it is zero. If so, the hydraulic water boiler quantity is set to zero. Otherwise, the quantity of GN2 is calculated and that quantity is used in calculating the hydraulic water boiler quantity. A check is made to determine if the computed value lies in the range 0 to 100 inclusive. If the value is less than zero, it is set to 0 and if greater than 100, it is set to 100. The computed value and status are then stored in the Display/Downlist table for display. The value is converted to PCM counts and stored in the Special Processes Output Buffer (SPOB) for output to the meter and downlist. If any input parameter for water tank 1 has an invalid parameter status, then the hydraulic water boiler quantity is set to invalid and the computation is bypassed. This same procedure is followed for computing the hydraulic water boiler quantities for water tank 2 and water tank 3. There is no OPS initialization or clean-up processing.

d. Outputs - Outputs from this module are specified in Table 3.2.1.14-1.

e. Module References - None

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

D INCLUDE TEMPLATE CSA_COT	Constant Table (COT) - Values
D INCLUDE TEMPLATE CSA_DDT	Display/Downlist Table
D INCLUDE TEMPLATE CSA_SPINB	Special Processes Input Buffer (SPINB)
D INCLUDE TEMPLATE SPOB	Special Processes Output Buffer

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.14-1 Hydraulic Water Boiler Quantity

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Hydr Sys 1 H20 Tank Temp.	A.2.17	I	SSD	CSHV_H20_TEMP$(1;)	V58T0161A	T2(1)
2	Hydr Sys 1 GN2 Tank Temp.	A.2.17	I	SSD	CSHV_N2_TEMP$(1;)	V58T0105A	T1(1)
3	Hydr Sys 1 GN2 Quantity	A.2.12	I	STM	CSHV_N2_QUANTITY$(1;)	V92Q0650C	Q(1)
4	Hydr Sys 1 GN2 Press	A.2.17	I	SSD	CSHV_N2_PRESS$(1;)	V58P0147A	P1(1)
5	Hydr Sys 1 GN2 Outlet Press	A.2.17	I	SSD	CSHV_N2OUT_PRESS$(1;)	V58P0104A	P2(1)
6	Hydr Sys 2 H20 Tank Temp.	A.2.17	I	SSD	CSHV_H20_TEMP$(2;)	V58T0261A	T2(2)
7	Hydr Sys 2 GN2 Tank Temp.	A.2.17	I	SSD	CSHV_N2_TEMP$(2;)	V58T0205A	T1(2)
8	Hydr Sys 2 GN2 Quantity	A.2.12	I	STM	CSHV_N2_QUANTITY	V92Q0651C	Q(2)
9	Hydr Sys 2 GN2 Press	A.2.17	I	SSD	CSHV_N2_PRESS$(2;)	V58P0247A	P1(2)
10	Hydr Sys 2 GN2	A.2.17	I	SSD	CSHV_N2OUT_PRESS$(2;)	V58P0204A	P2(2)
11	Hydr Sys 3 H20 Tank Temp.	A.2.17	I	SSD	CSHV_H20_TEMP$(3;)	V58T0361A	T2(3)
12	Hydr Sys 3 GN2 Tank Temp.	A.2.17	I	SSD	CSHV_N2_TEMP$(3;)	V58T0305A	T1(3)
13	Hydr Sys 3 GN2 Quantity	A.2.12	I	STM	CSHV_N2 QUANTITY$(3;)	V92Q0652C	Q(3)
14	Hydr Sys 3 GN2 Press	A.2.17	I	SSD	CSHV_N2_PRESS$(3;)	V58P0347A	P1(3)
15	Hydr Sys 3 GN2 Outlet Press	A.2.17	I	SSD	CSHV_N2OUT_PRESS$(3;)	V58P0304A	P2(3)
16	Hydr Sys 1 H20 Temp Input Status Indicator	A.2.17	I	SSD	CSHB_H20_TEMP_STAT$(1;)		
17	Hydr Sys 1 GN2 Temp Input Status Indicator	A.2.17	I	SSD	CSHB_N2_TEMP_STAT$(1;)		
18	Hydr Sys 1 GN2 Press Input Status Indicator	A.2.17	I	SSD	CSHB_N2_PRESS_STAT$(1;)		
19	Hydr Sys 1 GN2 Outlet Press Status Indicator	A.2.17	I	SSD	CSHB_N2OUT_PRESS_STAT$(1;)		
20	Hydr Sys 2 H20 Temp Input Status Indicator	A.2.17	I	SSD	CSHB_H20_TEMP_STAT$(2;)		
21	Hydr Sys 2 GN2 Temp Input Status Indicator	A.2.17	I	SSD	CSHB_N2_TEMP_STAT$(2;)		
22	Hydr Sys 2 GN2 Press Input Status Indicator	A.2.17	I	SSD	CSHB_N2_PRESS_STAT$(2;)		

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TABLE 3.2.1.14-1 Hydraulic Water Boiler Quantity(continued) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
23	Hydr Sys 2 GN2 Outlet Pressure Status Indicator	A.2.17	I	SSD	CSHB_N2OUT_PRESS_STAT$(2;)		
24	Hydr Sys 3 H20 Temp Input Status Indicator	A.2.17	I	SSD	CSHB_H2O_TEMP_STAT$(3;)		
25	Hydr Sys 3 GN2 Temp Input Status Indicator	A.2.17	I	SSD	CSHB_N2_TEMP_STAT$(3;)		
26	Hydr Sys 3 GN2 Press Input Status Indicator	A.2.17	I	SSD	CSHB_N2_PRESS_STAT$(3;)		
27	Hydr Sys 3 Outlet Press Status Indicator	A.2.17	I	SSD	CSHB_N2OUT_PRESS_STAT$(3;)		
28	Quantity of GN2 in GN2 Tank	E	L		SSH_N2_QUANTITY		Q1
29	Hydr Water Boiler Quantity (LOCAL)	E	L		SSH_TEMP_VR		
30	Hydr Sys 1 Output Parm Status Indicator	A.2.18	O		CSHB_QUANT_OUT_STAT$(1:)		
31	Hydr Sys 2 Output Parm Status Indicator	A.2.18	O		CSHB_QUANT_OUT_STAT$(2:)		
32	Hydr Sys 3 Output Parm Status Indicator	A.2.18	O		CSHB_QUANT_OUT_STAT$(3:)		
33	Hydr Sys 1 Display Water Boiler Quantity	A.2.18	O	CRT	CSHV_QUANT_CRT$(1:)	V72Q6040V	VR(1)
34	Hydr Sys 2 Display Water Boiler Quantity	A.2.18	O	CRT	CSHV_QUANT_CRT$(2:)	V72Q6042V	VR(2)
35	Hydr Sys 3 Display Water Boiler Quantity	A.2.18	O	CRT	CSHV_QUANT_CRT$(3:)	V72Q6044V	VR(3)
36	Hydr Sys 1 MDM Water Boiler Quantity	A.2.16	O	D/L, SSO	CSHV_QUANT_METER$(1)	V72Q6040V	VR(1)
37	Hydr Sys 2 MDM Water Boiler Quantity	A.2.16	O	D/L, SSO	CSHV_QUANT_METER$(2)	V72Q6042V	VR(2)
38	Hydr Sys 3 MDM Water Boiler Quantity	A.2.16	O	D/L, SSO	CSHV_QUANT_METER$(3)	V72Q6044V	VR(3)

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TABLE 3.2.1.14-1 Hydraulic Water Boiler Quantity (continued) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
39	Hydr Sys A Const	E	C		SSH_A_CONST		A
40	Hydr Sys B Const	E	C		SSH_B_CONST		B
41	Hydr Sys C Const	E	C		SSH_C_CONST		C
42	Hydr Sys D Const	E	C		SSH_D_CONST		D
43	Intermediate Meter Reading	E	L		SSH_QUANT_METER		

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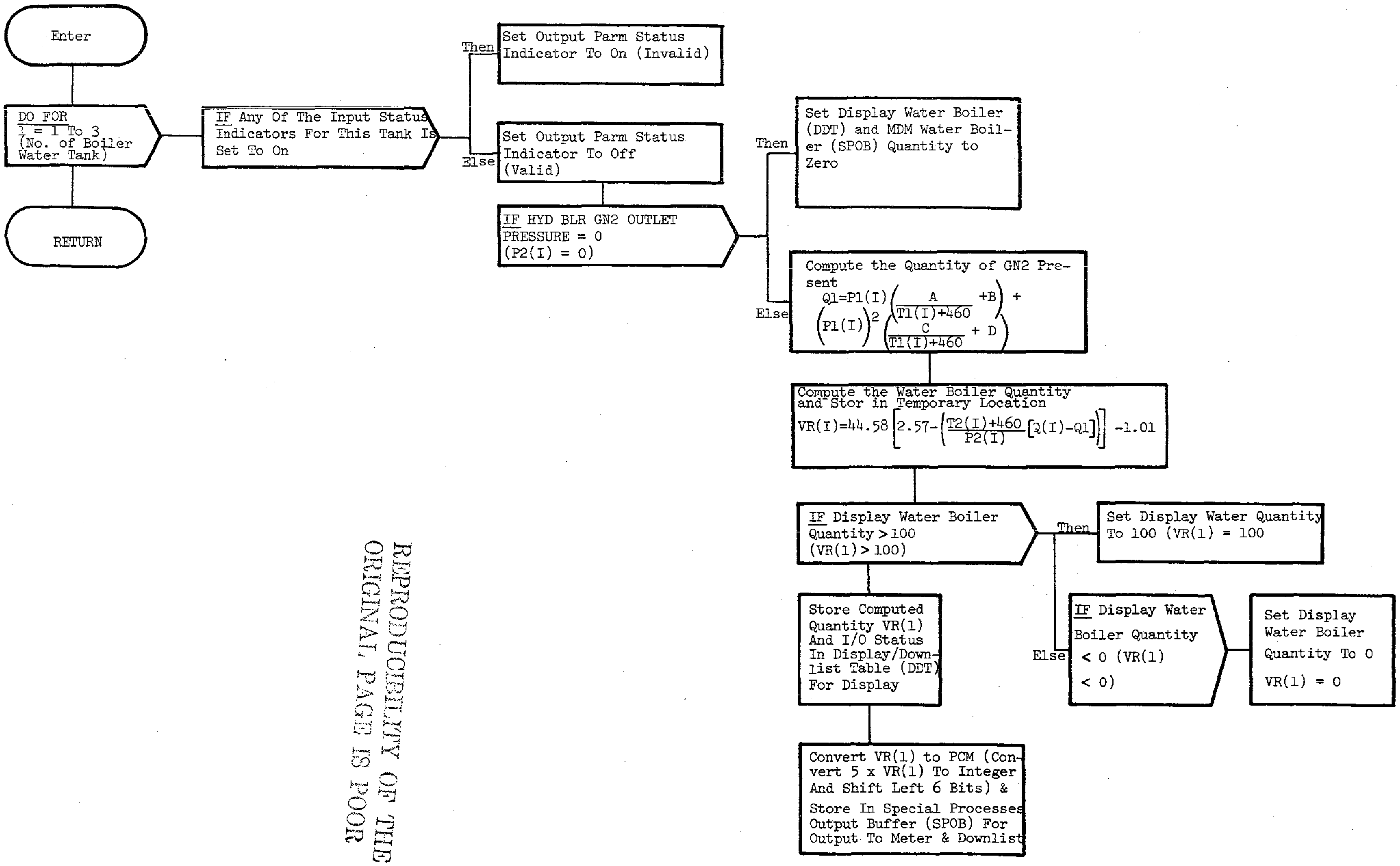

Figure 3.2.1.14-1 Hydraulic Water Boiler Quantity

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3.2.1.15 O_2/N_2 Quantity (SSN_O2N2_QTY)

The O_2/N_2 Quantity computation module computes the O_2 quantity remaining in the Emergency O_2 tank and the N_2 quantity remaining in the two system 1 and two system 2 N_2 tanks.

a. Control Interface - The O_2/N_2 Quantity computation module is CALL'ed by the Special Processes Executive once every two seconds.

   Invocation: CALL SSN_O2N2_QTY;

b. Inputs - Inputs to this module are specified in Table 3.2.1.15-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.15-1. If the inputs needed for the Emergency O_2 quantity computation are valid, the O_2 quantity remaining is computed and given a valid status. If the O_2 inputs are invalid then the O_2 quantity remaining status is set to invalid and the computation is bypassed. This same procedure is followed for computing the N_2 quantities remaining in the system 1 and system 2 tanks. There is no OPS initialization or clean-up processing.

d. Outputs - Outputs from this module are specified in Table 3.2.1.15-1.

e. Module References - None

f. Module Type and Attributes

   Type: External Procedure
   Attributes: Default (serially reusable with no protective mechanism).

g. Template References

CSS_SPINB	Special Processes Input Buffer
CSS_DDT	Display Downlist Table

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.15-1. O_2N_2 Quantity

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Emer O_2 Tank Press Status	A.2.17	I	SSD	CSNB_O2_PRESS_STATUS		
2	Emer O_2 Tank Temp Status	A.2.17	I	SSD	CSNB_O2_TEMP_STATUS		
3	Emer O_2 Tank Press	A.2.17	I	SSD	CSNV_O2_PRESS_VALUE	V61P2161A	P
4	Emer O_2 Tank Temp	A.2.17	I	SSD	CSNV_O2_TEMP_VALUE	V61T2216A	T
5	Emer O_2 Quantity Status	A.2.18	O	CRT	CSNB_O2_QTY_STATUS		
6	Emer O_2 Quantity	A.2.18	O	CRT,DL	CSNV_O2_QTY_VALUE	V92Q0305C	WO_2
7	Sys N_2 Press Stat (1)	A.2.17	I	SSD	CSNB_N2_PRESS_STAT$(1;)		
8	Sys N_2 Press Stat (2)	A.2.17	I	SSD	CSNB_N2_PRESS_STAT$(2;)		
9	Sys N_2 Tank 1 Temp Stat (1)	A.2.17	I	SSD	CSNB_N2_TANK1_TEMP_STAT$(1;)		
10	Sys N_2 Tank 1 Temp Stat (2)	A.2.17	I	SSD	CSNB_N2_TANK1_TEMP_STAT$(2;)		
11	Sys N_2 Tank 2 Temp Stat (1)	A.2.17	I	SSD	CSNB_N2_TANK2_TEMP_STAT$(1;)		
12	Sys N_2 Tank 2 Temp Stat (2)	A.2.17	I	SSD	CSNB_N2_TANK2_TEMP_STAT$(2;)		
13	Sys 1 N_2 Supply Pressure	A.2.17	I	SSD	CSNV_SUPPLY_PRESS$(1:)	V61P2301A	P(1)
14	Sys 2 N_2 Supply Pressure	A.2.17	I	SSD	CSNV_SUPPLY_PRESS$(2:)	V61P2309A	P(2)
15	Sys 1 N_2 Tank 1 Temp	A.2.17	I	SSD	CSNV_TANK1_TEMP$(1:)	V61T2406A	T(1)
16	Sys 1 N_2 Tank 2 Temp	A.2.17	I	SSD	CSNV_TANK2_TEMP$(1:)	V61T2407A	T(2)
17	Sys 2 N_2 Tank 1 Temp	A.2.17	I	SSD	CSNV_TANK1_TEMP$(2:)	V61T2408A	T(3)
18	Sys 2 N_2 Tank 2 Temp	A.2.17	I	SSD	CSNV_TANK2_TEMP$(2:)	V61T2409A	T(4)

TABLE 3.2.1.15-1. O_2N_2 Quantity

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
19	System 1 N_2 Supply Quantity	A.2.18	O	CRT,DL	CSNV_N2_QTY$(1:)	V92Q0315C	WN_2 (SYS 1)
20	System 2 N_2 Supply Quantity	A.2.18	O	CRT,DL	CSNV_N2_QTY$(2:)	V92Q0318C	WN_2 (SYS 2)
21	N2 Supply Quantity Status (1)	A.2.18	O	CRT	CSNB_N2_QTY_STAT$(1:)		
22	N2 Supply Quantity Status (2)	A.2.18	O	CRT	CSNB_N2_QTY_STAT$(2:)		
23	Temporary Press	E	L		SSN_TEMP_PRESS		

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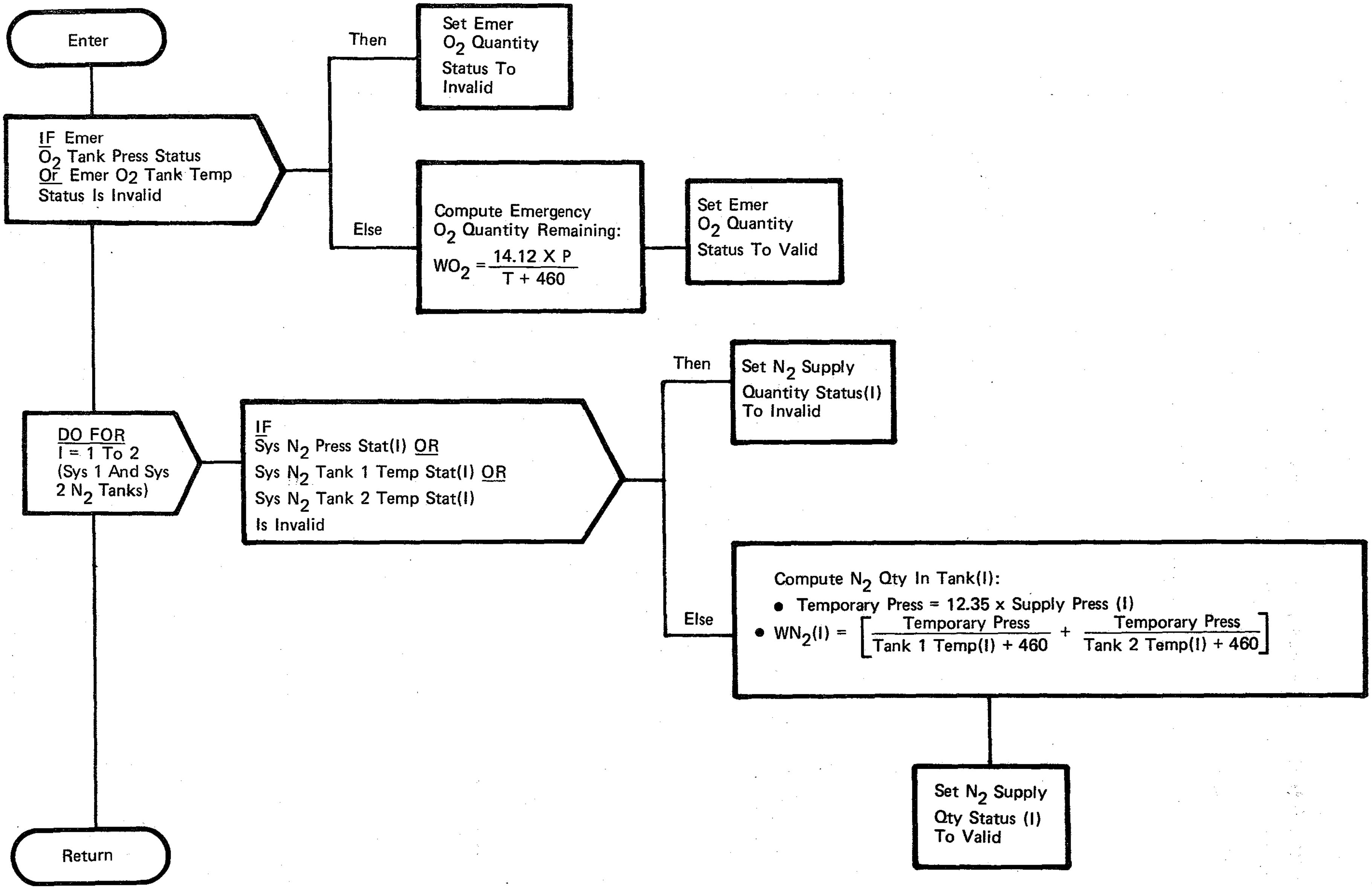

Figure 3.2.1.15-1. O_2/N_2 Quantity

BOOK: OFT SM Detailed Design Specification

3.2.1.16 H_2O Pump Delta Pressure (SSW_H20_PUMP_P)

The H_2O Pump Delta Pressure module computes the delta pressure for each of the two water coolant loops in the Atmospheric Revitalization System.

a. Control Interface - The H_2O Pump Delta Pressure module is CALL'ed by the Special Processes Executive once every two seconds.

   Invocation: CALL SSW_H20_PUMP_P

b. Inputs - Inputs to this module are specified in Table 3.2.1.16-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.16-1. If the inputs needed for the Loop 1 H_2O delta pressure computation are valid, the delta pressure is computed and given a valid status. If the inputs are invalid, the computation is bypassed and an invalid status is set for the delta pressure output. This same procedure is followed for computing the delta pressure of the Loop 2 H_2O pump. There is no OPS initialization or clean-up processing.

d. Outputs - Outputs from this module are specified in Table 3.2.1.16-1.

e. Module References - None

f. Module Type and Attributes

   Type: External Procedure
   Attributes: Default (serially reusable with no protective mechanism).

g. Template References

D INCLUDE TEMPLATE CSS_SPINB	Special Processes Input Buffer(SPINB)
D INCLUDE TEMPLATE CSS_DDT	Display/Downlist Table

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.16-1 H_2O Pump Delta Pressure

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Loop 1 Pump Inlet Pressure	A.2.17	I	SSD	CSWV_IN_PRESS1	V61P2605A	Pi1
2	Loop 1 Pump Inlet Pressure Status	A.2.17	I	SSD	CSWB_IN_PRESS1_STATUS		
3	Loop 1 Pump Outlet Pressure	A.2.17	I	SSD	CSWV_OUT_PRESS1	V61P2600A	Po1
4	Loop 1 Pump Outlet Pressure Status	A.2.17	I	SSD	CSWB_OUT_PRESS1_STATUS		
5	Loop 1 Pump Delta Pressure	A.2.18	O	CRT, DL	CSWV_DELTA_PRESS1	V92P0300C	P_1
6	Loop 1 Pump Delta Pressure Status	A.2.18	O	CRT, DL	CSWB_DELTA_PRESS1_STATUS		
7	Loop 2 Pump Inlet Pressure	A.2.17	I	SSD	CSWV_IN_PRESS2	V61P2705A	Pi2
8	Loop 2 Pump Inlet Pressure Status	A.2.17	I	SSD	CSWB_IN_PRESS2_STATUS		
9	Loop 2 Pump Outlet Pressure	A.2.17	I	SSD	CSWV_OUT_PRESS2	V61P2700A	Po2
10	Loop 2 Pump Outlet Pressure Status	A.2.17	I	SSD	CSWB_OUT_PRESS2_STATUS		
11	Loop 2 Pump Delta Pressure	A.2.18	O	CRT, DL	CSWV_DELTA_PRESS2	V92P0301C	P_2
12	Loop 2 Pump Delta Pressure Status	A.2.18	O	CRT, DL	CSWB_DELTA_PRESS2_STATUS		

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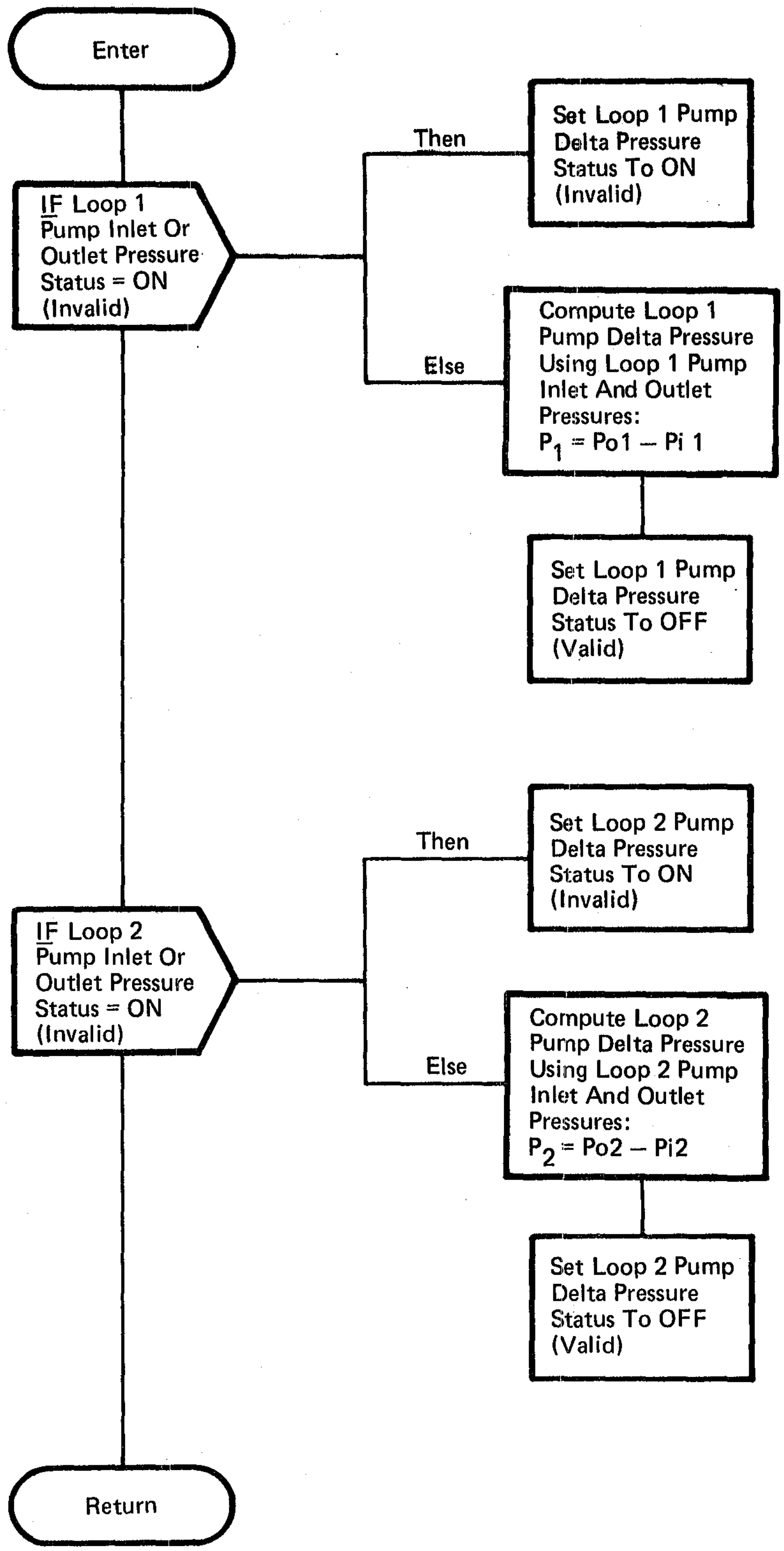

Figure 3.2.1.16-1. H_2O Pump Delta Pressure

BOOK: OFT SM Detailed Design Specification

3.2.1.17 Recorder Tape Position (SSR_REC_TAPE_POS)

The Recorder Tape Position module computes the tape position for each of these operational recorders (OPS1, OPS2, and payload), and updates a three-deep downlist buffer pushdown list if a new fault message has been generated by System Software annunciation. Each entry in this list contains the tape position and active track parameters for OPS1 and OPS2 recorders and a current time.

a. Control Interface - The Recorder Tape Position module is called by the Special Processes Executive (SSP_EXEC) once every two seconds.

   Invocation: CALL SSR_REC_TAPE_POS

b. Inputs - Inputs to this module are specified in Table 3.2.1.17-1.

c. Process Description - The control flow for this module is shown in figure 3.2.1.17-1. The recorder tape position is computed consecutively for all three recorders. If any input parameter status indicator for a recorder is invalid, the status associated with that recorder tape position output is set to invalid and the computation is bypassed. Otherwise, the recorder tape position is computed by isolating the five bits in the input data word and converting them to integer format. This value is used as an index (one is added to preclude using a zero index) into a 32 entry table. The values in this table represent the tape position output - 100/31 X rounded to the nearest integer. The status associated with the recorder tape position is set to valid and both the status and computation value are stored in the Display/Downlist table (DDT).

   The current time and percent tape and active track parameters from the two OPS recorders shall be logged every two seconds if the fault summary message (FSM) indicator has been set by system software/annunciation. The last three sets of these logged parameters will be maintained in a push down list. The contents of the push down list will be made available for display and downlist. Once the recorder parameters and time tag for the FSM indicator have been logged the FSM indicator shall be reset. The FSM indicator will be initialized to off during OPS initialization.

d. Output - Outputs from this module are specified in Table 3.2.1.17-1.

e. Module References - None

f. Module Type and Attributes

   Type: External Procedure

   Attributes: Default (serially reuseable with no protective mechanism).

g. Template Reference -

D INCLUDE TEMPLATE CSS_SPINB	Special Processes Input Buffer (SPINB)
D INCLUDE TEMPLATE CSS_DDT	Display/Downlist Table

h. Error Handling - None

i. Constraints and Assumptions - None.

TABLE 3.2.1.17-1 Recorder Tape Position

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	OPS1 Recorder Input Value (contains items 2-6)	A.2.17	I	SSD	CSRV_REC_VALUE$(1; 9 to 13)		X(1)
2	RCDR OPS1 Bit 1	A.2.17	I	SSD	CSRV_REC_VALUE$(1;9)	V75X2540	
3	RCDR OPS1 Bit 2	A.2.17	I	SSD	CSRV_REC_VALUE$(1;10)	V75X2541	
4	RCDR OPS1 Bit 3	A.2.17	I	SSD	CSRV_REC_VALUE$(1;11)	V75X2542	
5	RCDR OPS1 Bit 4	A.2.17	I	SSD	CSRV_REC_VALUE$(1;12)	V75X2543	
6	RCDR OPS1 Bit 5	A.2.17	I	SSD	CSRV_REC_VALUE$(1;13)	V75X2544	
7	OPS2 Recorder Input Value (contains items 8-12)	A.2.17	I	SSD	CSRV_REC_VALUE$(2;9 to 13)		X(2)
8	RCDR OPS2 Bit 1	A.2.17	I	SSD	CSRV_REC_VALUE$(2;9)	V75X2640	
9	RCDR OPS2 Bit 2	A.2.17	I	SSD	CSRV_REC_VALUE$(2;10)	V75X2641	
10	RCDR OPS2 Bit 3	A.2.17	I	SSD	CSRV_REC_VALUE$(2;11)	V75X2642	
11	RCDR OPS2 Bit 4	A.2.17	I	SSD	CSRV_REC_VALUE$(2;12)	V75X2643	
12	RCDR OPS2 Bit 5	A.2.17	I	SSD	CSRV_REC_VALUE$(2;13)	V75X2644	
13	Payload Recorder Input Value (contains items 14-18)	A.2.17	I	SSD	CSRV_REC_VALUE$(3;9 to 13)		X(3)
14	RCDR PL Bit 1	A.2.17	I	SSD	CSRV_REC_VALUE$(3;9)	V75X2740	
15	RCDR PL Bit 2	A.2.17	I	SSD	CSRV_REC_VALUE$(3;10)	V75X2741	
16	RCDR PL Bit 3	A.2.17	I	SSD	CSRV_REC_VALUE$(3;11)	V75X2742	
17	RCDR PL Bit 4	A.2.17	I	SSD	CSRV_REC_VALUE$(3;12)	V75X2743	
18	RCDR PL Bit 5	A.2.17	I	SSD	CSRV_REC_VALUE$(3;13)	V75X2744	
19	OPS1 Recorder Input Status	A.2.17	I	SSD	CSRB_REC_STAT$(1;)		
20	OPS2 Recorder Input Status	A.2.17	I	SSD	CSRB_REC_STAT$(2;)		
21	Payload Recorder Input Status	A.2.17	I	SSD	CSRB_REC_STAT$(3;)		

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TABLE 3.2.1.17-1 Recorder Tape Position

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
22	OPS1 Active Track Input Value (Contains Items 23 - 26)	A.2.17	I	SSD	CSSV_SPINB_D3875$(9to 12)		
23	RCDR OPS1 Active Bit 1	A.2.17	I	SSD	CSSV_SPINB_D3875$(9)	V75X2547E	
24	RCDR OPS1 Active Bit 2	A.2.17	I	SSD	CSSV_SPINB_D3875$(10)	V75X2548E	
25	RCDR OPS1 Active Bit 3	A.2.17	I	SSD	CSSV_SPINB_D3875$(11)	V75X2549E	
26	RCDR OPS1 Active Bit 4	A.2.17	I	SSD	CSSV_SPINB_D3875$(12)	V75X2550E	
27	OPS2 Active Track Input Value (Contains Items (28 - 31)	A.2.17	I	SSD	CSSV_SPINB_D4050$(9 to 12)		
28	RCDR OPS2 Active Bit 1	A.2.17	I	SSD	CSSV_SPINB_d4050$(9)	V75X2647E	
29	RCDR OPS2 Active Bit 2	A.2.17	I	SSD	CSSV_SPINB_D4050$(10)	V75X2648E	
30	RCDR Ops2 Active Bit 3	A.2.17	I	SSD	CSSV_SPINB_D4050$(11)	V75X2649E	
31	RCDR OPS2 Active Bit 4	A.2.17	I	SSD	CSSV_SPINB_D4050$(12)	V75X2650E	
32	Fault Summary Message Indicator	E	I/O	UI	CDLB_SM_RECORDER_FLAG	V92X7000X	
32A	SP Current Time	A.2.11.3	I	SSP	CSSV_SP_CURRENT_TIME	V91M1999P	

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TABLE 3.2.1.17-1 Recorder Tape Position (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
33	OPS1 Recorder Output status indicator	A.2.18	O	CRT	CSRB_POS_OUT_STAT$(1;)		
34	OPS2 Recorder Output status indicator	A.2.18	O	CRT	CSRB_POS_OUT_STAT$(2;)		
35	PL Recorder Output status indicator	A.2.18	O	CRT	CSRB_POS_OUT_STAT$(3;)		
36	OPS1 Recorder tape position	A.2.18	O	CRT,DL	CSRV_TAPE_POS$(1)	V92Q0091C	P(1)
37	OPS2 Recorder tape position	A.2.18	O	CRT,DL	CSRV_TAPE_POS$(2)	V92Q0092C	P(2)
38	PL Recorder tape position	A.2.18	O	CRT,DL	CSRV_TAPE_POS$(3)	V92Q0090C	P(3)
39	OPS DownList Buffer (Contains Items 40-96)	A.2.18	O	CRT, DL	CSRV_DL_BUFFER$(1 to 3)		
	(ITEMS 40 - 58 PERTAIN TO ANOMALY 1)						
40	OPS1 Tape Pos Bit 1	A.2.18	O	CRT, DL	CSRV_OPS1_TAPE_POS$(1;9)	V92X0711X	
41	OPS1 Tape Pos Bit 2	A.2.18	O	CRT, DL	CSRV_OPS1_TAPE_POS$(1;10)	V92X0712X	
42	OPS1 Tape Pos Bit 3	A.2.18	O	CRT, DL	CSRV_OPS1_TAPE_POS$(1;11)	V92X0713X	
43	OPS1 Tape Pos Bit 4	A.2.18	O	CRT, DL	CSRV_OPS1_TAPE_POS$(1;12)	V92X0714X	
44	OPS1 Tape Pos Bit 5	A.2.18	O	CRT, DL	CSRV_OPS1_TAPE_POS$(1;13)	V92X0715X	
45	OPS2 Tape Pos Bit 1	A.2.18	O	CRT, DL	CSRV_OPS2_TAPE_POS$(1;9)	V92X0732X	
46	OPS2 Tape Pos Bit 2	A.2.18	O	CRT, DL	CSRV_OPS2_TAPE_POS$(1;10)	V92X0733X	
47	OPS2 Tape Pos Bit 3	A.2.18	O	CRT, DL	CSRV_OPS2_TAPE_POS$(1;11)	V92X0734X	
48	OPS2 Tape Pos Bit 4	A.2.18	O	CRT, DL	CSRV_OPS2_TAPE_POS$(1;12)	V92X0735X	
49	OPS2 Tape Pos Bit 5	A.2.18	O	CRT, DL	CSRV_OPS2_TAPE_POS$(1;13)	V92X0736X	
50	OPS1 Active Trk Bit 1	A.2.18	O	CRT, DL	CSRV_OPS1_ACT_TRK$(1;9)	V92X0754X	
51	OPS1 Active Trk Bit 2	A.2.18	O	CRT, DL	CSRV_OPS1_ACT_TRK$(1;10)	V92X0755X	
52	OPS1 Active Trk Bit 3	A.2.18	O	CRT, DL	CSRV_OPS1_ACT_TRK$(1;11)	V92X0756X	
53	OPS1 Active Trk Bit 4	A.2.18	O	CRT, DL	CSRV_OPS1_ACT_TRK$(1;12)	V92X0757X	
54	OPS2 Active Trk Bit 1	A.2.18	O	CRT, DL	CSRV_OPS2_ACT_TRK$(1;9)	V92X0772X	
55	OPS2 Active Trk Bit 2	A.2.18	O	CRT, DL	CSRV_OPS2_ACT_TRK$(1;10)	V92X0773X	
56	OPS2 Active Trk Bit 3	A.2.18	O	CRT, DL	CSRV_OPS2_ACT_TRK$(1;11)	V92X0774X	
57	OPS2 Active Trk Bit 4	A.2.18	O	CRT, DL	CSRV_OPS2_ACT_TRK$(1;12)	V92X0775X	
58	GMTTMETAG	A.2.18	O	CRT, DL	CSRV_GMT_TIME_TAG$(1)	V92W0701C	

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TABLE 3.2.1.17-1 MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
	(ITEMS 59 - 77 PERTAIN TO ANOMALY 2)						
59	OPS1 Tape Pos Bit 1	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(2;9)	V92X0718X	
60	OPS1 Tape Pos Bit 2	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(2;10)	V92X0719X	
61	OPS1 Tape Pos Bit 3	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(2;11)	V92X0720X	
62	OPS1 Tape Pos Bit 4	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(2;12)	V92X0721X	
63	OPS1 Tape Pos Bit 5	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(2;13)	V92X0722X	
64	OPS2 Tape Pos Bit 1	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(2;9)	V92X0739X	
65	OPS2 Tape Pos Bit 2	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(2;10)	V92X0740X	
66	OPS2 Tape Pos Bit 3	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(2;11)	V92X0741X	
67	OPS2 Tape Pos Bit 4	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(2;12)	V92X0742X	
68	OPS2 Tape Pos Bit 5	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(2;13)	V92X0743X	
69	OPS1 Active Trk Bit 1	A.2.18	0	CRT, DL	CSRV_OPS1_ACT_TRK$(2;9)	V92X0760X	
70	OPS1 Active Trk Bit 2	A.2.18	0	CRT, DL	CSRV_OPS1_ACT_TRK$(2;10)	V92X0761X	
71	OPS1 Active Trk Bit 3	A.2.18	0	CRT, DL	CSRV_OPS1_ACT_TRK$(2;11)	V92X0762X	
72	OPS1 Active Trk Bit 4	A.2.18	0	CRT, DL	CSRV_OPS1_ACT_TRK$(2;12)	V92X0763X	
73	OPS2 Active Trk Bit 1	A.2.18	0	CRT, DL	CSRV_OPS2_ACT_TRK$(2;9)	V92X0780X	
74	OPS2 Active Trk Bit 2	A.2.18	0	CRT, DL	CSRV_OPS2_ACT_TRK$(2;10)	V92X0781X	
75	OPS2 Active Trk Bit 3	A.2.18	0	CRT, DL	CSRV_OPS2_ACT_TRK$(2;11)	V92X0782X	
76	OPS2 Active Trk Bit 4	A.2.18	0	CRT, DL	CSRV_OPS2_ACT_TRK$(2;12)	V92X0783X	
77	GMT Time Tag	A.2.18	0	CRT, DL	CSRV_GMT_TIME_TAG$(2)	V92W0702C	
	(ITEMS 78 - 96 PERTAIN TO ANOMALY 3)						
78	OPS1 Tape Pos Bit 1	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(3;9)	V92X0725X	
79	OPS1 Tape Pos Bit 2	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(3;10)	V92X0726X	
80	OPS1 Tape Pos Bit 3	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(3;11)	V92X0727X	
81	OPS1 Tape Pos Bit 4	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(3;12)	V92X0728X	
82	OPS1 Tape Pos Bit 5	A.2.18	0	CRT, DL	CSRV_OPS1_TAPE_POS$(3;13)	V92X0729X	
83	OPS2 Tape Pos Bit 1	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(3;9)	V92X0745X	
84	OPS2 Tape Pos Bit 2	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(3;10)	V92X0746X	
85	OPS2 Tape Pos Bit 3	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(3;11)	V92X0747X	
86	OPS2 Tape Pos Bit 4	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(3;12)	V92X0748X	
87	OPS2 Tape Pos Bit 5	A.2.18	0	CRT, DL	CSRV_OPS2_TAPE_POS$(3;13)	V92X0749X	
88	OPS1 Active Trk Bit 1	A.2.18	0	CRT, DL	CSRV_OPS1_ACT_TRK$(3;9)	V92X0766X	
89	OPS1 Active Trk Bit 2	A.2.18	0	CRT, DL	CSRV_OPS1_ACT_TRK$(3;10)	V92X0767X	
90	OPS1 Active Trk Bit 3	A.2.18	0	CRT, DL	CSRV_OPS1_ACT_TRK$(3;11)	V92X0768X	
91	OPS1 Active Trk Bit 4	A.2.18	0	CRT, DL	CSRV_OPS1_ACT_TRK$(3;12)	V92X0769X	
92	OPS2 Active Trk Bit 1	A.2.18	0	CRT, DL	CSRV_OPS2_ACT_TRK$(3;9)	V92X0786X	
93	OPS2 Active Trk Bit 2	A.2.18	0	CRT, DL	CSRV_OPS2_ACT_TRK$(3;10)	V92X0787X	
94	OPS2 Active Trk Bit 3	A.2.18	0	CRT, DL	CSRV_OPS2_ACT_TRK$(3;11)	V92X0788X	
95	OPS2 Active Trk Bit 4	A.2.18	0	CRT, DL	CSRV_OPS2_ACT_TRK$(3;12)	V92X0789X	
96	GMT Time Tag	A.2.18	0	CRT, DL	CSRV_GMT_TIME_TAG$(3)	V92X0703X	
97	Tape Position Table	E	L		SSR_TAPE_POS_TBL		

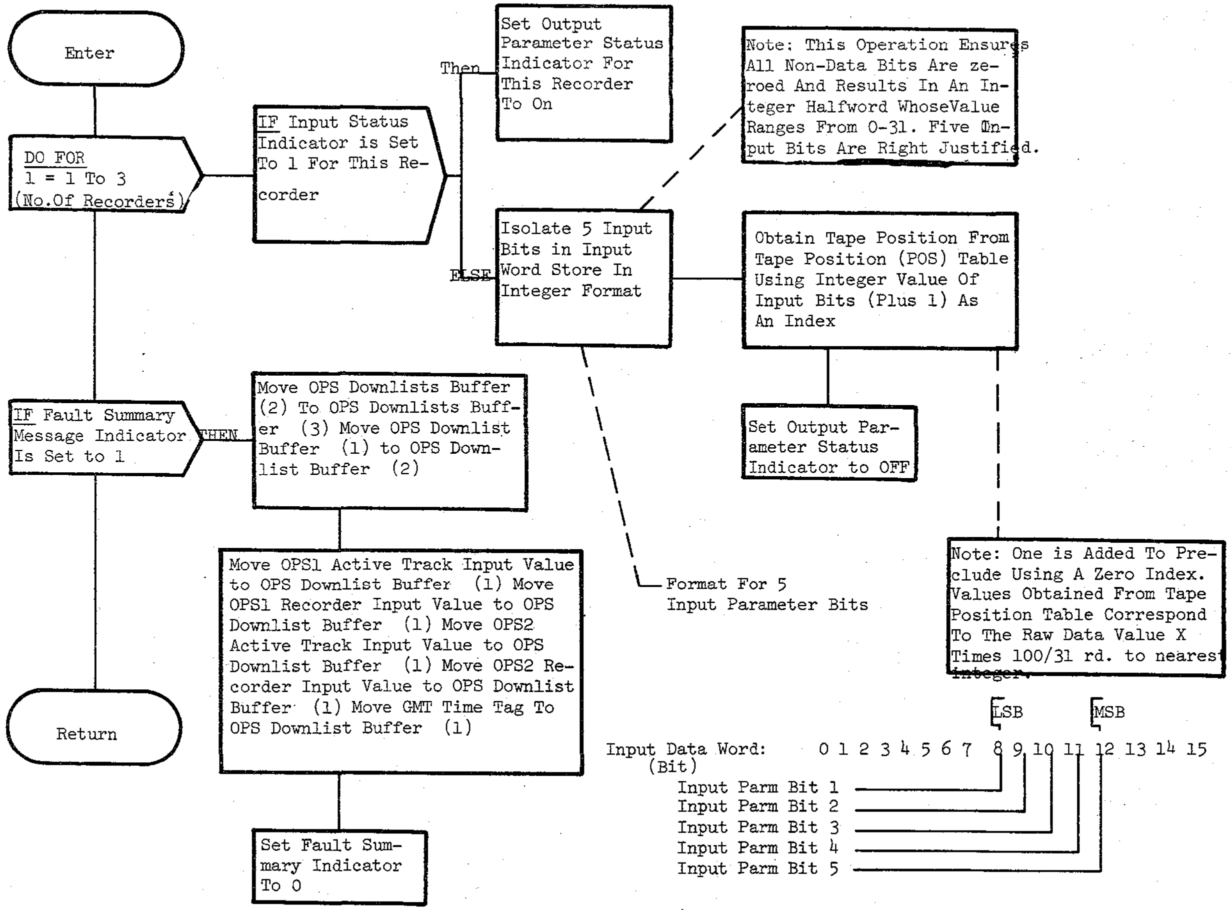

Figure 3.2.1.17-1 Recorder Tape Position

BOOK: OFT SM Detailed Design Specification

3.2.1.18 Fuel Cell Purge (SSC_FUEL_CELL_PURGE)

The Fuel Cell Purge module provides automatic purging of the three fuel cells to maintain fuel cell operating efficiency.

a. Control Interface - The Fuel Cell Purge module is CALL'ed by the Special Processes Executive once every two seconds.
Invocation: CALL SSC_FUEL_CELL_PURGE;

b. Inputs - Inputs to this module are specified in Table 3.2.1.18-1.

c. Process Description - The control flows for this module are shown in Figures 3.2.1.18-1 through 3.2.1.18-9. The I/O status of each switch position measurement is first checked for validity. If valid, that measurement value is moved to a save area - otherwise the save area is not overlayed. All subsequent references to these measurement values are from the save area, thereby insuring that only valid values are used.

The Fuel Cell Purge (FCP) module determines whether or not the FCP sequence is already in progress. If it is in progress, discrete parameters are checked to determine if the sequence should continue or terminate. If the sequence is to continue (FCP ON discrete is on), the logic associated with the currently active timer is executed. There are five timers within the FCP sequence--the 'open' W timer, the 'close' W timer, the X timer, the Y timer and the Z timer. After the purge valves are commanded open (closed), the 'open' W timer and the 'close' W timer are used to provide a W-second delay prior to performing the valve open (close) verification computation. The X timer is used to control the time allocated (X minute delay time) for the purge lines to reach predefined temperatures. If the temperatures are not reached within the allotted time, annunication of that condition is enabled. The Y timer is used to initiate the closing of a purge valve Y minutes after the valve-open verification check was performed. The Z timer is used to delay commanding the purge line heaters off for Z minutes after the last selected FCP valve is verified closed or fails to open (close) when commanded open (closed). Only one of these timers can be active at any one time. The Y minute time is the only constant changeable by the Table Maintenance Specialist Function.

If the FCP module determines that the FCP sequence is not in progress, discrete parameters are checked to see if conditions exist for initiating the FCP sequence. Depending on these conditions, the Fuel Cell Purge module either initiates the Fuel Cell Purge sequence or exits. There is no OPS initialization or clean-up processing.

d. Outputs - Outputs from this module are specified in Table 3.21.18-1.

e. Module References - None

BOOK: OFT SM Detailed Design Specification

f. Module Type and Attributes

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References

D Include Template CSS_SPINB	Special Processes Input Buffer
D Include Template CSS_SPOB	Special Processes Output Buffer
D Include Template CSS_COT	Constants Table - values
D Include Template CSS_SP_CMT	Special Processes CMT

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	FC GPC Sequence Start (Auto purge start discrete)	A.2.17	I	SSD	CSUV_FC_GPC_SEQ_START	V72K6050Y	
1A	FC GPC Sequence start input location	A.2.17	I	SSD	CSSV_SPINB_D120601		
1B	FC GPC Sequence start status	A.2.17	I	SSD	CSSV_INSTAT_D120601		
2	FCP On Discrete	A.2.17	I	SSD	CSUV_FCP_ON	V45X0804E	
2A	FCP On discrete-input location	A.2.17	I	SSD	CSSV_SPINB_D4077		
2B	FCP On discrete status	A.2.17	I	SSD	CSSV_INSTAT_D4077		
3	FCP O_2/H_2 Purge Htrs GPCA (Purge Line Heater Switch)	A.2.17	I	SSD	CSUV_FCP_HTRS_GPCA	V45S0604E	
3A	FCP O_2/H_2 Purge Htrs GPCA input location	A.2.17	I	SSD	CSSV_SPINB_D4060		
3B	FCP O_2/H_2 Purge Htrs GPCA status	A.2.17	I	SSD	CSSV_INSTAT_D4060		
4	FCP1 Purge VLVS GPCA	A.2.17	I	SSD	CSUV_FCP1_VLV_OPEN	V45S0815E	
4A	FCP1 Purge VLVS GPCA input location	A.2.17	I	SSD	CSSV_SPINB_D4064		
4B	FCP1 Purge VLVS GPCA status	A.2.17	I	SSD	CSSV_INSTAT_D4064		
5	FCP2 Purge VLVS GPCA	A.2.17	I	SSD	CSUV_FCP2_VLV_OPEN	V45S0825E	
5A	FCP2 Purge VLVS GPCA input location	A.2.17	I	SSD	CSSV_SPINB_D4071		
5B	FCP2 Purge VLVS GPCA status	A.2.17	I	SSD	CSSV_INSTAT_D4071		
6	FCP3 Purge VLVS GPCA	A.2.17	I	SSD	CSUV_FCP3_VLV_OPEN	V45S0835E	
6A	FCP3 Purge VLVS GPCA input location	A.2.17	I	SSD	CSSV_SPINB_D4075		

TABLE 3.2.1.18-1 Fuel Cell Purge

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
6B	FCP3 Purge VLVS GPCA status	A.2.17	I	SSD	CSSV_INSTAT_D4075		
7	FCP O_2/H_2 Purge Htrs GPC-A On	A.2.16	O	SSO	CSSV_SPOB_D121401$(1)	V45K0604Y	
8	FCP O_2/H_2 Purge Htrs GPC-B on	A.2.16	O	SSO	CSSV_SPOB_D121401 $(2)	V45K0605Y	
9	X Minute delay time	E	C		SSC_X_MIN_DELAY		
10	FCP Control Timer	E	L		SSC_FCP_CONTROL_TIMER		
11	W Second Delay Time	E	C		SSC_W_SEC_DELAY		
12	Y Minute Time	A.2.12,D.12	I	STM	CSUV_Y_MIN_TIME	V92W0635C	
13	Z Minute Time	E	C		SSC_Z_MIN_TIME		
14	SP Current time	A.2.11	I	SSP	CSSV_SP_CURRENT_TIME	V91M1999P	
15	FC Purge temp fail flag	A.2.16	O	SSO,CRT,DL	CSSB_CUR_ANN$(3)	V92X2105X	
16	FC Purge 1 fail flag	A.2.16	O	SSO,CRT,DL	CSSB_CUR_ANN$(4)	V92X2100X	
17	FC Purge 2 fail flag	A.2.16	O	SSO,CRT,DL	CSSB_CUR_ANN$(5)	V92X2101X	
18	FC Purge 3 fail flag	A.2.16	O	SSO,CRT,DL	CSSB_CUR_ANN$(6)	V92X2102X	
19	Active FCP timer	E	L		SSC_ACT_FCP_TIME		
20	FC Selected	E	L		SSC_FC_SELECTED		
21	FCP O_2 Vent line temp	A.2.17	I	SSD	CSUV_FCP_O2_VENT_LINE_TEMP	V45T0600A	
22	FCP H2 Vent Line temp 1	A.2.17	I	SSD	CSUV_FCP_H2_VENT_LINE_TEMP1	V45T0699A	

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TABLE 3.2.1.18-1 Fuel Cell Purge (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
23	FCP H_2 Vent Line Temp 2	A.2.17	I	SSD	CSUV_FCP_H2_VENT_LINE_TEMP2	V45T0700A	
24	FCP 1 Purge VLVS GPC-A Open	A.2.16	O	SSO	CSSV_SPOB_D100701$(1)	V45K0815Y	
25	FCP 1 Purge VLVS GPC-B Open	A.2.16	O	SSO	CSSV_SPOB_D100701$(2)	V45K0816Y	
26	FCP 2 Purge VLVS GPC-A Open	A.2.16	O	SSO	CSSV_SPOB_D101401$(1)	V45K0825Y	
27	FCP 2 Purge VLVS GPC-B Open	A.2.16	O	SSO	CSSV_SPOB_D101401$(2)	V45K0826Y	
28	FCP 3 Purge VLVS GPC-A Open	A.2.16	O	SSO	CSSV_SPOB_D120701$(1)	V45K0835Y	
29	FCP 3 Purge VLVS GPC-B Open	A.2.16	O	SSO	CSSV_SPOB_D120701$(2)	V45K0836Y	
30	FC Current (1)	A.2.17	I	SSD	CSFV_FC_CURRENT$(1;)	V45C0101A	
31	O_2 Flow (1)	A.2.17	I	SSD	CSUV_O2_FLOW$(1;)	V45R0160A	
32	H_2 Flow (1)	A.2.17	I	SSD	CSUV_H2_FLOW$(1;)	V45R0170A	
33	FC Current (2)	A.2.17	I	SSD	CSFV_FC_CURRENT$(2:)	V45C0201A	
34	O_2 Flow (2)	A.2.17	I	SSD	CSUV_O2_FLOW$(2;)	V45R0260A	
35	H_2 Flow (2)	A.2.17	I	SSD	CSUV_H2_FLOW$(2;)	V45R0270A	
36	FC Current (3)	A.2.17	I	SSD	CSFV_FC_CURRENT$(3:)	V45C0301A	
37	O_2 Flow (3)	A.2.17	I	SSD	CSUV_O2_FLOW$(3;)	V45R0360A	
38	H_2 Flow (3)	A.2.17	I	SSD	CSUV_H2_FLOW$(3;)	V45R0370A	
39	Δ3	E	C		SSC_DELTA_THREE		Δ3
40	Δ4	E	C		SSC_DELTA_FOUR		Δ4
41	Δ1	E	C		SSC_DELTA_ONE		Δ1
42	Δ2	E	C		SSC_DELTA_TWO		Δ2
43	(Deleted)						
43A	(Deleted)						

TABLE 3.2.1.18-1 Fuel Cell Purge (Cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
43B	(Deleted)						
44	(Deleted)						
44A	(Deleted)						
44B	(Deleted)						
45	FC Auto Purge Seq fail flag	A.2.16	0	SS0	CSSB_CUR_ANN$(9)	V92X2106X	

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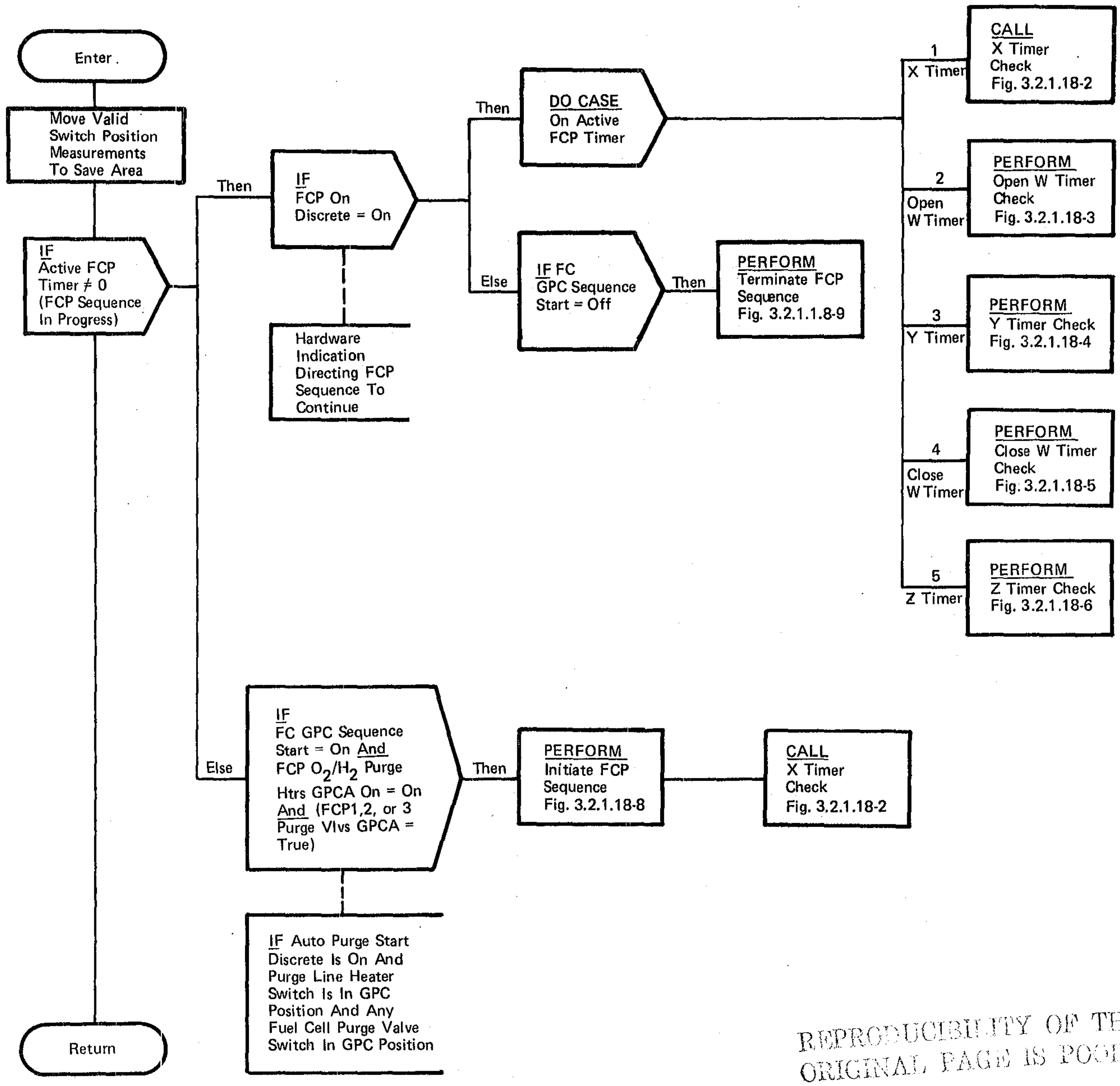

Figure 3.2.1.18-1. Fuel Cell Purge

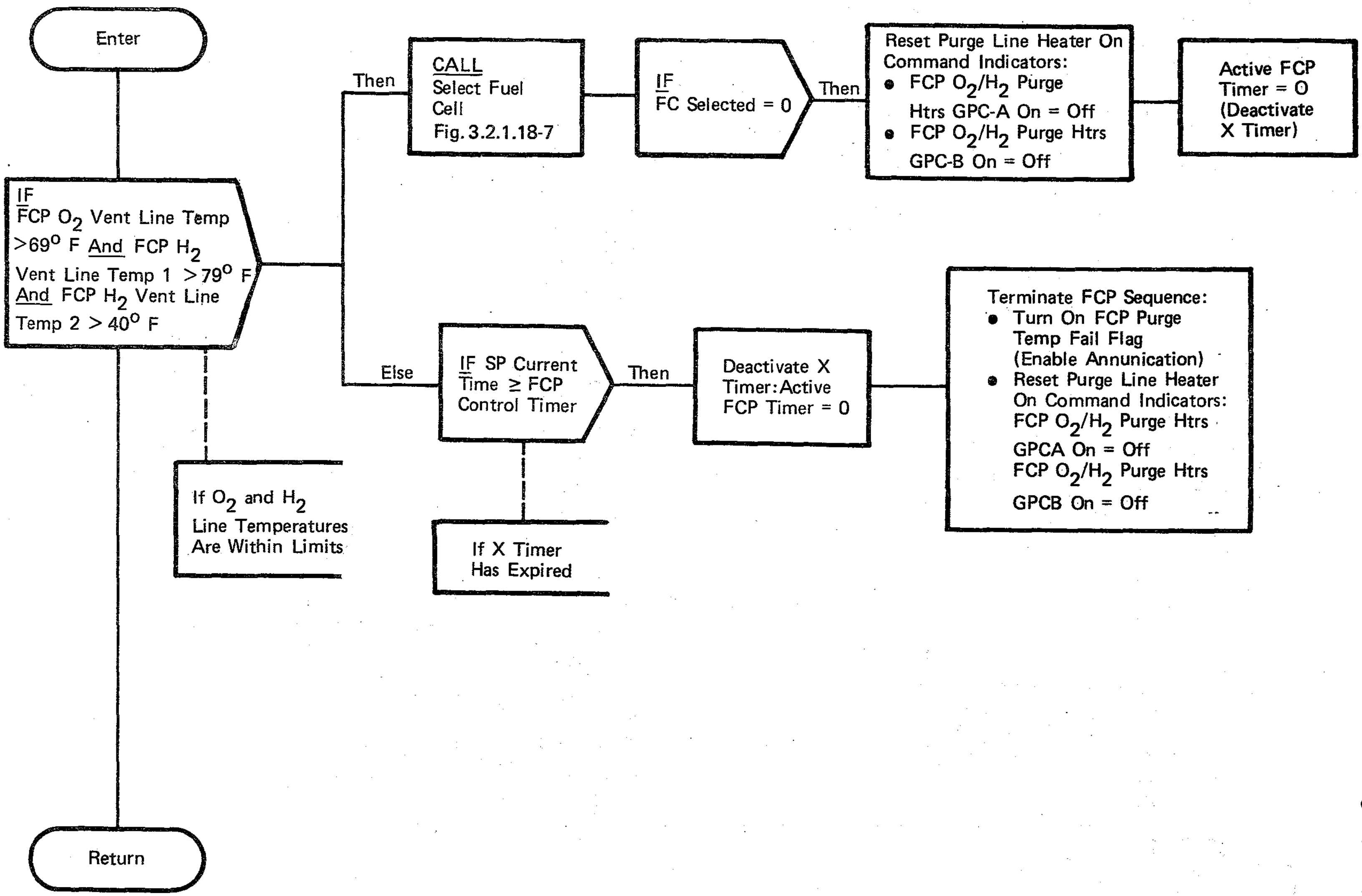

Figure 3.2.1.18-2. X Timer Check

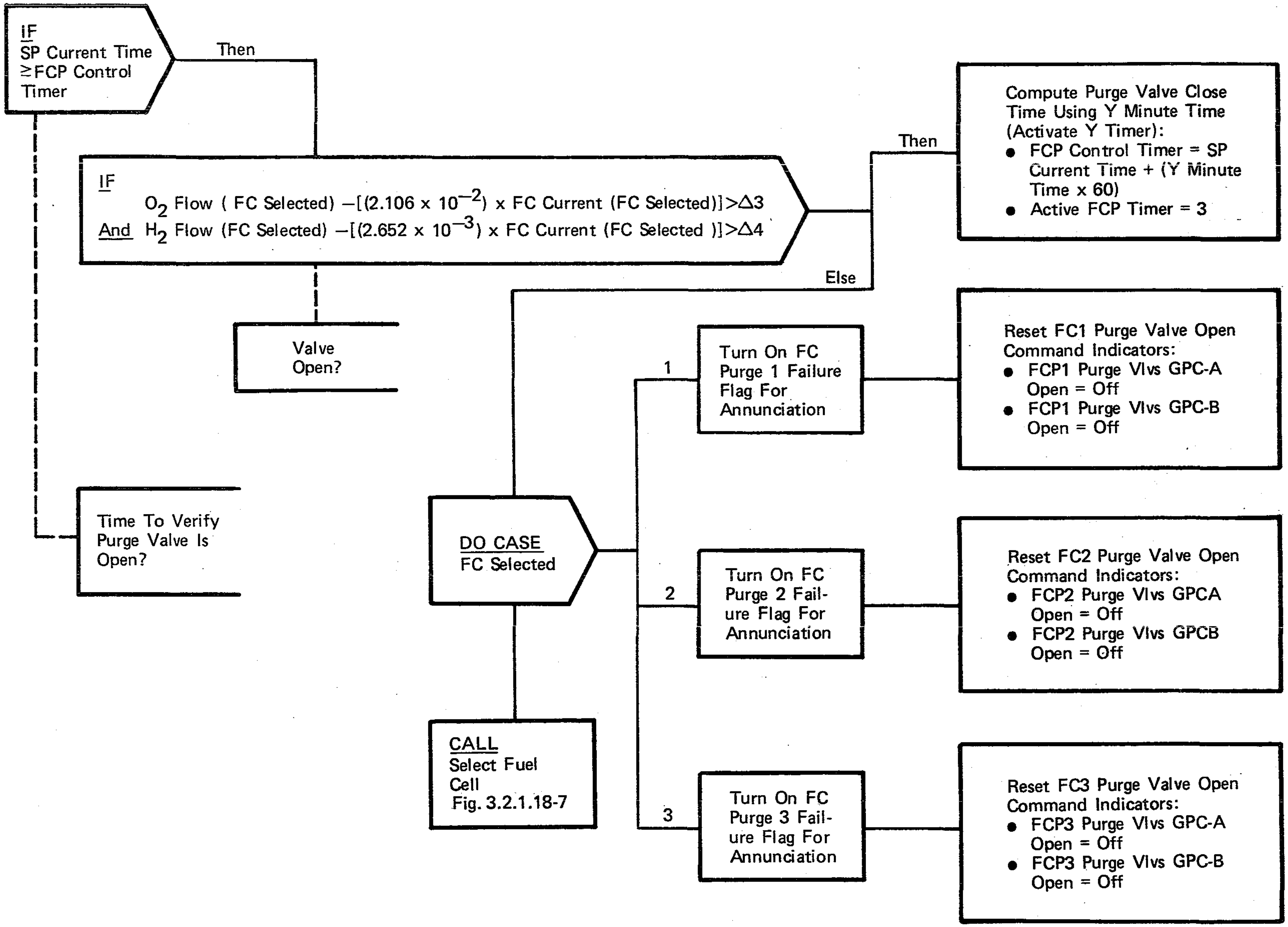

Figure 3.2.1.18-3. Open W Timer Check

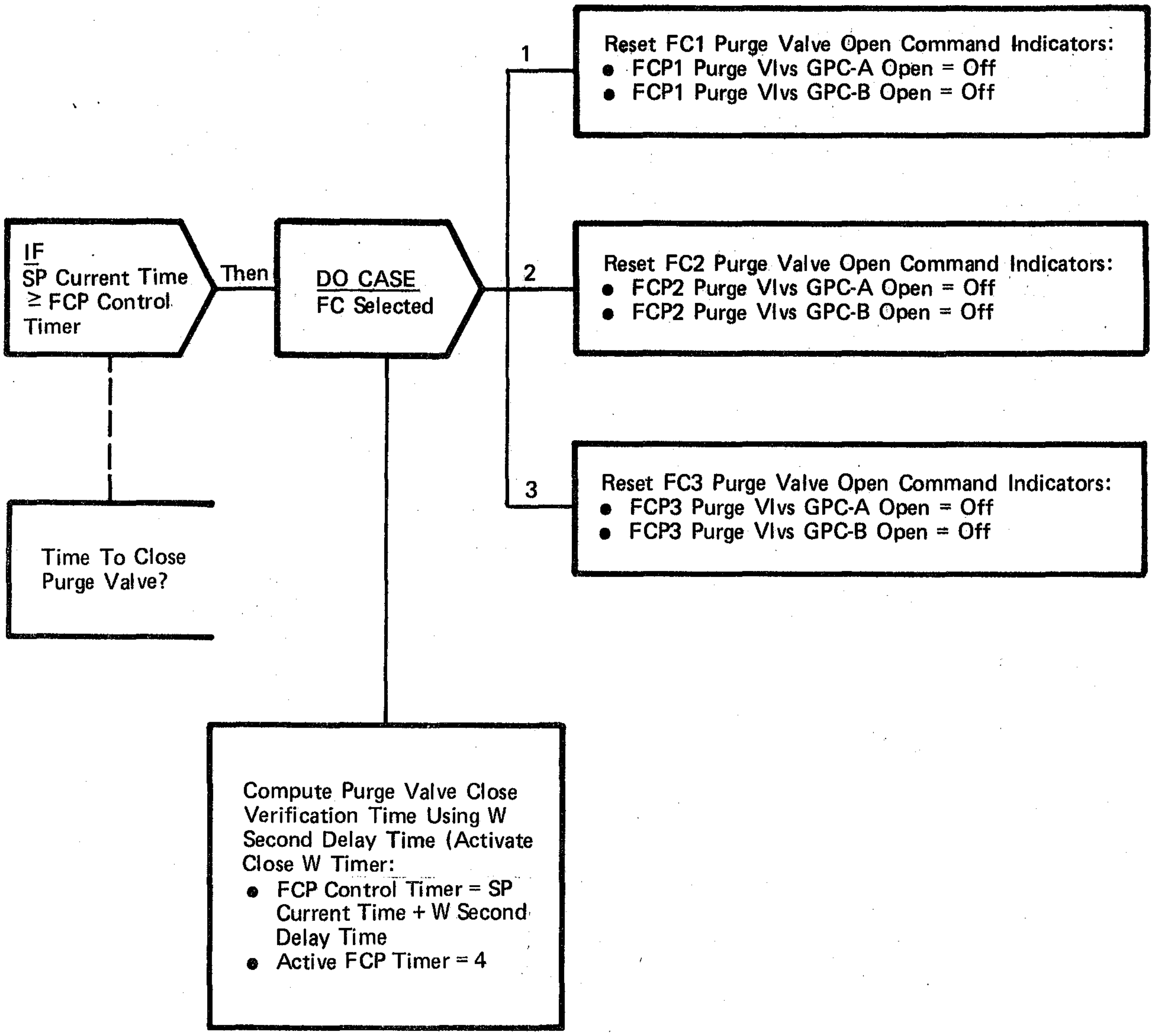

Figure 3.2.1.18-4. Y Timer Check

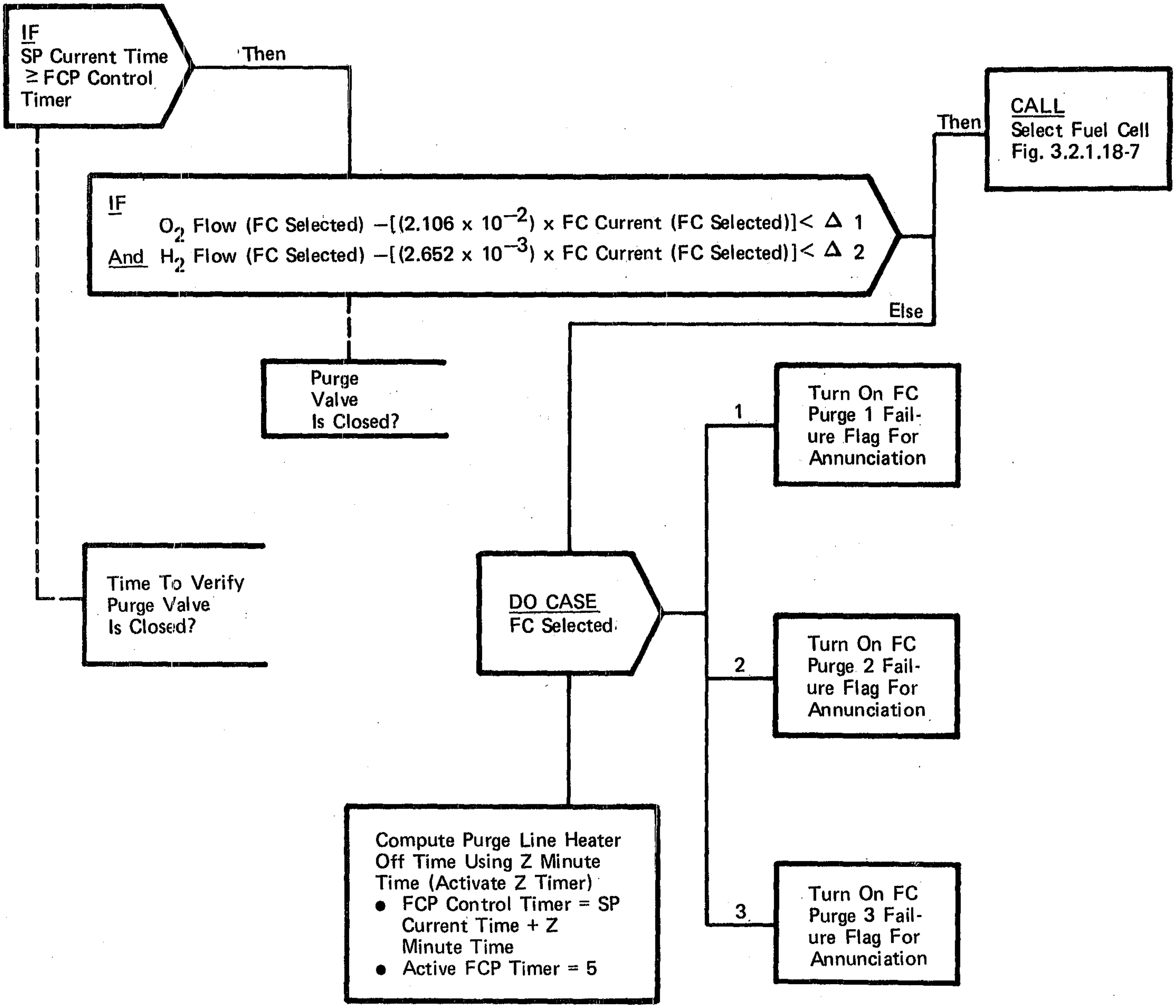

Figure 3.2.1.18-5. Close W Timer Check

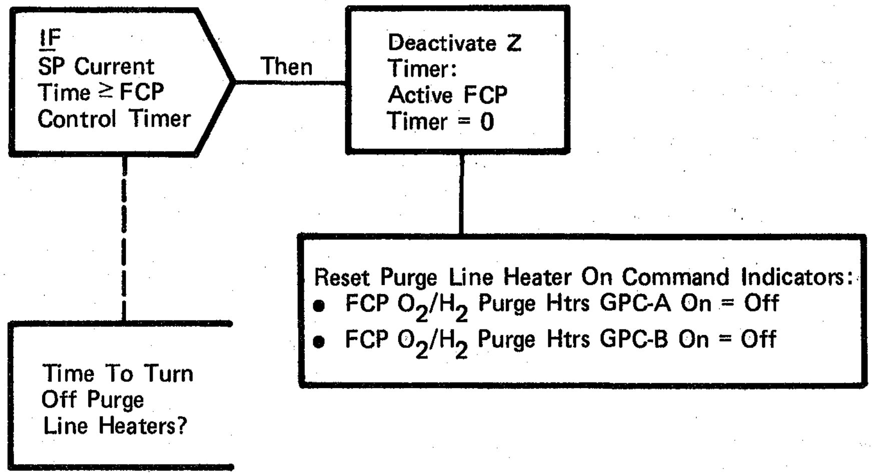

Figure 3.2.1.18-6. Z Timer Check

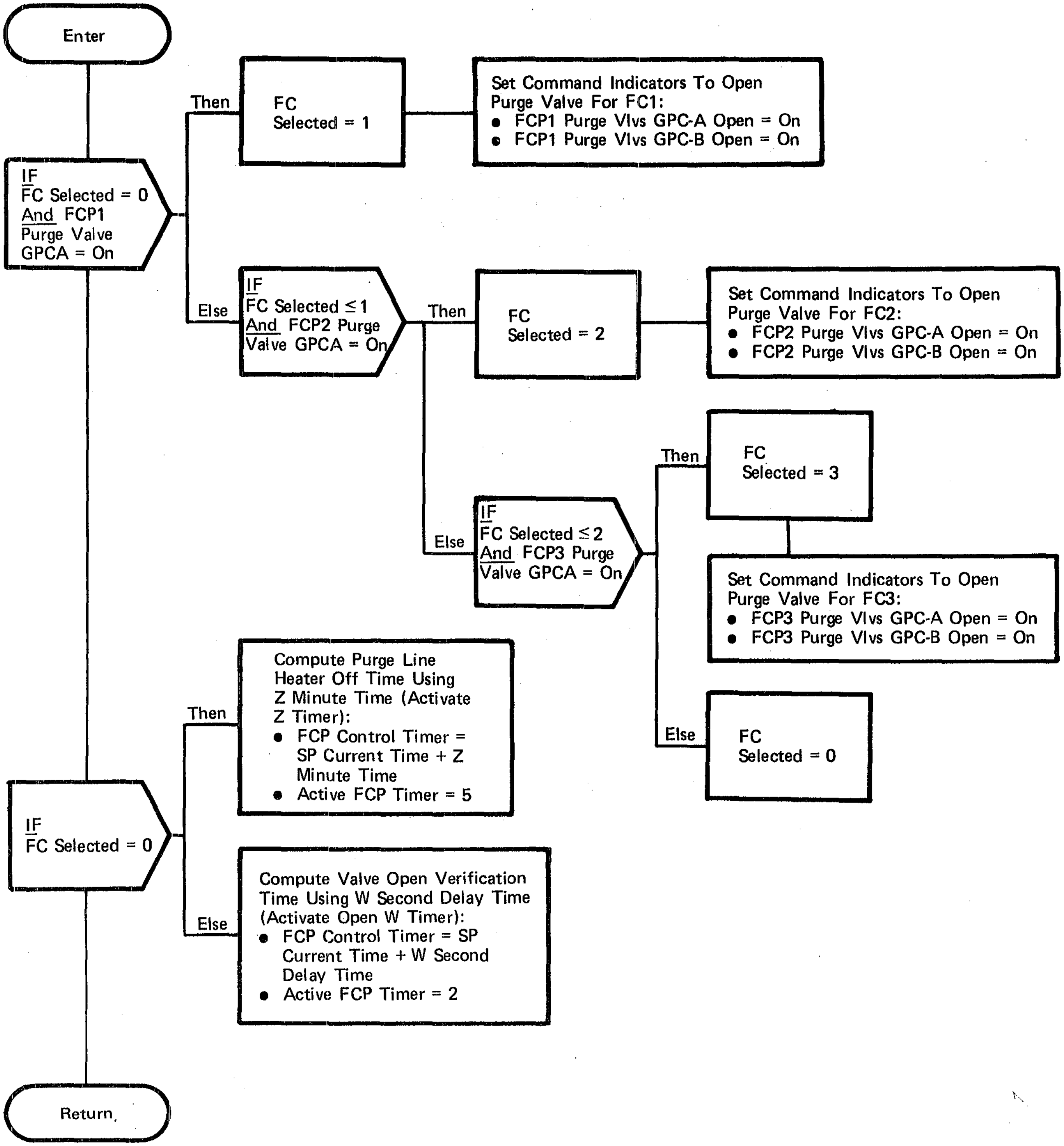

Figure 3.2.1.18-7. Select Fuel Cell

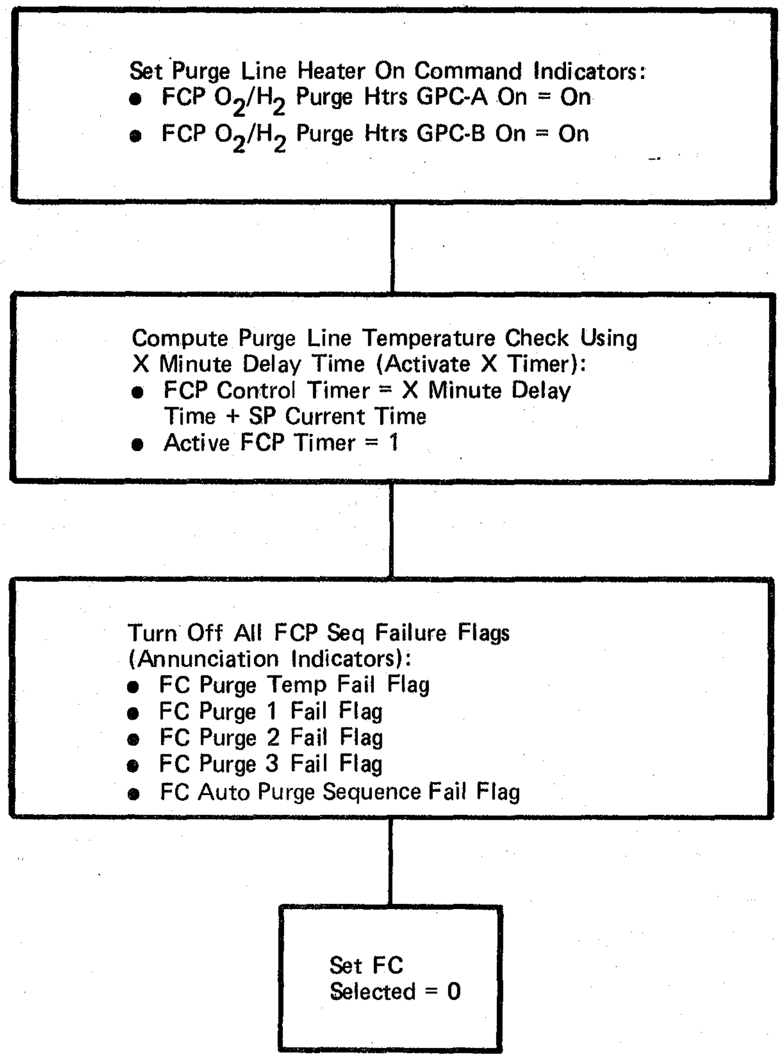

Figure 3.2.1.18-8. Initiate FCP Sequence

Reset All Purge Valve Open Command Indicators:
- FCP1 Purge Vlvs GPC-A Open = Off
- FCP1 Purge Vlvs GPC-B Open = Off
- FCP2 Purge Vlvs GPC-A Open = Off
- FCP2 Purge Vlvs GPC-B Open = Off
- FCP3 Purge Vlvs GPC-A Open = Off
- FCP3 Purge Vlvs GPC-B Open = Off

Reset Purge Line Heater On Command Indicators:
- FCP O_2/H_2 Purge Htrs GPC-A On = Off
- FCP O_2/H_2 Purge Htrs GPC-B On = Off

Deactivate All Timers
(Active FCP Timer = 0)

Set FC Auto
Purge Seq Fail Flag
For Annunciation

Figure 3.2.1.18-9. Terminate FCP Sequence

3.2.1.19 Hydraulic Fluid Temperature Control (SST_HYD_FLD_TEMP)

The Hydraulic Fluid Temperature Control module turns the three hydraulic fluid pumps on and off in sequence, based on the monitoring of fluid temperature sensors in each of the three hydraulic systems.

a. Control Interfaces - his module is CALL'd by the Special Processes Executive (SSP_EXEC) once every two seconds.

Invocation: CALL SST_HYD_FLD_TEMP

b. Inputs - Inputs to this module are specified in Table 3.2.1.19-1.

c. Process Description - The control flows for this module are shown in Figures 3.2.1.19-1 through 3.2.1.19-4. When this module is first called after an OPS transition, the 'hyd fluid init flag' is ON (set by OPS initialization/cleanup module). This flag and the annunciation indicator are both turned off. Also, the total priorities assigned, the priority #1 pump and all system priorities are set to 0 and all ON/OFF command indicators are set to off.

For all subsequent calls to this module, the I/O status of each switch position measurement is checked. If valid, that measurement value is moved to a save area; otherwise the save area is not overlayed. All subsequent references to these switch measurement values are from the save area, thereby ensuring that only valid (no I/O error) values are used. Each hydraulic system is consecutively processed in order to establish which system, is any, is a candidate for having its circulation pump turned on or off. If the circulation pump switch is in the GPC position and a priority is not assigned to this system, temperature sensors are monitored for an out-of-limits low condition. The next available priority is assigned to this system if one or more of its temperature sensors is below limits. If the circulation pump switch is not in the GPC position and the system being processed has an assigned priority, the circulation pump turn off function is performed. The position of the circulation pump switch is indicated by redundant measurements.

After all hydraulic systems have been processed as described above, the system with priority 1 is checked for pump status.

If the pump has been commanded on, and if all of its temperature sensors are out-of-limits high, or the minimum allowable continous run time for the operating circulation pump is exceeded and another system is assigned a priority, then the circulation pump turn off function is performed. If the pump for this system has not been commanded on, the circulation pump turn on process is performed.

The circulation pump turn off function removes the priority for system, updates priorities for all other systems, sets the hydraulic circulation annunciation indicator to off, and sets the circulation pump ON/OFF command indicators to OFF. The ON/OFF command indicators are redundant outputs and are subsequently processed by the Special Process Data Out (section 3.2.1.11) to command the circulation pumps on or off.

The circulation pump turn on process is as follows:

If the delay time (Z minute time) has elapsed, check to see if any pump, other than the Priority No. 1 pump, is on (use the pump pressure test). If no other pump is on, command the Priority No. 1 pump on and set the X timer to the earliest pump turn off time. Also set the hydraulic circulation pump annunciation indicator to OFF. If another pump is on, set the hydraulic circulation pump annuniciation indicator to ON.

d. Outputs - Outputs from this module are specified in Table 3.2.1.19-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure

Attributes: Default (serially reusable with no protective mechanism).

g. Template References

D Include Template CSS_SPINB	Special Processes Input Buffer
D Include Template CSS_SPOB	Special Processes Output Buffer
D Include Template CSS_COT	Constants Table - values
D Include Template CSS_SP_CMT	Special Processes CMT

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Hydr Fluid Init Flag	A.2.11	I/O	S2I	CSOB_SP_HYDR_INIT		
2	Total Prior Assign	E	L		SST_NO_ASSN_PRIOR		
3	Prior No. 1 Pump	E	L		SST_NO1_PUMP		
4	Hydr Circ Pump Annun Ind	A.2.16	O	SSD	CSOB_SPOB_ANNUN_IND	V92X0655X	
5	Sys 1 Prior No	E	L		SST_PRIOR$(1)		
6	Sys 2 Prior No	E	L		SST_PRIOR$(2)		
7	Sys 3 Prior No	E	L		SST_PRIOR$(3)		
8	Deleted						
9	XTIMER	E	L		SST_XTIMER		
10	Z Minute Time	A.2.12	I	STM	CSOV_COT_ZMIN_TIME	V92W1676C	
11	Z TIMER	E	L		SST_ZTIMER		
12	Hydr Sys 1 Circ Pump Auto Enable A-input location	A.2.17	I	SSD	CSSV_SPINB_D3755$(5)	V58S0140E	
13	Hydr Sys 1 Circ Pump Auto Enable B-input location	A.2.17	I	SSD	CSSV_SPINB_D3601$(11)	V58S0141E	
14	Hydr Sys 2 Circ Pump Auto Enable A-input location	A.2.17	I	SSD	CSSV_SPINB_D3577$(7)	V58S0240E	
15	Hydr Sys 2 Circ Pump Auto Enable B-input location	A.2.17	I	SSD	CSSV_SPINB_D3647$(8)	V58S0241E	
16	Hydr Sys 3 Circ Pump Auto Enable A-input location	A.2.17	I	SSD	CSSV_SPINB_D3669$(8)	V58S0340E	
17	Hydr Sys 3 Circ Pump Auto Enable B-input location	A.2.17	I	SSD	CSSV_SPINB_D3744$(5)	V58S0341E	
18	Hydr Sys 1 Temp Sensor No. 1	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;1)	V58T9183A	
19	Hydr Sys 1 Temp Sensor No. 2	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;2)	V58T1143A	
20	Hydro Sys 1 Temp Sensor No. 3	A.2.17	I	SSD	CSOV)TEMP_SENSOR$(1;3)	V58T9186A	

TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
21	Hydr Sys 1 Temp Sensor No. 4	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;4)	V58T9194A	
22	Hydr Sys 1 Temp Sensor No. 5	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;5)	V58T9190A	
23	Hydr Sys 1 Temp Sensor No. 6	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;6)	V58T0846A	
24	Hydr Sys 1 Temp Sensor No. 7	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;7)	V58T9189A	
25	Hydr Sys 1 Temp Sensor No. 8	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;8)	V58T9173A	
26	Hydr Sys 1 Temp Sensor No. 9	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;9)	V58T9144A	
27	Hydr Sys 1 Temp Sensor No. 10	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;10)	V58T9160A	
28	Hydr Sys 1 Temp Sensor No. 11	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;11)	V58T9262A	
29	Hydr Sys 1 Temp Sensor No. 12	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;12)	V58T0159A	
30	Hydr Sys 1 Temp Sensor No. 13	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;13)	V58T9261A	
31	Hydr Sys 1 Temp Sensor No. 14	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;14)	V58T0157A	
32	Hydr Sys 1 Temp Sensor No. 15	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;15)	V58T0198A	
33	Hydr Sys 1 Temp Sensor No. 16	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(1;16)	V58T1006A	

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TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control(Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
34	Hydr Sys 2 Temp Sensor No. 1	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;1)	V58T0296A	
35	Hydr Sys 2 Temp Sensor No. 2	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;2)	V58T9263A	
36	Hydr Sys 2 Temp Sensor No. 3	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;3)	V58T9264A	
37	Hydr Sys 2 Temp Sensor No. 4	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;4)	V58T0841A	
38	Hydr Sys 2 Temp Sensor No. 5	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;5)	V58T9236A	
39	Hydr Sys 2 Temp Sensor No. 6	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;6)	V58T0288A	
40	Hydr Sys 2 Temp Sensor No. 7	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;7)	V58T9165A	
41	Hydr Sys 2 Temp Sensor No. 8	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;8)	V58T0933A	
42	Hydr Sys 2 Temp Sensor No. 9	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;9)	V58T0883A	
43	Hydr Sys 2 Temp Sensor No.10	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;10)	V58T0257A	
44	Hydr Sys 2 Temp Sensor No. 11	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;11)	V58T9244A	
45	Hydr Sys 2 Temp Sensor No. 12	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(2;12)	V58T0298A	

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TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control(Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
46	Hydr Sys 3 Temp Sensor No. 1	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;1)	V58T9351A	
47	Hydr Sys 3 Temp Sensor No. 2	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;2)	V58T9352A	
48	Hydr Sys 3 Temp Sensor No. 3	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;3)	V58T0845A	
49	Hydr Sys 3 Temp Sensor No. 4	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;4)	V58T0842A	
50	Hydr Sys 3 Temp Sensor No. 5	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;5)	V58T9349A	
51	Hydr Sys 3 Temp Sensor No. 6	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;6)	V58T0388A	
52	Hydr Sys 3 Temp Sensor No. 7	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;7)	V58T0983A	
53	Hydr Sys 3 Temp Sensor No. 8	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;8)	V58T0359A	
54	Hydr Sys 3 Temp Sensor No. 9	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;9)	V58T9361A	
55	Hydr Sys 3 Temp Sensor No.10	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;10)	V58T0833A	
56	Hydr Sys 3 Temp Sensor No. 11	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;11)	V58T9344A	
57	Hydr Sys 3 Temp Sensor No. 12	A.2.17	I	SSD	CSOV_TEMP_SENSOR$(3;12)	V58T0398A	
58	Hydr Sys 1 Temp Lo Lim No. 1	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,1)	V92T1700C	

TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control(Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
59	Hydr Sys 1 Temp Lo Lim No. 2	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,2)	V92T1702C	
60	Hydr Sys 1 Temp Lo Lim No. 3	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,3)	V92T1704C	
61	Hydr Sys 1 Temp Lo Lim No. 4	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,4)	V92T1706C	
62	Hydr Sys 1 Temp Lo Lim No. 5	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,5)	V92T1708C	
63	Hydr Sys 1 Temp Lo Lim No. 6	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,6)	V92T1710C	
64	Hydr Sys 1 Temp Lo Lim No. 7	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,7)	V92T1712C	
65	Hydr Sys 1 Temp Lo Lim No. 8	A.2.12	I	STM	CSOV_COT_LOLIMTEMP$(1,8)	V92T1714C	
66	Hydr Sys 1 Temp Lo Lim No. 9	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,9)	V92T1718C	
67	Hydr Sys 1 Temp Lo Lim No. 10	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,10)	V92T1720C	
68	Hydr Sys 1 Temp Lo Lim No. 11	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,11)	V92T1722C	
69	Hydr Sys 1 Temp Lo Lim No. 12	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,12)	V92T1724C	
70	Hydr Sys 1 Temp Lo Lim No. 13	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,13)	V92T1728C	
71	Hydr Sys 1 Temp Lo Lim No. 14	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,14)	V92T1730C	

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TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
72	Hydr Sys 1 Temp Lo Lim No. 15	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,15)	V92T1736C	
73	Hydr Sys 1 Temp Lo Lim No. 16	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(1,16)	V92T1738C	
74	Hydr Sys 2 Temp Lo Lim No. 1	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,1)	V92T1800C	
75	Hydr Sys 2 Temp Lo Lim No. 2	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,2)	V92T1802C	
76	Hydr Sys 2 Temp Lo Lim No. 3	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,3)	V92T1804C	
77	Hydr Sys 2 Temp Lo Lim No. 4	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,4)	V92T1806C	
78	Hydr Sys 2 Temp Lo Lim No. 5	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,5)	V92T1812C	
79	Hydr Sys 2 Temp Lo Lim No. 6	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,6)	V92T1814C	
80	Hydr Sys 2 Temp Lo Lim No. 7	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,7)	V92T1816C	
81	Hydr Sys 2 Temp Lo Lim No. 8	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,8)	V92T1818C	
82	Hydr Sys 2 Temp Lo Lim No. 9	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,9)	V92T1820C	
83	Hydr Sys 2 Temp Lo Lim No.10	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,10)	V92T1822C	

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TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control(Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
84	Hydr Sys 2 Temp Lo Lim No. 11	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,11)	V92T1830C	
85	Hydr Sys 2 Temp Lo Lim No. 12	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(2,12)	V92T1832C	
86	Hydr Sys 3 Temp Lo Lim No. 1	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,1)	V92T1900C	
87	Hydr Sys 3 Temp Lo Lim No. 2	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,2)	V92T1902C	
88	Hydr Sys 3 Temp Lo Lim No. 3	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,3)	V92T1904C	
89	Hydr Sys 3 Temp Lo Lim No. 4	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,4)	V92T1906C	
90	Hydr Sys 3 Temp Lo Lim No. 5	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,5)	V92T1912C	
91	Hydr Sys 3 Temp Lo Lim No. 6	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,6)	V92T1914C	
92	Hydr Sys 3 Temp Lo Lim No. 7	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,7)	V92T1916C	
93	Hydr Sys 3 Temp Lo Lim No. 8	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,8)	V92T1918C	
94	Hydr Sys 3 Temp Lo Lim No. 9	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,9)	V92T1920C	
95	Hydr Sys 3 Temp Lo Lim No. 10	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,10)	V92T1922C	
96	Hydr Sys 3 Temp Lo Lim No. 11	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,11)	V92T1928C	

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TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
97	Hydr Sys 3 Temp Lo Lim No. 12	A.2.12	I	STM	CSOV_COT_LOLIM_TEMP$(3,12)	V92T1930C	
98	Hydr Sys 1 Temp Hi Lim No. 1	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,1)	V92T1701C	
99	Hydr Sys 1 Temp Hi Lim No. 2	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,2)	V92T1703C	
100	Hydr Sys 1 Temp Hi Lim No. 3	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,3)	V92T1705C	
101	Hydr Sys 1 Temp Hi Lim No. 4	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,4)	V92T1707C	
102	Hydr Sys 1 Temp Hi Lim No. 5	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,5)	V92T1709C	
103	Hydr Sys 1 Temp Hi Lim No. 6	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,6)	V92T1711C	
104	Hydr Sys 1 Temp Hi Lim No. 7	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,7)	V92T1713C	
105	Hydr Sys 1 Temp Hi Lim No. 8	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,8)	V92T1715C	
106	Hydr Sys 1 Temp Hi Lim No. 9	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,9)	V92T1719C	
107	Hydr Sys 1 Temp Hi Lim No. 10	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,10)	V92T1721C	
108	Hydr Sys 1 Temp Hi Lim No. 11	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,11)	V92T1723C	
109	Hydr Sys 1 Temp Hi Lim No. 12	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,12)	V92T1725C	
110	Hydr Sys 1 Temp Hi Lim No. 13	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,13)	V92T1729C	
111	Hydr Sys 1 Temp Hi Lim No. 14	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,14)	V92T1731C	

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TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
112	Hydr Sys 1 Temp Hi Lim No. 15	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,15)	V92T1737C	
113	Hydr Sys 1 Temp Hi Lim No. 16	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(1,16)	V92T1739C	
114	Hydr Sys 2 Temp Hi Lim No. 1	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,1)	V92T1801C	
115	Hydr Sys 2 Temp Hi Lim No. 2	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,2)	V92T1803C	
116	Hydr Sys 2 Temp Li Lim No. 3	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,3)	V92T1805C	
117	Hydr Sys 2 Temp Hi Lim No. 4	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,4)	V92T1807C	
118	Hydr Sys 2 Temp Hi Lim No. 5	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,5)	V92T1813C	
119	Hydr Sys 2 Temp Hi Lim No. 6	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,6)	V92T1815C	
120	Hydr Sys 2 Temp Hi Lim No. 7	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,7)	V92T1817C	
121	Hydr Sys 2 Temp Hi Lim No. 8	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,8)	V92T1819C	
122	Hydr Sys 2 Temp Hi Lim No. 9	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,9)	V92T1821C	
123	Hydr Sys 2 Temp Hi Lim No. 10	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,10)	V92T1823C	

TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
124	Hydr Sys 2 Temp Hi Lim No. 11	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,11)	V92T1831C	
125	Hydr Sys 2 Temp Hi Lim No. 12	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(2,12)	V92T1833C	
126	Hydr Sys 3 Temp Hi Lim No. 1	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,1)	V92T1901C	
127	Hydr Sys 3 Temp Hi Lim No. 2	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,2)	V92T1903C	
128	Hydr Sys 3 Temp Hi Lim No. 3	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,3)	V92T1905C	
129	Hydr Sys 3 Temp Hi Lim No. 4	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,4)	V92T1907C	
130	Hydr Sys 3 Temp Hi Lim No. 5	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,5)	V92T1913C	
131	Hydr Sys 3 Temp Hi Lim No. 6	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,6)	V92T1915C	
132	Hydr Sys 3 Temp Hi Lim No. 7	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,7)	V92T1917C	
133	Hydr Sys 3 Temp Hi Lim No. 8	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,8)	V92T1919C	
134	Hydr Sys 3 Temp Hi Lim No. 9	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,9)	V92T1921C	
135	Hydr Sys 3 Temp Hi Lim No.10	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,10)	V92T1923C	

TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
136	Hydr Sys 3 Temp Hi Lim No. 11	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,11)	V92T1929C	
137	Hydr Sys 3 Temp Hi Lim No. 12	A.2.12	I	STM	CSOV_COT_HILIM_TEMP$(3,12)	V92T1931C	
138	Hydr Sys 1 Circ Pump On/Off Command Ind-A	A.2.16	O	SSD	CSSB_SPOB_D101400$(10)	V58K0142Y	
139	Hydr Sys 1 Circ Pump On/Off Command Ind-B	A.2.16	O	SSD	CSSB_SPOB_D121400$(10)	V58K0143Y	
140	Hydr Sys 2 Circ Pump On/Off Command Ind-A	A.2.16	O	SSD	CSSB_SPOB_D101400$(11)	V58K0242Y	
141	Hydr Sys 2 Circ Pump On/Off Command Ind-B	A.2.16	O	SSD	CSSB_SPOB_D121400$(11)	V58K0243Y	
142	Hydr Sys 3 Circ Pump On/Off Command Ind-A	A.2.16	O	SSD	CSSB_SPOB_D101400$(12)	V58K0342Y	
143	Hydr Sys 3 Circ Pump On/Off Command Ind-B	A.2.16	O	SSD	CSSB_SPOB_D121400$(12)	V58K0343Y	
144	Hydr Sys 1 Circ Pump Press	A.2.17	I	SSD	CSOV_PUMP_PRESS$(1)	V58P0137A	
145	Hydr Sys 2 Circ Pump Press	A.2.17	I	SSD	CSOV_PUMP_PRESS$(2)	V58P0237A	
146	Hydr Sys 3 Circ Pump Press	A.2.17	I	SSD	CSOV_PUMP_PRESS$(3)	V58P0337A	
147	Hydr Sys 1 Press Lo Lim	A.2.12	I	STM	COT_LOLIM_PRESS(1)	V92P1742C	
148	Hydr Sys 2 Press Lo Lim	A.2.12	I	STM	COT_LOLIM_PRESS(2)	V92P1842C	
149	Hydr Sys 3 Press Lo Lim	A.2.12	I	STM	COT_LOLIM_PRESS(3)	V92P1942C	
150	SP Current Time	A.2.11	I	SSP	CSSV_SP_CURRENT TIME	V91M1999P	

TABLE 3.2.1.19-1 Hydraulic Fluid Temperature Control (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
151	Temp Sensor Count	E	L		SST_TEMP_COUNT		
152	Hydr Pump Index (I)	E	L		SST_I		
153	Hydr Sys 1 Circ Pump Auto Enable A-save location	A.2.17	I	SSD	CSOV_AUTO_ENABLE_A$(1;)		
154	Hydr Sys 1 Circ Pump Auto Enable B-Save location	A.2.17	I	SSD	CSOV_AUTO_ENABLE_B$(1;)		
155	Hydr Sys 2 Circ Pump Auto Enable A-Save location	A.2.17	I	SSD	CSOV_AUTO_ENABLE_A$(2;)		
156	Hydr Sys 2 Circ Pump Auto Enable B-Save location	A.2.17	I	SSD	CSOV_AUTO_ENABLE_B$(2;)		
157	Hydr Sys 3 Circ Pump Auto Enable A-Save location	A.2.17	I	SSD	CSOV_AUTO_ENABLE_A$(3;)		
158	Hydr Sys 3 Circ Pump Auto Enable B-Save location	A.2.17	I	SSD	CSOV_AUTO_ENABLE_B$(3;)		
159	Hydr Sys 1 X Minute Time	A.2.12	I	STM	CSOV_COT_XMIN_TIME$(1:)	V92W1744C	
160	Hydr Sys 2 X Minute Time	A.2.12	I	STM	CSOV_COT_XMIN_TIME$(2:)	V92W1745C	
161	Hydr Sys 3 X Minute Time	A.2.12	I	STM	CSOV_COT_XMIN_TIME$(3:)	V92W1746C	

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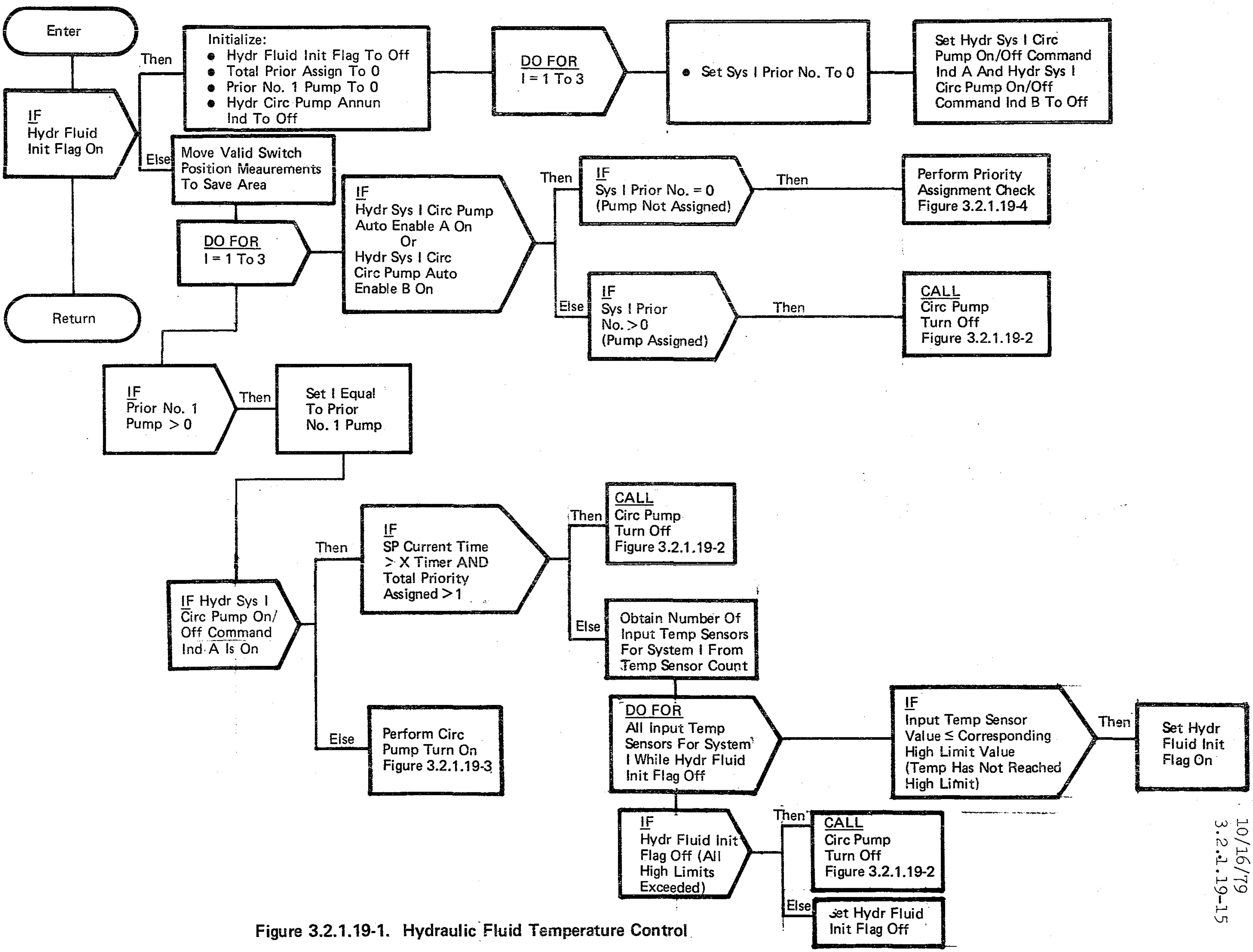

Figure 3.2.1.19-1. Hydraulic Fluid Temperature Control

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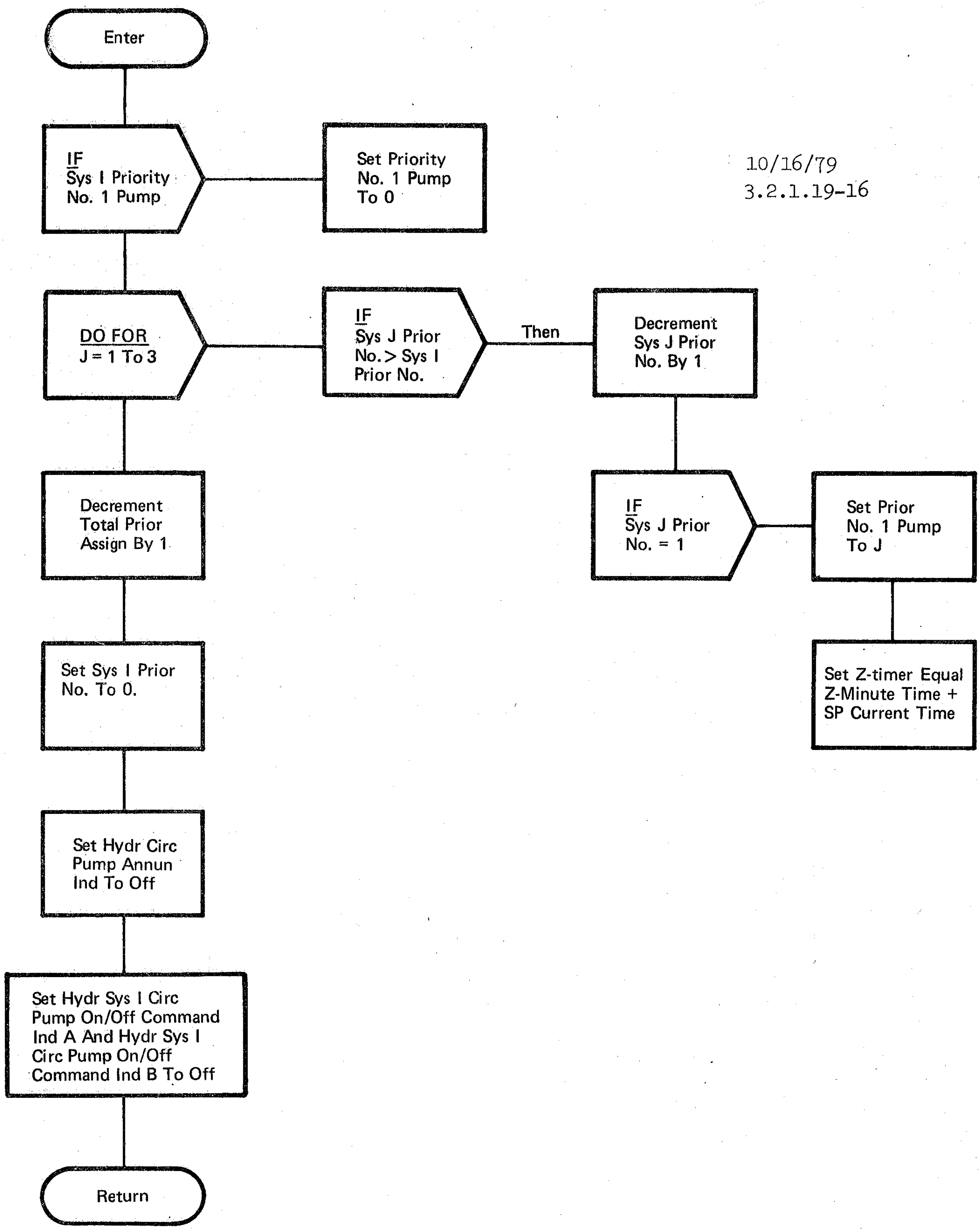

Figure 3.2.1.19-2. Circ Pump Turn OFF

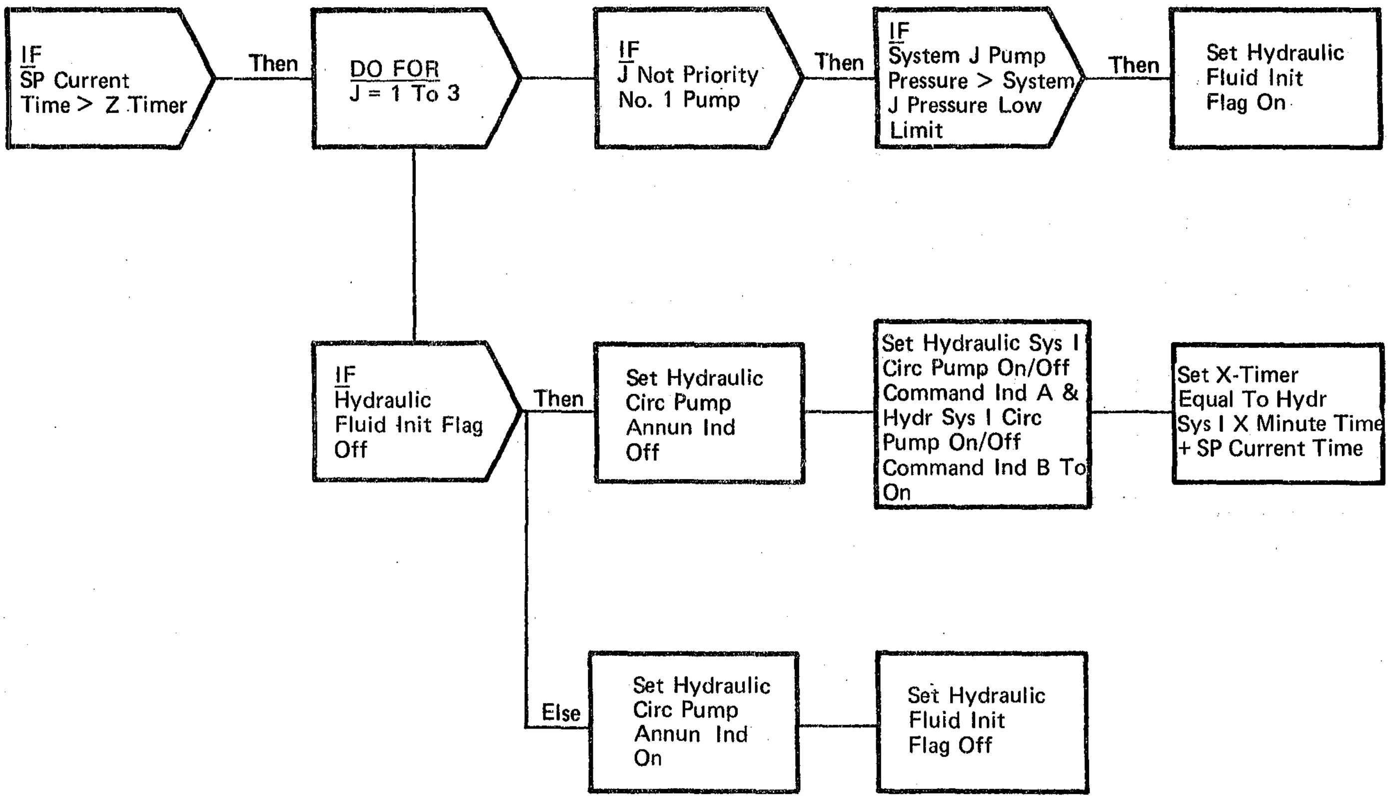

Figure 3.2.1.19-3. Circ Pump Turn ON

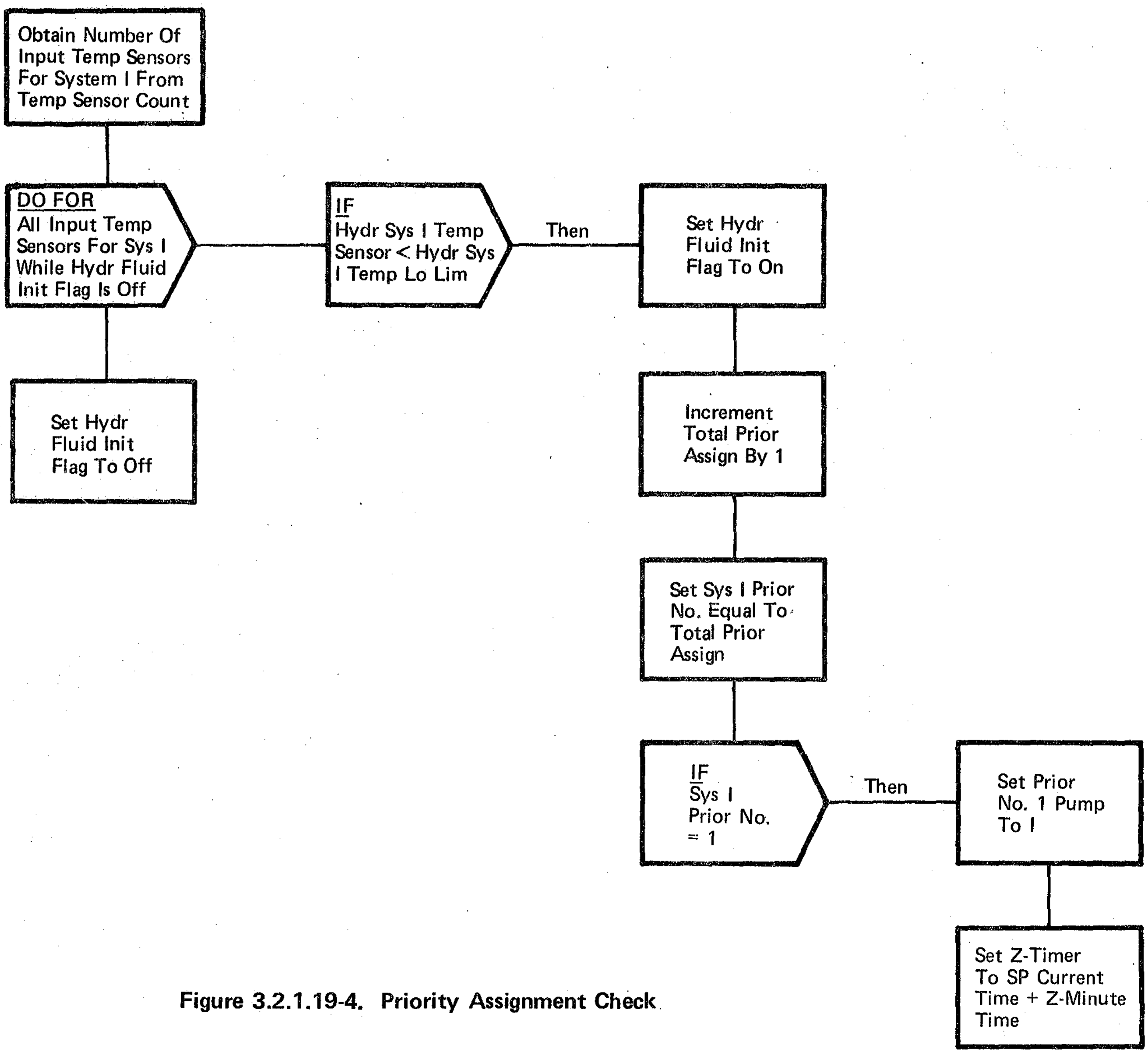

Figure 3.2.1.19-4. Priority Assignment Check

3.2.1.20 Payload Bay Doors (SSB_PL_BAY_DOORS)

The Payload Bay Doors (PBD) module executes cyclically to open and close the payload bay doors and their associated latches.

a. Control Interface - The Payload Bay Doors module is CALL'ed by the Special Processes Executive once every 400 milliseconds while operating in SM OPS 202.

   Invocation: CALL SSB_PL_BAY_DOORS

b. Inputs - Inputs to this module are specified in Table 3.2.1.20-1.

c. Process Description - The control flows for this module are shown in Figures 3.2.1.20-1 through 3.2.1.20-25. The Payload Bay Doors module operates in two basic modes, "auto" and "manual". The "auto" mode executes all the steps necessary to fully open or close the payload bay doors. In the "manual" mode, desired latch group(s) or door(s) are specified individually to be opened or closed. The above sequences are controlled from the PBD display and the three position PBD control switch ("open", "stop" and "close").

   The Payload Bay Doors module first determines if the power to drive the motors for the latch groups and doors should be turned on or off. If so, commands are enabled to turn the power on or off as desired. In addition, if the request is power off, an indicator is set to cause the PBD cyclic to turn off the reset masks for the power enable/disable 'B' commands during the next execution cycle. The position of the hardware PBD control switch is then determined and made available for display. A capability is provided to override the hardware PBD control switch position by item entry on the PBD display. If this option is in effect, the hardware switch position will be overlayed by the item entry switch position. The above processing is performed on each execution. Here a check is made to determine if a full PBD execution is needed. This is done in the following manner. If the full execute flag is on or the position of the PBD control switch has changed since the last execution, then the remainder of this module is executed. Otherwise, it is bypassed and the end of program is executed. If the remainder of this module needs to be executed, then the feedback status of each latch group and door is computed and made available for display. Then the position of the PBD control switch is examined. If the switch is in the "stop" position, a process is executed to determine if a new sequence has been selected. Sequence selection is done by the Payload Bay Doors Item Processor (Section 3.3.5) and executes asynchronously to the Payload Bay Doors cyclic processor. The "auto" mode flag is turned on if a manual sequence is selected. If the switch position is "open" or "close", the mode flags are tested to determine the type of processing to be performed. The auto sequence enables the commands to open or close the payload bay doors and latches in a predefined order. Certain pairs of latch groups are opened or closed concurrently. If feedback signals indicating open or close completion are not received before a predefined length of time, a fail indicator is set and annunciation is performed. If the "manual" mode flag is on, commands are enabled to open or close individual latch groups or doors specified by items entered from the PBD display. The initial item must be entered when the PBD control switch is in the "stop" position. Subsequent manual items can be entered with the switch in any position. After the commands are issued, no monitoring of them is done and no fail indications are given.

If the PBD control switch is returned to the "stop" position during an "auto" sequence, the sequence is considered suspended. All commands which have not been verified shall be terminated. The sequence shall continue from this point when the PBD control switch is returned to the original "open" or "close" position. The terminated commands shall be reenabled and the timer for fail indication shall be reset. If the PBD control switch is returned to a different position other than the original, e.g. during an "auto" open sequence, the PBD control switch is turned to "stop" then returned to the "close" position, the appropriate commands shall be enabled to perform the "new" sequence and the timer for fail indication is reset. In manual mode, return of the PBD control switch to the "stop" position terminates all commands enabled for the selected options. A return to the "open" or "close" position for the "stop" position will cause the terminated commands to be reenabled provided the corresponding options are still selected.

When open or close commands are enabled or disabled during an auto sequence, entries are set or reset in an internal array called the commands enabled array to maintain the status of all the commands issued. This internal array facilitates the check to determine if commands have been issued for the current latch group or door.

When the PBD contro switch is in the "open" or "close" position, an Event is set in the User Interface Compool Table CZ1_COMMON to inhibit OPS/Mode termination. Any request to terminate will be rejected and a class 5 error message will be output. When the control switch is in the "STOP" position, the event is reset in CZ1_COMMON to enable normal OPS/Mode transition.

When the Payload Bay doors module has completed, it checks an indicator to determine if it has commands to output. If so, the special process data Out Module is CALLED to perform this task.

Only parameters with valid input status are used in the sequence and made available for display and downlist.

The following chart is a matrix that shows what events cause PBD processing indicators and flags to be reset:

BOOK: OFT SM Detailed Design Specification

Affected Indicator \ Event	SM OPS 202 Is Entered	New PBD Sequence Is Selected	SM OPS 202 Is Terminated
PBD Latch/Door Fail Indicators		RESET	RESET
Power On Item	RESET		RESET
Power Off Item	SET		SET
PBD Open/Close Complete Indicator		RESET	
Auto And Manual Mode Items	RESET		RESET
Auto and Manual Mode Flags	RESET		
Common PBD Fail Indicator		RESET	RESET

d. Outputs - Outputs from this module are specified in Table 3.2.1.20-1.

e. Module References

Process	Section	Reference
Special Processes Data Out	3.2.1.11	CALL

f. Module Type and Attributes:

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References

D INCLUDE TEMPLATE	CCS_COT	Constants Table (COT) - Value
D INCLUDE TEMPLATE	CCS_SPINB	Special Processes Input Buffer (SPINB)
D INCLUDE TEMPLATE	CCS_SPOB	Special Processes Output Buffer (SPOB)
D INCLUDE TEMPLATE	CCS_SP_CMT	Special Processes CMT
D INCLUDE TEMPLATE	CSB_PBD_CMT	Payload Bay Doors CMT
D INCLUDE OPSTMACS		OPS Transition Macros
D INCLUDE TEMPLATE	SSO_SP_DATA_OUT	SP Data Out

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.20-1 Payload Bay Doors MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	Power On Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_POWER_ON_OFF_ ITEM$(1)	V93X5830X	
2.	Power Off Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_POWER_ON_OFF_ ITEM$(2)	V93X5831X	
3.	Auto Mode Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_AUTO_MODE_ ITEM	V93X5800X	
4.	Manual Mode Items (Items 5 thru 14)	A.2.11,D.13	I/O	SBD,S2I,CRT,DL			
5.	Centerline Latch Group 5-8 Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(4)	V93X5801X	
6.	Centerline Latch Group 9-12 Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(5)	V93X5802X	
7.	Centerline Latch Group 1-4 Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(6)	V93X5803X	
8.	Centerline Latch Group 13-16 Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(7)	V93X5804X	
9.	Right FWD BKHD Latch Group Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(8)	V93X5810X	
10.	Right AFT BKHD Latch Group Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(9)	V93X5811X	
11.	Right PBD Door Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(10)	V93X5812X	
12.	Left FWD BKHD Latch Group Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(11)	V93X5819X	
13.	Left AFT BKHD Latch Group Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(12)	V93X5820X	
14.	Left PBD Door Item	A.2.11,D.13	I/O	SBD,S2I,CRT,DL	CSBB_MANUAL_MODE_ ITEMS$(13)	V93X5821X	

TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
15.	Switch Bypass Item	A.2.11, D.13	I/O	SBD,CRT,DL	CSBB_SWITCH_BYPASS_ITEM	V93X5814X	
16.	Open Item	A.2.11, D. 13	I/O	SBD,CRT,DL	CSBB_PBD_OPEN_ITEM	V93X5815X	
17.	Stop Item	A.2.11, D.13	I/O	SBD,CRT,DL	CSBB_PBD_STOP_ITEM	V93X5816X	
18.	Close Item	A.2.11, D.13	I/O	SBD,CRT,DL	CSBB_PBD_CLOSE_ITEM	V93X5817X	
19.	Control Switch Position Open And Close Feedback Discretes (Items 20 through 27)	A.2.17	I/O	SSD,CRT,DL		V72K3221Y	
19A	Parent Feedback 1 From PF01. Contains Discretes Listed below: 22, 26, 45, 47, 50, 52, 53, 55, 58, 61.	A.2.17	I/O	SSD, CRT, DL	CSSV_SPINB_D100300		
19B	Parent Feedback 1 from PF02. Contains Discretes Listed Below: 20, 24, 46, 48, 49, 51, 54, 56, 59, 62.	A.2.17	I/O	SSD, CRT, DL	CSSV_SPINB_D120300		
19C	Parent Feedback 2 from PF0 1. Contains Discrete Listed Below: 21, 25, 63, 65, 67, 69, 72, 73, 76, 80.	A.2.17	I/O	SSD,CRT,DL	CSSV_SPINB_D100600		
19D	Parent Feedback 2 from PF02. Contains Discretes Listed Below: 23, 27, 64, 66, 68, 70, 71, 75, 78, 79.	A.2.17	I/O	SSD,CRT,DL	CSSV_SPINB_D120600		
19E	Parent Feedback 3 from PF01. Contains Discretes Listed Below: 29, 31, 33, 35, 37, 39, 42, 44, 74, 77.	A.2.17	I/O	SSD,CRT,DL	CSSV_SPINB_D100900		
19F	Parent Feedback 3 from PF02. Contains Discretes Listed Below: 30, 32, 34, 36, 38, 40, 41, 43, 57, 60.	A.2.17	I/O	SSD,CRT,DL	CSSV_SPINB_D120900		
20	Control Switch Open Position A	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1$(8)	V72K3220Y	

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TABLE 3.2.1.20-1 Payload Bay Doors (Cont;d)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
21	Control Switch Open Position B	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2$(8)	V72K3221Y	

TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
22.	Control Switch Open Position C	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(8)	V72K3222Y	
23.	Control Switch Open Position D	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(8)	V72K3223Y	
24.	Control Switch Close Position A	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(9)	V72K3230Y	
25.	Control Switch Close Position B	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2 $(9)	V72K3231Y	
26.	Control Switch Close Position C	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(9)	V72K3232Y	
27.	Control Switch Close Position D	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(9)	V72K3233Y	
28.	PBD Open/Close Feedback Discretes (Items 29 thru 80)	A.2.17	I/O	SSD,CRT,DL			
29.	Centerline Latch Group 5-8 Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(5)	V37X3390Y	
30.	Centerline Latch Group 5-8 Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(5)	V37X3391Y	
31.	Centerline Latch Group 5-8 Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(6)	V37X3395Y	
32.	Centerline Latch Group 5-8 Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(6)	V37X3396Y	
33.	Centerline Latch Group 9-12 Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(8)	V37X3405Y	
34.	Centerline Latch Group 9-12 Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(8)	V37X3406Y	
35.	Centerline Latch Group 9-12 Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(7)	V37X3400Y	
36.	Centerline Latch Group 9-12 Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(7)	V37X3401Y	
37.	Centerline Latch Group 1-4 Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(3)	V37X3330Y	
38.	Centerline Latch Group 1-4 Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(3)	V37X3331Y	

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TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
39.	Centerline Latch Group 1-4 Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(4)	V37X3385Y	
40.	Centerline Latch Group 1-4 Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(4)	V37X3386Y	
41.	Centerline Latch Group 13-16 Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(10)	V37X3415Y	
42.	Centerline Latch Group 13-16 Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(10)	V37X3416Y	
43.	Centerline Latch Group 13-16 Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(9)	V37X3410Y	
44.	Centerline Latch Group 13-16 Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(9)	V37X3411Y	
45.	Right FWD BHD Latch Group Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(3)	V37X3430Y	
46.	Right FWD BHD Latch Group Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(3)	V37X3431Y	
47.	Right FWD BHD Latch Group Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(4)	V37X3440Y	
48.	Right FWD BHD Latch Group Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(4)	V37X3441Y	
49.	Right AFT BHD Latch Group Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(5)	V37X3450Y	
50.	Right AFT BHD Latch Group Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(5)	V37X3451Y	
51.	Right AFT BHD Latch Group Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(6)	V37X3460Y	
52.	Right AFT BHD Latch Group Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(6)	V37X3461Y	
53.	Right Door Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(7)	V37X3300Y	
54.	Right Door Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(7)	V37X3301Y	
55.	Right FWD BHD Latch Group Ready For Closing Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(1)	V37X3435Y	

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TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
56.	Right FWD BHD Latch Group Ready For Closing Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(1)	V37X3436Y	
57.	Right FWD BHD Latch Group Ready For Closing Indicator 3	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(1)	V37X3437Y	
58.	Right AFT BHD Latch Group Ready For Closing Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(2)	V37X3455Y	
59.	Right AFT BHD Latch Group Ready For Closing Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(2)	V37X3456Y	
60.	Right AFT BHD Latch Group Ready for Closing Indicator 3	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_3 $(2)	V37X3457Y	
61.	Right Door Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_1 $(11)	V37X3302Y	
62.	Right Door Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_1 $(11)	V37X3303Y	
63.	Left FWD BHD Latch Group Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2 $(3)	V37X3320Y	
64.	Left FWD BHD Latch Group Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(3)	V37X3321Y	
65.	Left FWD BHD Latch Group Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2_$(4)	V37X3330Y	
66.	Left FWD BHD Latch Group Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(4)	V37X3331Y	
67.	Left AFT BHD Latch Group Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2 $(5)	V37X3350Y	
68.	Left AFT BHD Latch Group Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(5)	V37X3351Y	
69.	Left AFT BHD Latch Group Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2 $(6)	V37X3360Y	
70.	Left AFT BHD Latch Group Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(6)	V37X3361Y	

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
71.	Left Door Open Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(7)	V37X3305Y	
72.	Left Door Open Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2 $(7)	V37X3306Y	
73.	Left FWD BHD Latch Group Ready For Closing Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2 $(1)	V37X3325Y	
74.	Left FWD BHD Latch Group Ready For Closing Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(1)	V37X3326Y	
75.	Left FWD BHD Latch Group Ready For Closing Indicator 3	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(1)	V37X3327Y	
76.	Left AFT BHD Latch Group Ready For Closing Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2 $(2)	V37X3355Y	
77.	Left AFT BHD Latch Group Ready For Closing Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_3 $(2)	V37X3356Y	
78.	Left AFT BHD Latch Group Ready For Closing Indicator 3	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(2)	V37X3357Y	
79.	Left Door Close Indicator 1	A.2.17	I/O	SSD,CRT,DL	CSBB_PF02_INPUT_2 $(12)	V37X3307Y	
80.	Left Door Close Indicator 2	A.2.17	I/O	SSD,CRT,DL	CSBB_PF01_INPUT_2 $12)	V37X3308Y	
81.	PF1 Input Status Word 1	A.2.17	I	SSD	CSSV_INSTAT_D100300		
82.	PF2 Input Status Word 1	A.2.17	I	SSD	CSSV_INSTAT_D120300		
83.	PF1 Input Status Word 2	A.2.17	I	SSD	CSSV_INSTAT_D100600		
84.	PF2 Input Status Word 2	A.2.17	I	SSD	CSSV_INSTAT_D120600		
85.	PF1 Input Status Word 3	A.2.17	I	SSD	CSSV_INSTAT_D100900		
86.	PF2 Input Status Word 3	A.2.17	I	SSD	CSSV_INSTAT_D120900		

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TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
87.	Full Execute Flag	A.2.11	I	SSP	CSSB_FULL_EX_FLAG		
88.	Auto Mode Flag	A.2.11,D.27	I	S2I	CSBB_AUTO_MODE_FLAG		
89.	Manual Mode Flag	A.2.11,D.27	I	S2I	CSBB_MANUAL_MODE_FLAG		
90.	Power On/Off Flag	A.2.11,D.29	I	SBD	CSBB_POWER_ON_OFF_FLAG		
91.	Special Processes Current Time	A.2.11	I	SSP	CSSV_SP_CURRENT_TIME	V91M1999P	
92.	Power On/Off Commands (Items 93 thru 104)	A.2.16	O	SSO,DL			
93.	Power On/Off Command 1A	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 $(7)	V37K2000Y	
94.	Power On/Off Command 1B	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_4 $(8)	V37K2001Y	
95.	Power On/Off Command 2A	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(7)	V37K2002Y	
96.	Power On/Off Command 2B	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_3 $(7)	V37K2003Y	
97.	Power On/Off Command 3A	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 $(8)	V37K2004Y	
98.	Power On/Off Command 3B	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_3 $(8)	V37K2005Y	
99.	Power On/Off Command 4A	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 $(9)	V37K2006Y	
100.	Power On/Off Command 4B	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_3 $(9)	V37K2007Y	
101.	Power On/Off Command 5A	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(8)	V37K2008Y	
102.	Power On/Off Command 5B	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_3 $(8)	V37K2009Y	
103.	Power On/Off Command 6A	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(9)	V37K2010Y	
104.	Power On/Off Command 6B	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_4 $(2)	V37K2011Y	
105.	PBD Open/Close Commands (Items 106 thru 145)	A.2.16	O	SSO,DL			
106.	Centerline Latch Group 5-8 Open Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(5)	V37K2220Y	

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TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
107.	Centerline Latch Group 5-8 Open Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2 $(5)	V37K2221Y	
108.	Centerline Latch Group 5-8 Close Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(6)	V37K2230Y	
109.	Centerline Latch Group 5-8 Close Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2$(6)	V37K2231Y	
110.	Centerline Latch Group 9-12 Open Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(7)	V37K2240Y	
111.	Centerline Latch Group 9-12 Open Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2 $(7)	V37K2241Y	
112.	Centerline Latch Group 9-12 Close Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(8)	V37K2250Y	
113.	Centerline Latch Group 9-12 Close Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2 $(8)	V37K2251Y	
114.	Centerline Latch Group 1-4 Open Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(3)	V37K2200Y	
115.	Centerline Latch Group 1-4 Open Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2 $(3)	V37K2201Y	
116.	Centerline Latch Group 1-4 Close Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(4)	V37K2210Y	
117.	Centerline Latch Group 1-4 Close Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2 $(4)	V37K2211Y	
118.	Centerline Latch Group 13-16 Open Command 1	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2 $(9)	V37K2260Y	
119.	Centerline Latch Group 13-16 Open Command 2	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(9)	V37K2261Y	
120.	Centerline Latch Group 13-16 Close Command 1	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2 $(10)	V37K2270Y	
121.	Centerline Latch Group 13-16 Close Command 2	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(10)	V37K2271Y	
122.	Right FWD BHD Latch Group Open Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 (3)	V37K2100Y	
123.	Right FWD BHD Latch Group Open Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(3)	V37K2101Y	

TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
124.	Right FWD BHD Latch Group Close Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 $(4)	V37K2110Y	
125.	Right FWD BHD Latch Group Close Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(4)	V37K2111Y	
126.	Right AFT BHD Latch Group Open Command 1	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(5)	V37K2120Y	
127.	Right AFT BHD Latch Group Open Command 2	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 $(5)	V37K2121Y	
128.	Right AFT BHD Latch Group Close Command 1	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(6)	V37K2130Y	
129.	Right AFT BHD Latch Group Close Command 2	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 $(6)	V37K2131Y	
130.	Right Door Open Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 $(1)	V37K2050Y	
131.	Right Door Open Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(1)	V37K2051Y	
132.	Right Door Close Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_1 $(2)	V37K2060Y	
133.	Right Door Close Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_1 $(2)	V37K2061Y	
134.	Left FWD BHD Latch Group Open Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_3 $(3)	V37K2150Y	
135.	Left FWD BHD Latch Group Open Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_3 $(3)	V37K2151Y	
136.	Left FWD BHD Latch Group Close Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_3 $(4)	V37K2160Y	
137.	Left FWD BHD Latch Group Close Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_3 $(4)	V37K2161Y	
138.	Left AFT BHD Latch Group Open Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_3 $(5)	V37K2170Y	
139.	Left AFT BHD Latch Group Open Command 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_3 $(5)	V37K2171Y	
140.	Left AFT BHD Latch Group Close Command 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_3 $(6)	V37K2180Y	

TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
141.	Left AFT BHD Latch Group Close Command 2	A.2.16	0	SSO,DL	CSBB_PF02_OUTPUT_3 $(6)	V37K2181Y	
142.	Left Door Open Command 1	A.2.16	0	SSO,DL	CSBB_PF02_OUTPUT_3 $(1)	V37K2070Y	
143.	Left Door Open Command 2	A.2.16	0	SSO_DL	CSBB_PF01_OUTPUT_3 $(1)	V37K2071Y	
144.	Left Door Close Command 1	A.2.16	0	SSO,DL	CSBB_PF02_OUTPUT_3 $(2)	V37K2080Y	
145.	Left Door Close Command 2	A.2.16	0	SSO,DL	CSBB_PF01_OUTPUT_3 $(2)	V37K2081Y	
146.	PBD Open/Close Fail Indicators (Items 147 thru 166)	A.2.11	0	CRT,DL			
147.	Centerline Latch Group 5-8 Open Fail Indicator	A.2.11	0	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(1)	V92X0555X	
148.	Centerline Latch Group 5-8 Close Fail Indicator	A.2.11	0	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(1)	V92X0551X	
149.	Centerline Latch Group 9-12 Open Fail Indicator	A.2.11	0	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(2)	V92X0556X	
150.	Centerline Latch Group 9-12 Close Fail Indicator	A.2.11	0	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(2)	V92X0552X	
151.	Centerline Latch Group 1-4 Open Fail Indicator	A.2.11	0	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(3)	V92X0554X	
152.	Centerline Latch Group 1-4 Close Fail Indicator	A.2.11	0	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(3)	V92X0550X	
153.	Centerline Latch Group 13-16 Open Fail Indicator	A.2.11	0	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(4)	V92X0557X	
154.	Centerline Latch Group 13-16 Close Fail Indicator	A.2.11	0	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(4)	V92X0553X	
155.	Right FWD BHD Latch Group Open Fail Indicator	A.2.11	0	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(5)	V92X0531X	

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TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
156.	Right FWD BHD Latch Group Close Fail Indicator	A.2.11	O	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(5)	V92X0530X	
157.	Right AFT BHD Latch Group Open Fail Indicator	A.2.11	O	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(6)	V92X0536X	
158.	Right AFT BHD Latch Group Close Fail Indicator	A.2.11	O	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(6)	V92X0535X	
159.	Right Door Panel Open Fail Indicator	A.2.11	O	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(7)	V92X0510X	
160.	Right Door Panel Close Fail Indicator	A.2.11	O	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(7)	V92X0511X	
161.	Left FWD BHD Latch Group Open Fail Indicator	A.2.11	O	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(8)	V92X0516X	
162.	Left FWD BHD Latch Group Close Fail Indicator	A.2.11	O	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(8)	V92X0515X	
163.	Left AFT BHD Latch Group Open Fail Indicator	A.2.11	O	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(9)	V92X0521X	
164.	Left AFT BHD Latch Group Close Fail Indicator	A.2.11	O	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(9)	V92X0520X	
165.	Left Door Panel Open Fail Indicator	A.2.11	O	CRT,DL	CSBB_OPEN_FAIL_INDICATOR $(10)	V92X0505X	
166.	Left Door Panel Close Fail Indicator	A.2.11	O	CRT,DL	CSBB_CLOSE_FAIL_INDICATOR $(10)	V92X0506X	
167.	Common PBD Fail Indicator	A.2.16	O	SSO,CRT,DL	CSBB_COMMON_PBD_FAIL_INDICATOR	V92X0490X	
168.	PBD Open Complete Indicator 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(1)	V72X3780Y	
169.	PBD Open Complete Indicator 2	A.2.16	O	SSO,DL	CSBB_PF02_OUTPUT_2 $(1)	V72X3781Y	
170.	PBD Close Complete Indicator 1	A.2.16	O	SSO,DL	CSBB_PF01_OUTPUT_2 $(2)	V72X3785Y	

TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
171.	PBD Close Complete Indicator 2	A.2.16	0	SSO, DL	CSBB_PFO2_OUTPUT_2$(2)	V72X3786Y	
172.	Control Switch Position Indicator	A.2.11, D17	0	SBD	CSBB_CONTROL_SWITCH_POS_INDIC		
173.	PBD Output Indicator	A.2.11	0	SSO	CSBB_PBD_OUTPUT_INDICATOR		
174.	PBD Switch Indicator Text	A.2.11	0	CRT	CSBB_PBD_SWITCH_IND_TEXT	V92J0508C	
175.	PBD Switch Output Status	A.2.11	0	CRT	CSBB_PBD_SW_OUT_STATUS		
176.	Latch And Door Status Text (Items 176 thru 185)	A.2.11	0	CRT			
177.	Centerline Latch 5-8 Text	A.2.11	0	CRT	CSBB_C_LCH_5_8_TEXT	V92J0492C	
178.	Centerline Latch 9-12 Text	A.2.11	0	CRT	CSBB_C_LCH_9_12_TEXT	V92J0493C	
179.	Centerline Latch 1-4 Text	A.2.11	0	CRT	CSBB_C_LCH_1_4_TEXT	V92J0494C	
180.	Centerline Latch 13-16 Text	A.2.11	0	CRT	CSBB_C_LCH_13_16_TEXT	V92J0495C	
181.	Right FWD BHD Latch Text	A.2.11	0	CRT	CSBB_R_FWD_BHD_TEXT	V92J0496C	
182.	Right AFT BHD Latch Text	A.2.11	0	CRT	CSBB_R_AFT_BHD_TEXT	V92J0498C	
183.	Right Door Text	A.2.11	0	CRT	CSBB_R_DOOR_TEXT	V92J0503C	
184.	Left FWD BHD Latch Text	A.2.11	0	CRT	CSBB_L_FWD_BHD_TEXT	V92J0497C	
185.	Left AFT BHD Latch Text	A.2.11	0	CRT	CSBB_L_AFT_BHD_TEXT	V92J0499C	
186.	Left Door Text	A.2.11	0	CRT	CSBB_L_DOOR_TEXT	V92J0504C	
187.	Latch And Door Output Status	A.2.11	0	CRT	CSBB_L_LATCH_DOOR_OUT_STAT		
188.	PBD Display Update Indicator	A.2.11	0	CRT	CSBB_PBD_DISP_UPDATE_IND		
189.	Current Latch Groups/ Door Pointer	E	L		SSB_CURRENT_LATCH_DOOR_POINTER		
190.	Previous Switch Position	E	L		SSB_PREVIOUS_SWITCH_POS		
191.	Open/Close Feedback Indicator	E	L		SSB_OPEN_CLOSE_FEEDBACK_INDIC		

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TABLE 3.2.1.20-1 Payload Bay Doors (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
192.	Switch Open Indicator	E	L		SSB_SWITCH_OPEN_INDICATOR		
193.	Switch Close Indicator	E	L		SSB_SWITCH_CLOSE_INDICATOR		
194.	Latch/Door Input Parameter 1	E	L		SSB_LATCH_DOOR_INPUT_PARM_1		
195.	Latch/Door Input Parameter 2	E	L		SSB_LATCH_DOOR_INPUT_PARM_2		
196.	Latch/Door Input Parameter 3	E	L		SSB_LATCH_DOOR_INPUT_PARM_3		
197.	Latch/Door Input Parameter 4	E	L		SSB_LATCH_DOOR_INPUT_PARM_4		
198.	Latch Computed Value	E	L		SSB_LATCH_COMPUTED_VALUE		
199.	Door Computed Value	E	L		SSB_DOOR_COMPUTED_VALUE		
200.	Current Latch Groups/ Door Expiration Time	E	L		SSB_LATCH_DOOR_EXPIR_TIME		
201.	Commands Enabled Array	E	L		SSB_COMMANDS_ENABLED_ARRAY		
202.	PBD More Work Indicator	E	L		SSB_PBD_MORE_WORK+IND		
203.	Timer Constants Array	E	C		SSB_TIMER_CONSTANTS_ARRAY		
204.	Mode Transition Enable/ Inhibit Event	E	O	UI	CZ1E_OPS_MODE_INHIBIT$3		
205	Open/Close Complete Ind.	E	L		SSB_OPEN_CLOSE_COMPLETE		
206	Power Disable Indicator	E	L		SSB_POWER_DISABLE_IND		

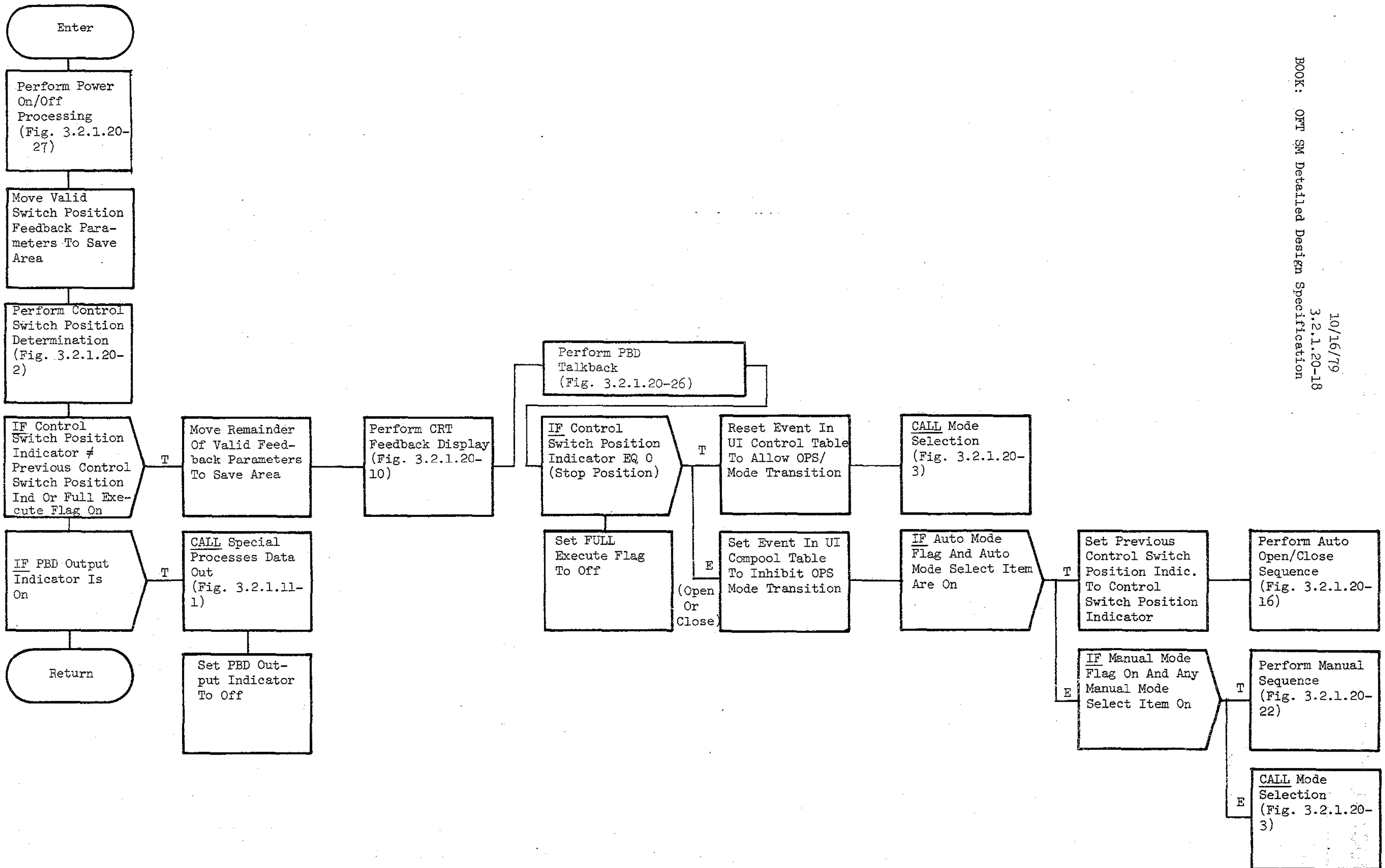

Figure 3.2.1.20-1. Payload Bay Doors

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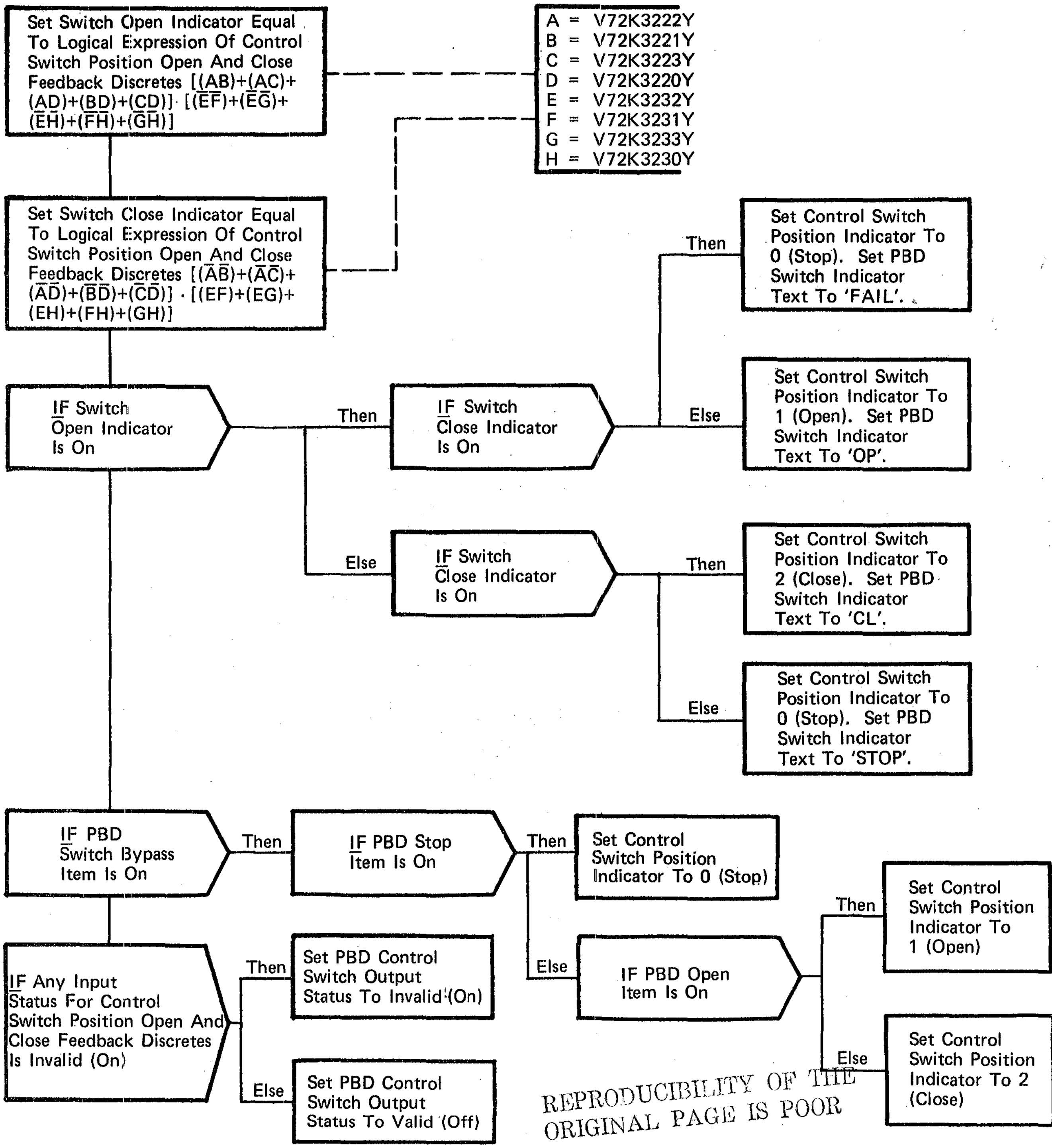

Figure 3.2.1.20-2. Control Switch Position Determination

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

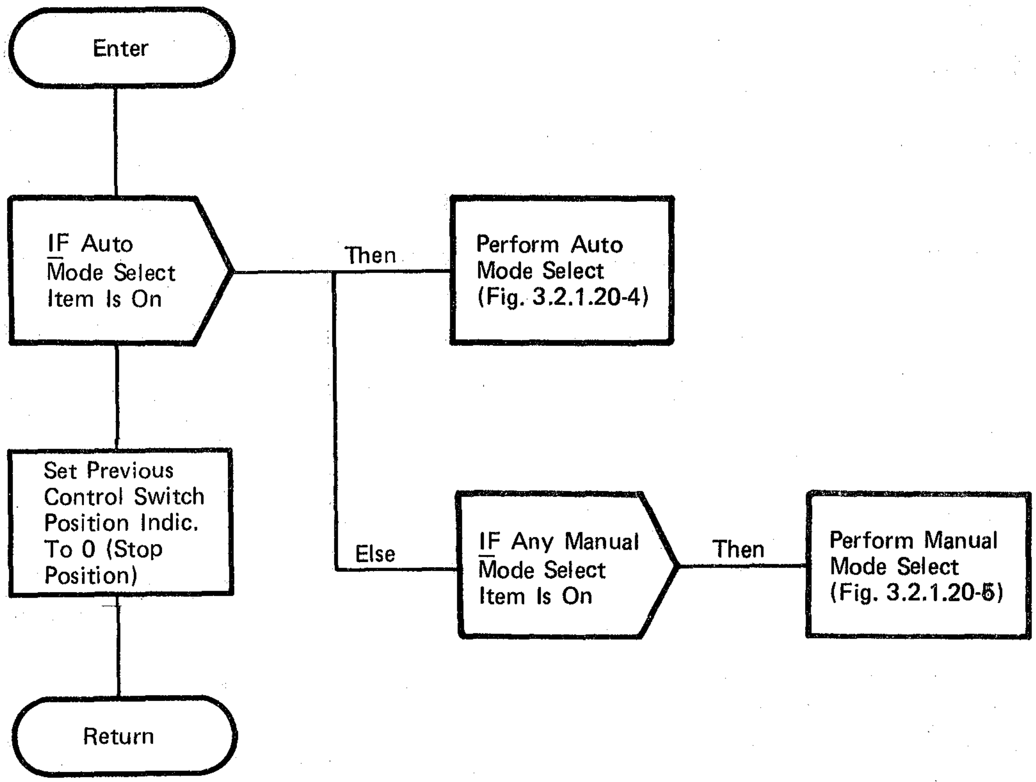

Figure 3.2.1.20-3. Mode Selection

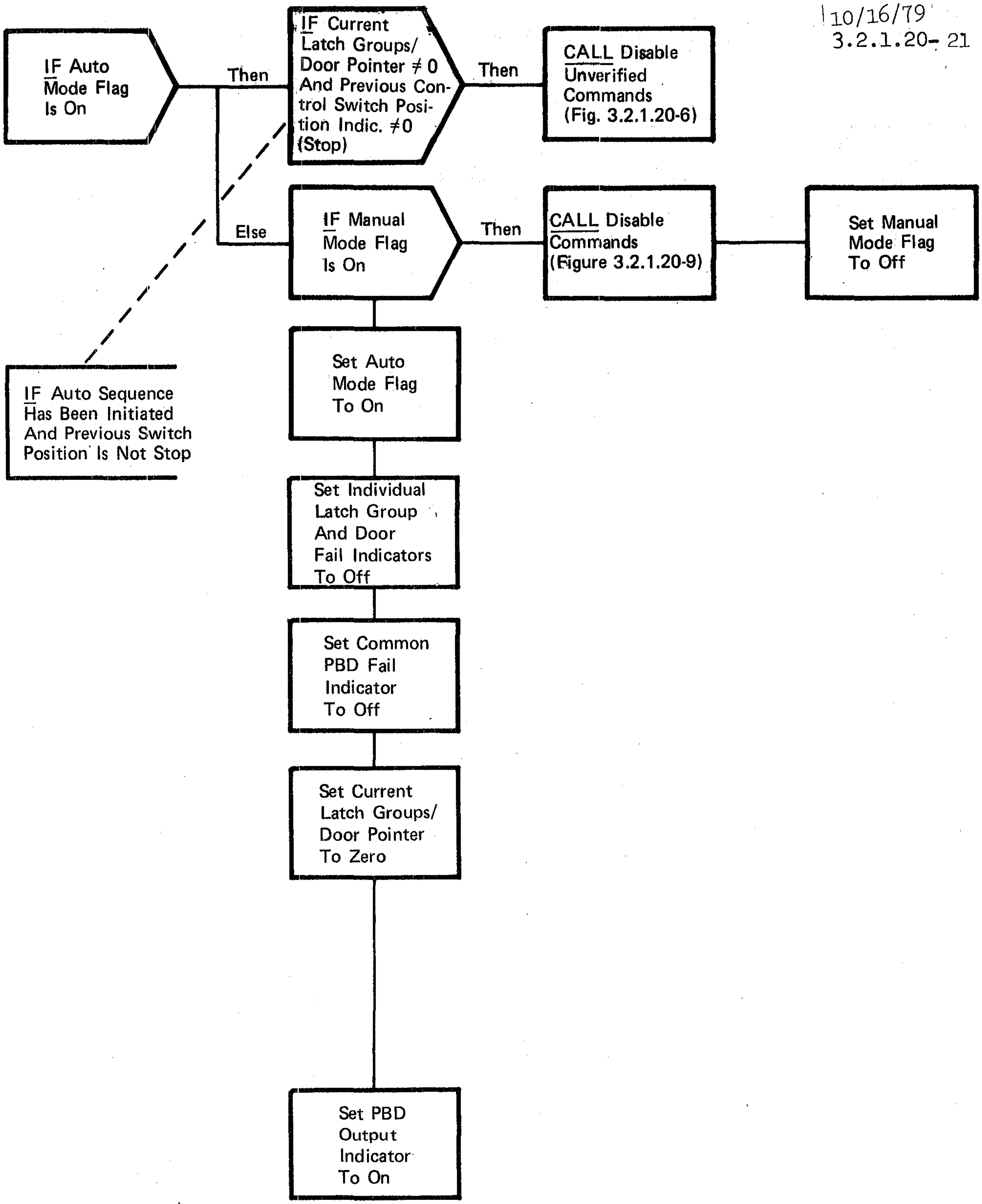

Figure 3.2.1.20-4. Auto Mode Select

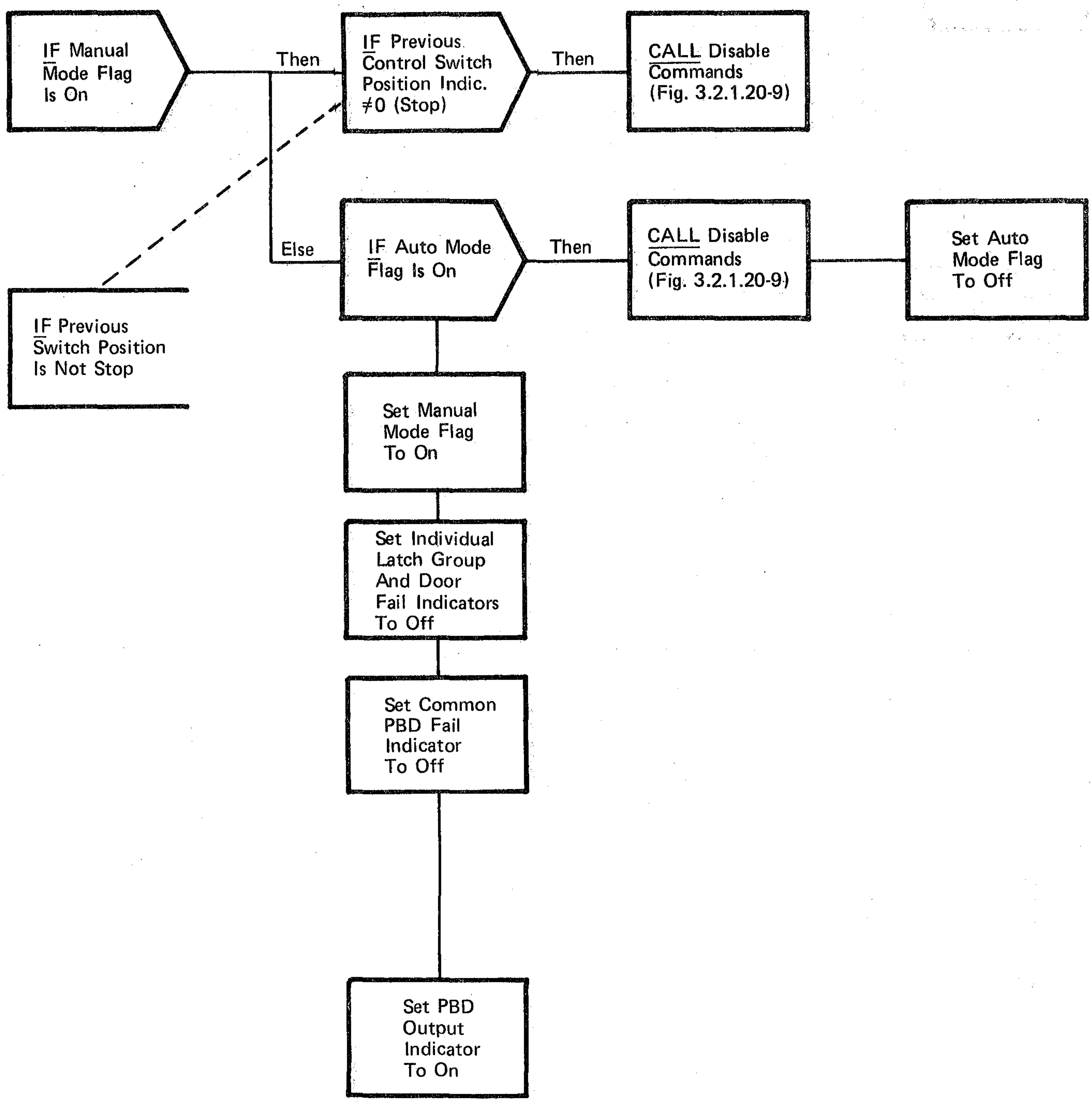

Figure 3.2.1.20-5. Manual Mode Select

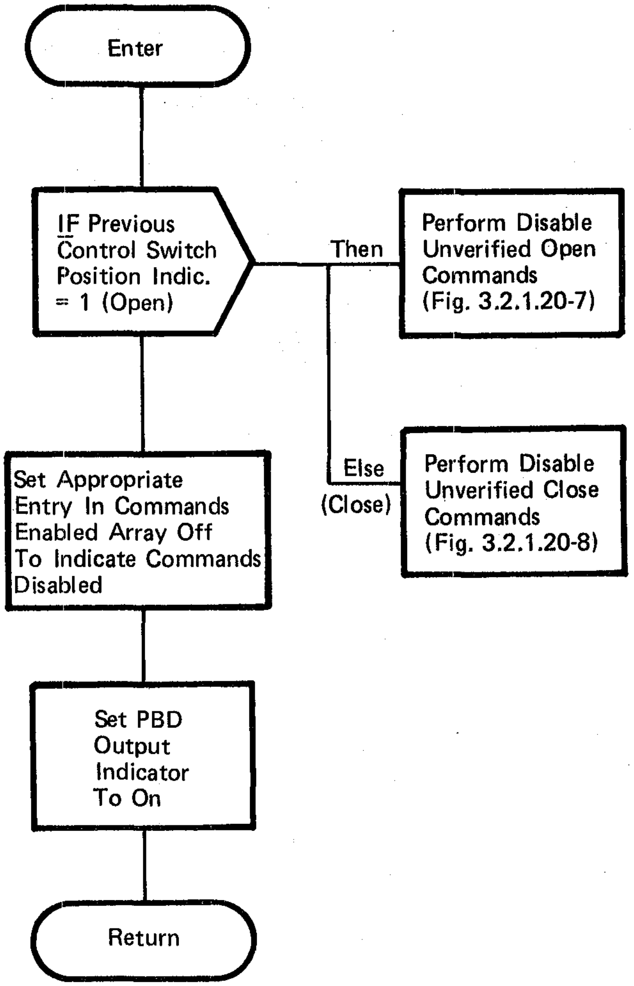

Figure 3.2.1.20-6. Disable Unverified Commands

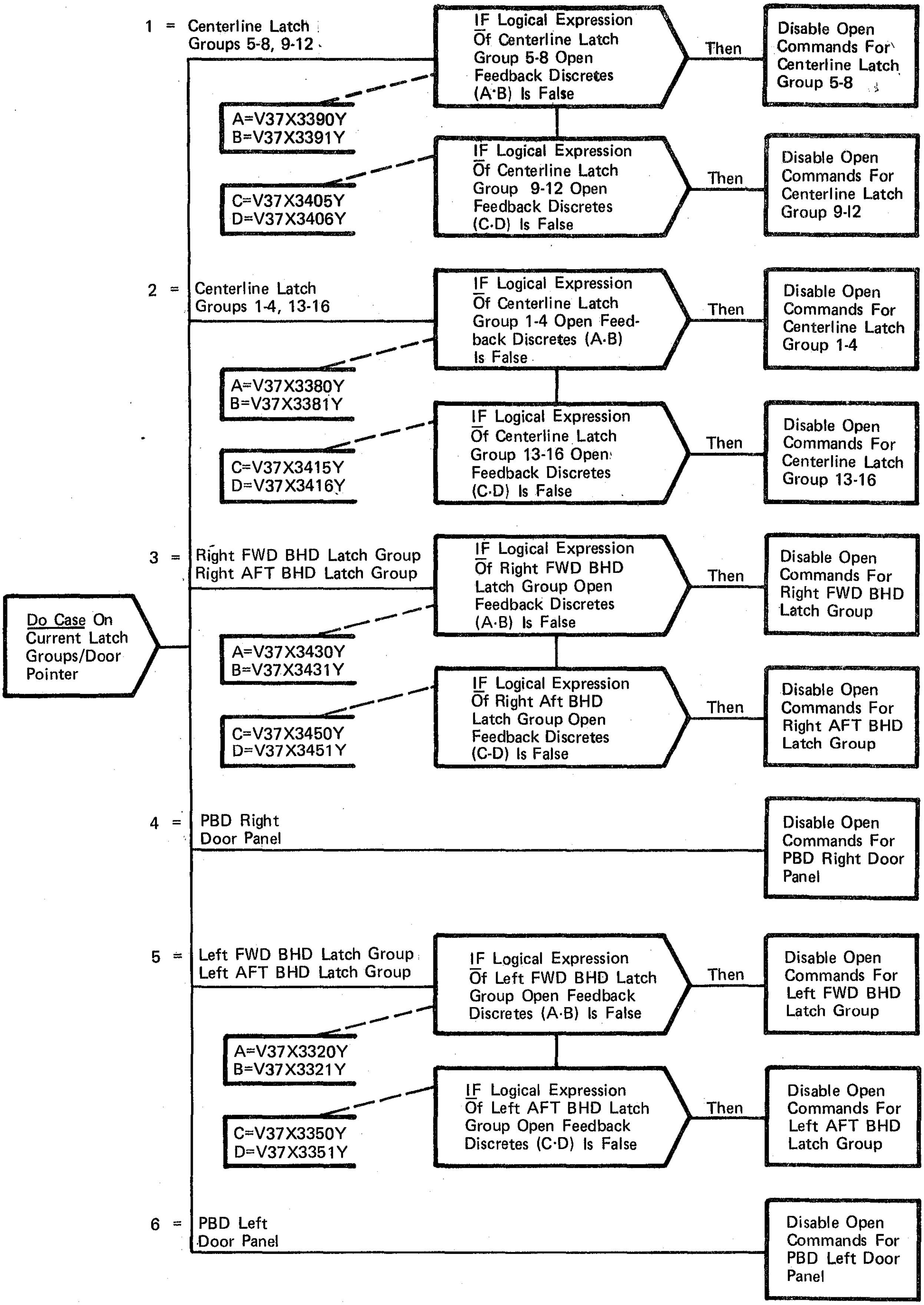

Figure 3.2.1.20-7. Disable Unverified Open Commands

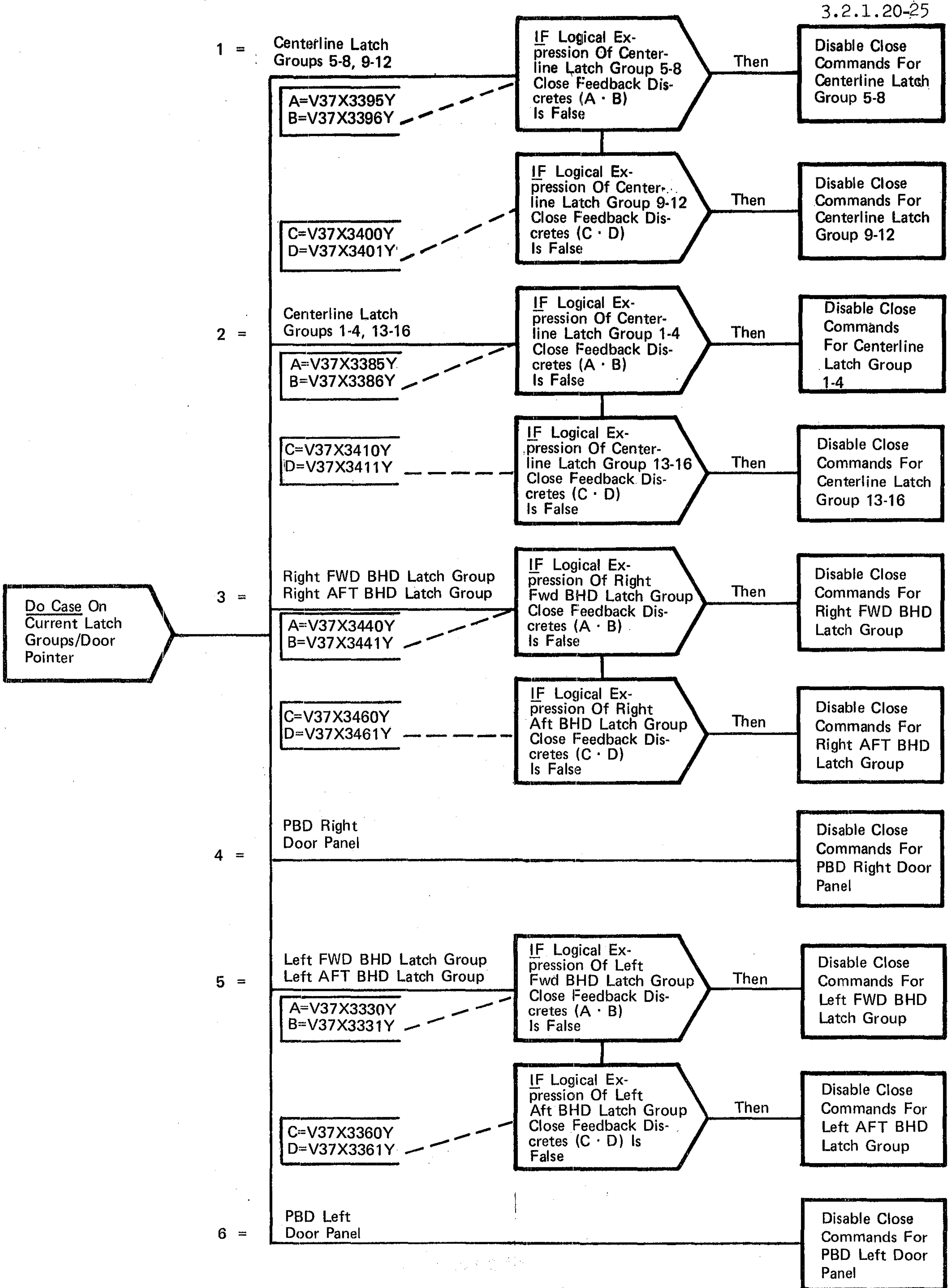

Figure 3.2.1.20-8. Disable Unverified Close Commands

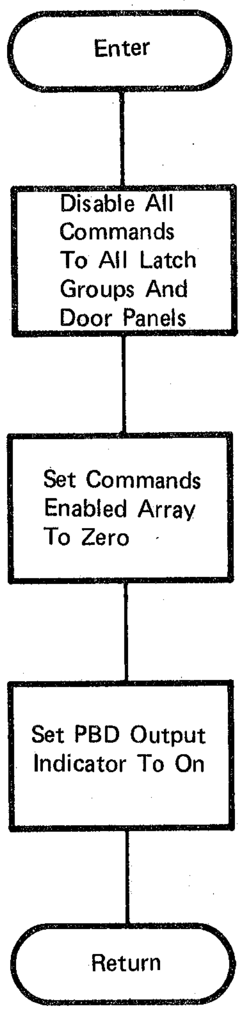

Figure 3.2.1.20-9. Disable Commands

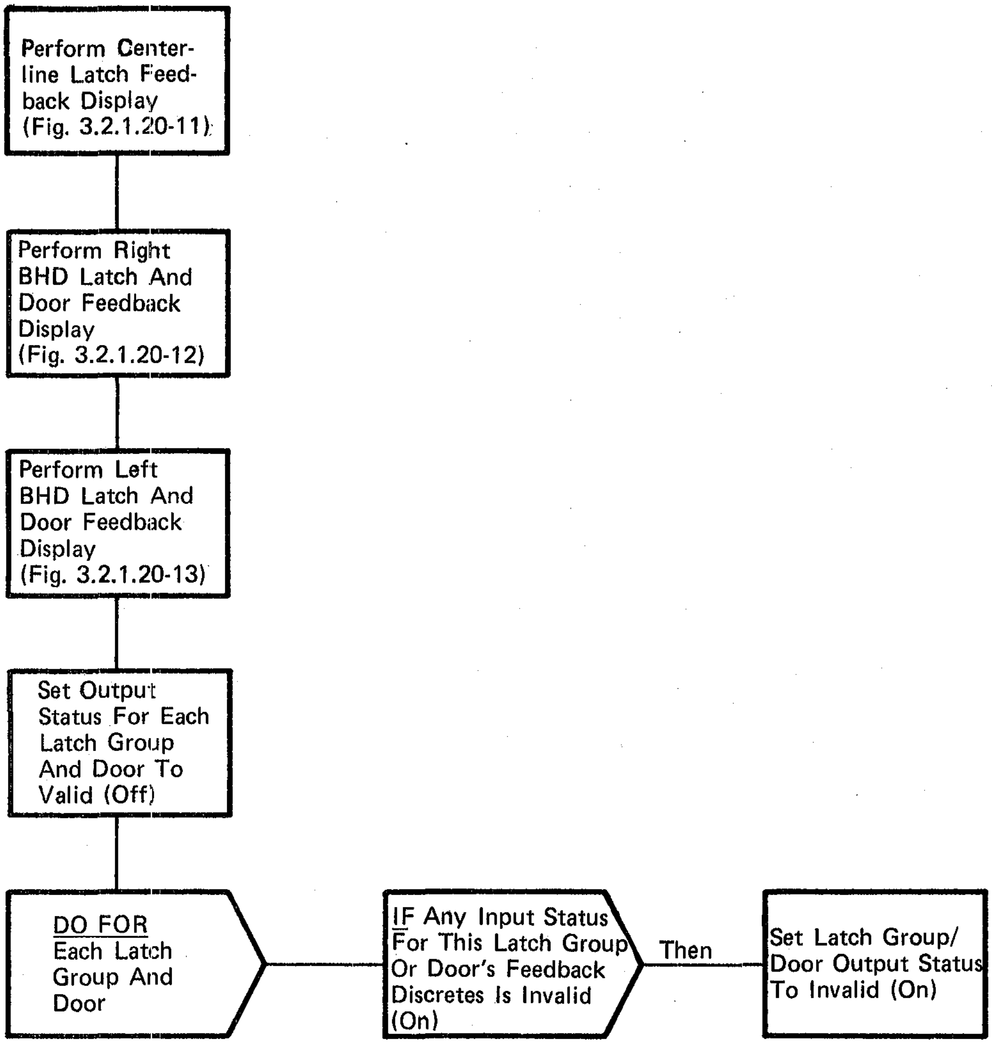

Figure 3.2.1.20-10. CRT Feedback Display

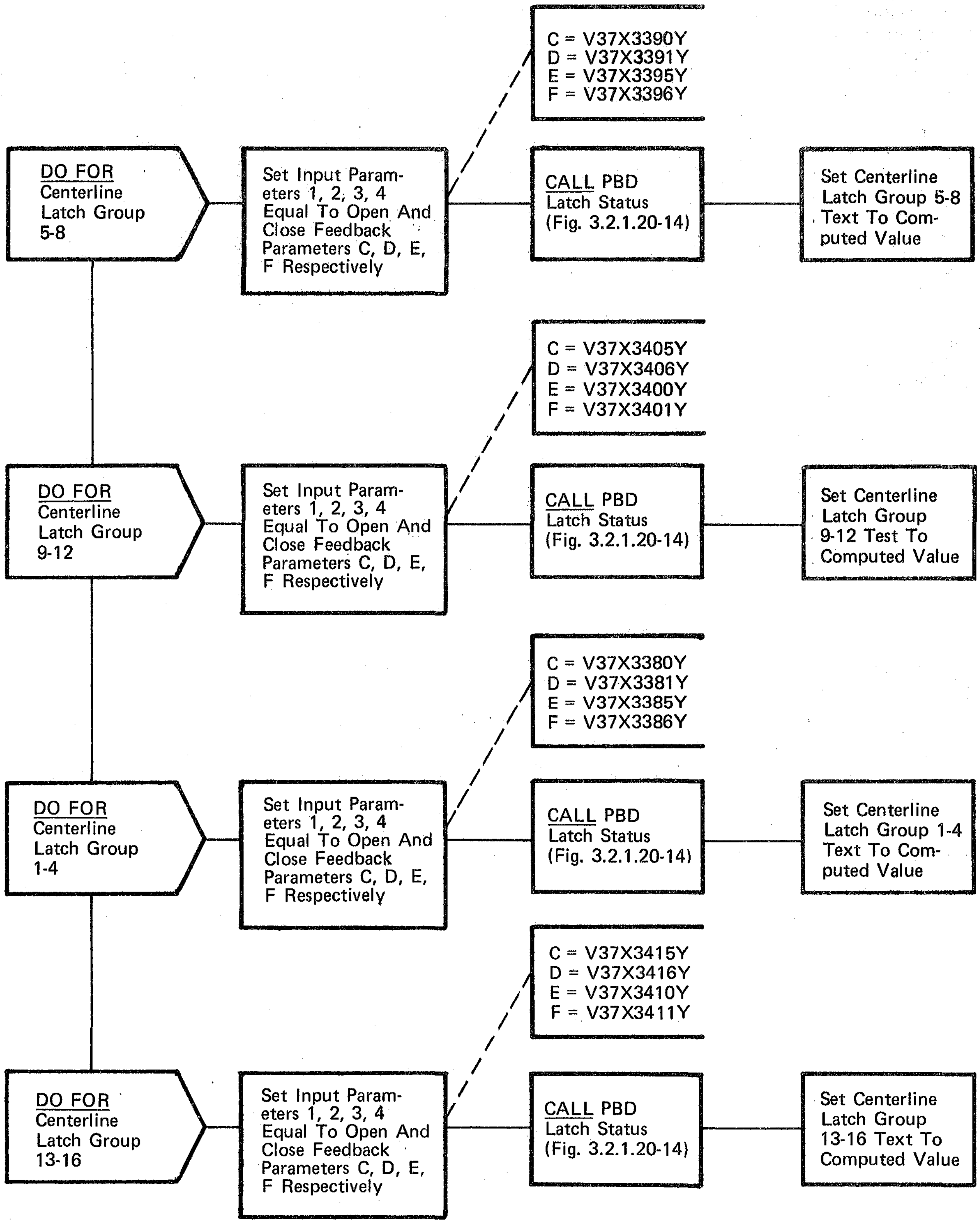

Figure 3.2.1.20-11. Centerline Latch Feedback Display

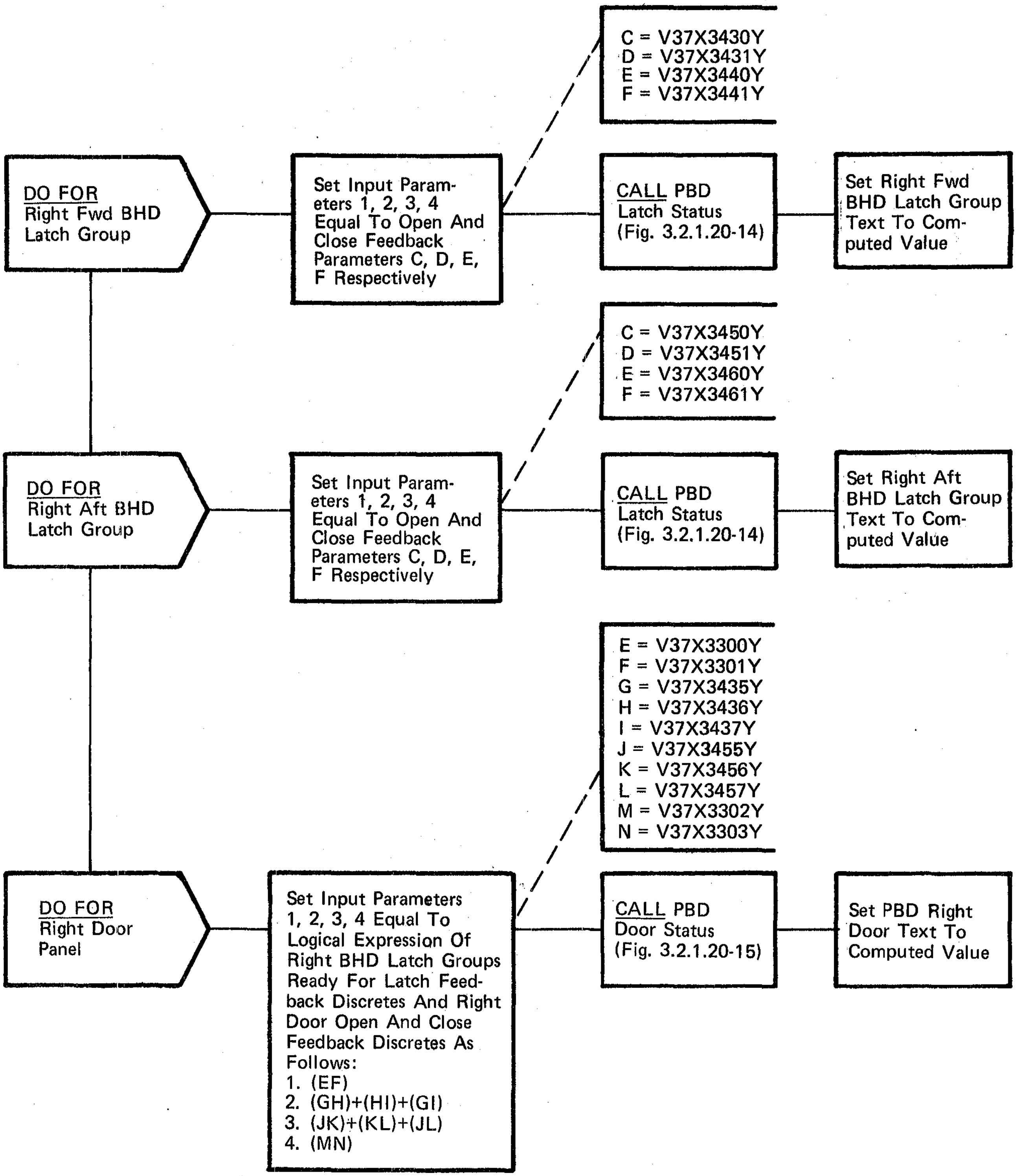

Figure 3.2.1.20-12. Right BHD Latch And Door Feedback Display

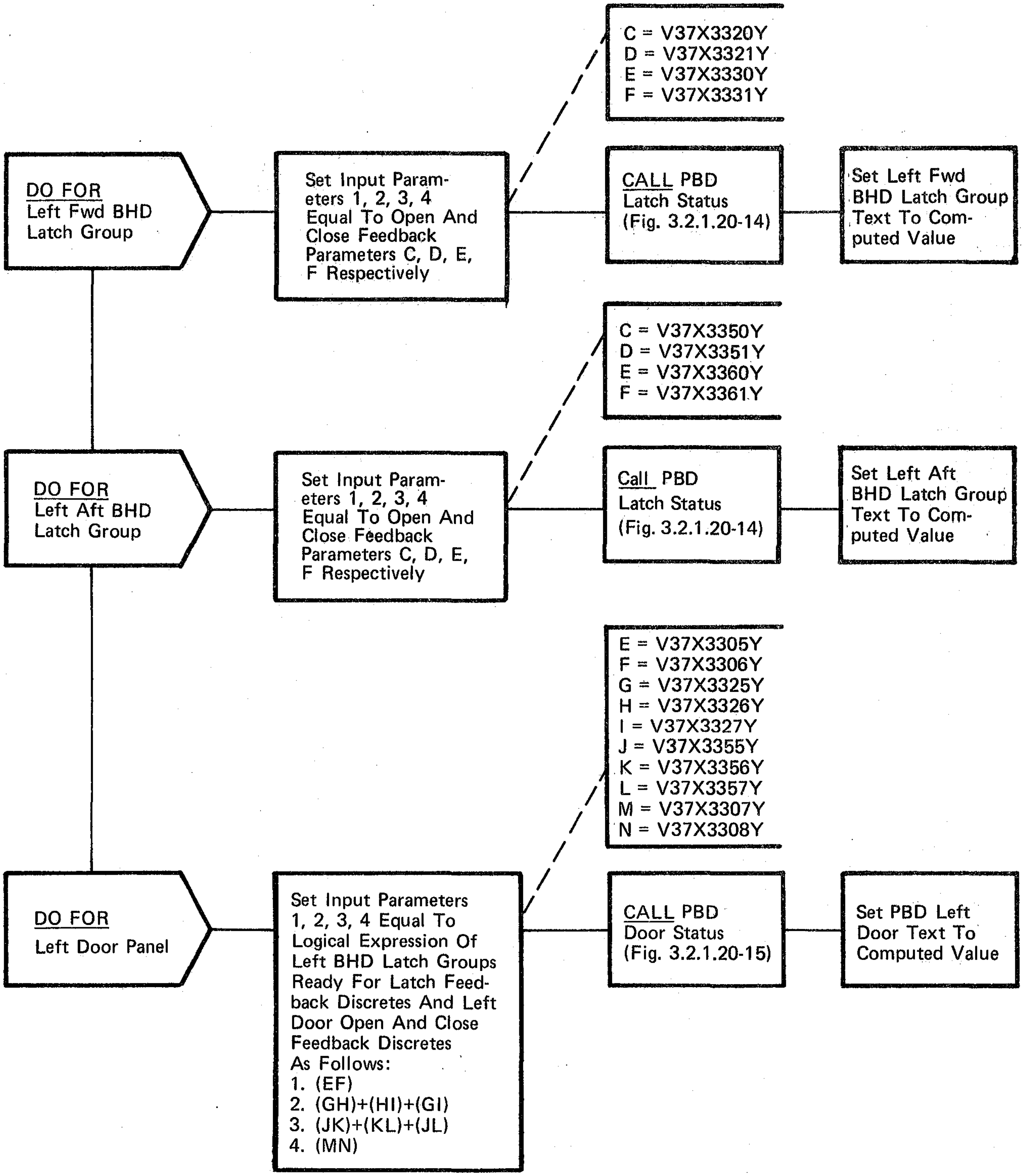

Figure 3.2.1.20-13. Left BHD Latch And Door Feedback Display

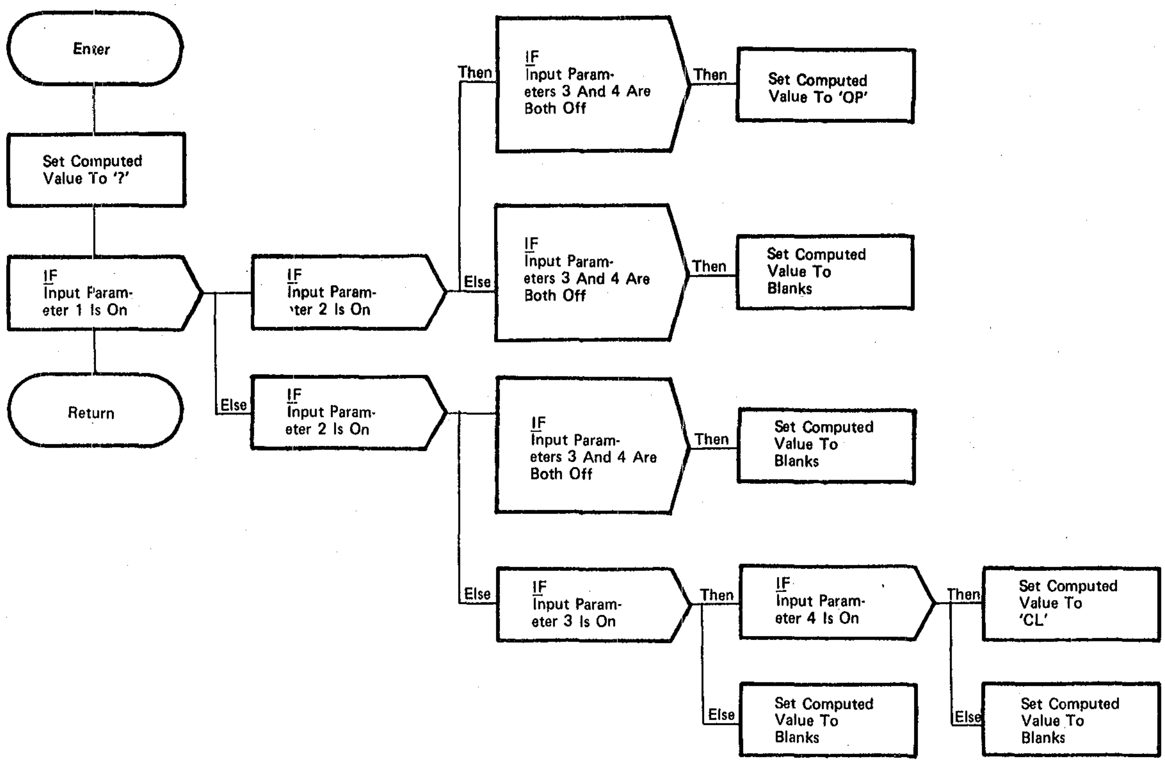

Figure 3.2.1.20-14. PBD Latch Status

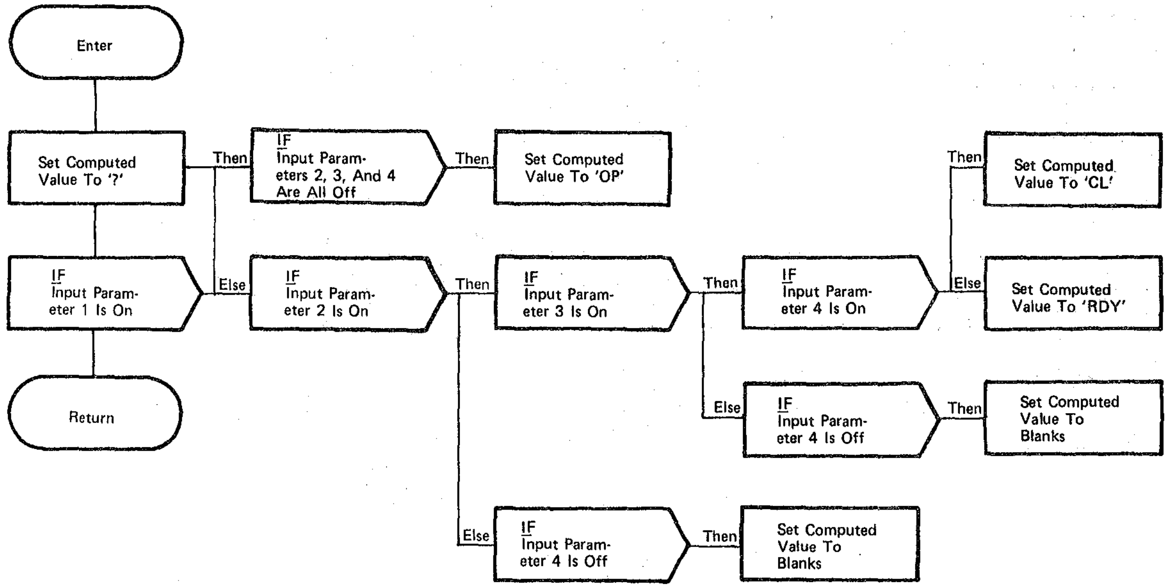

Figure 3.2.1.20-15. PBD Door Status

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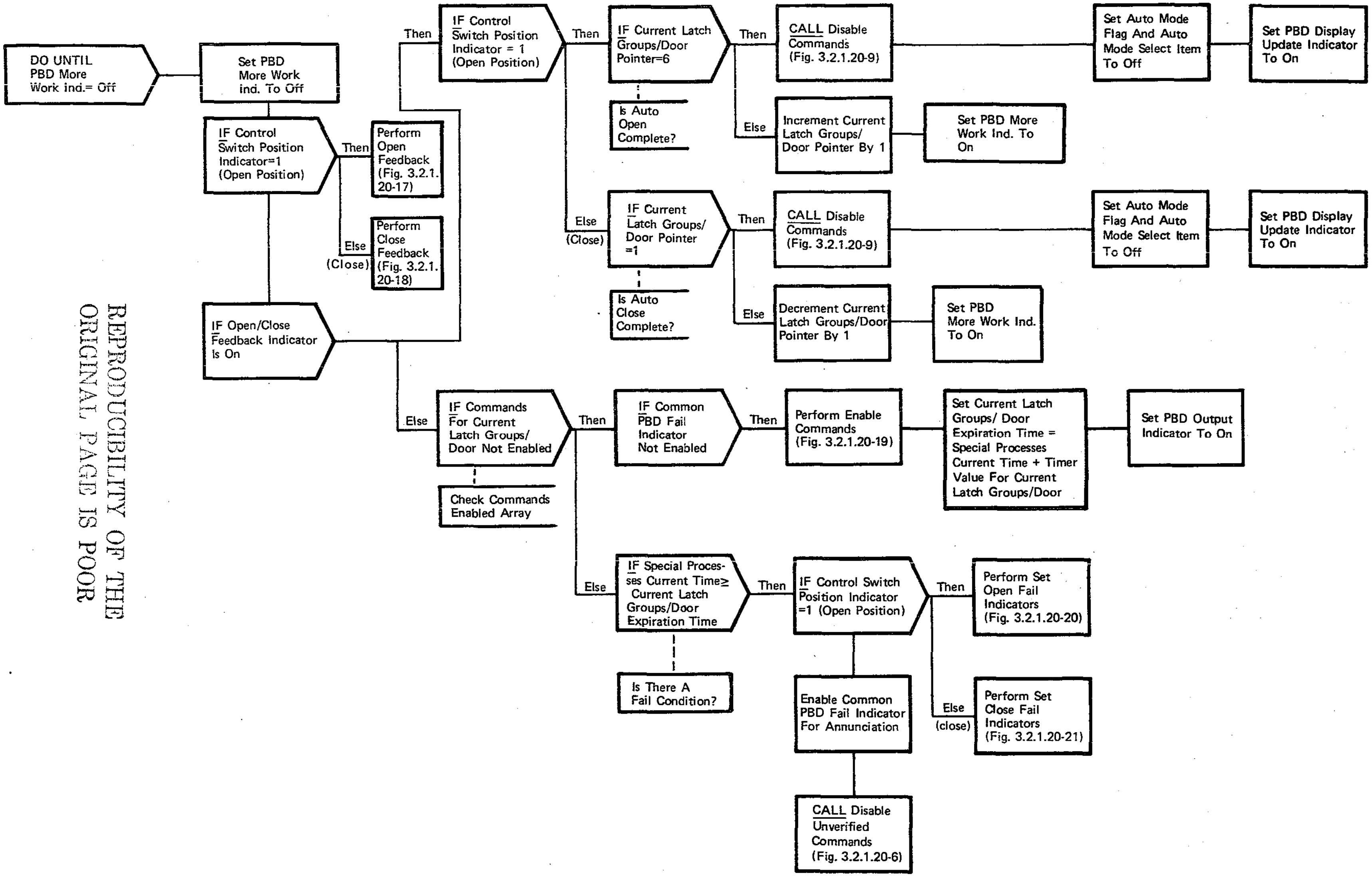

Figure 3.2.1.20-16. Auto Open/Close Sequence

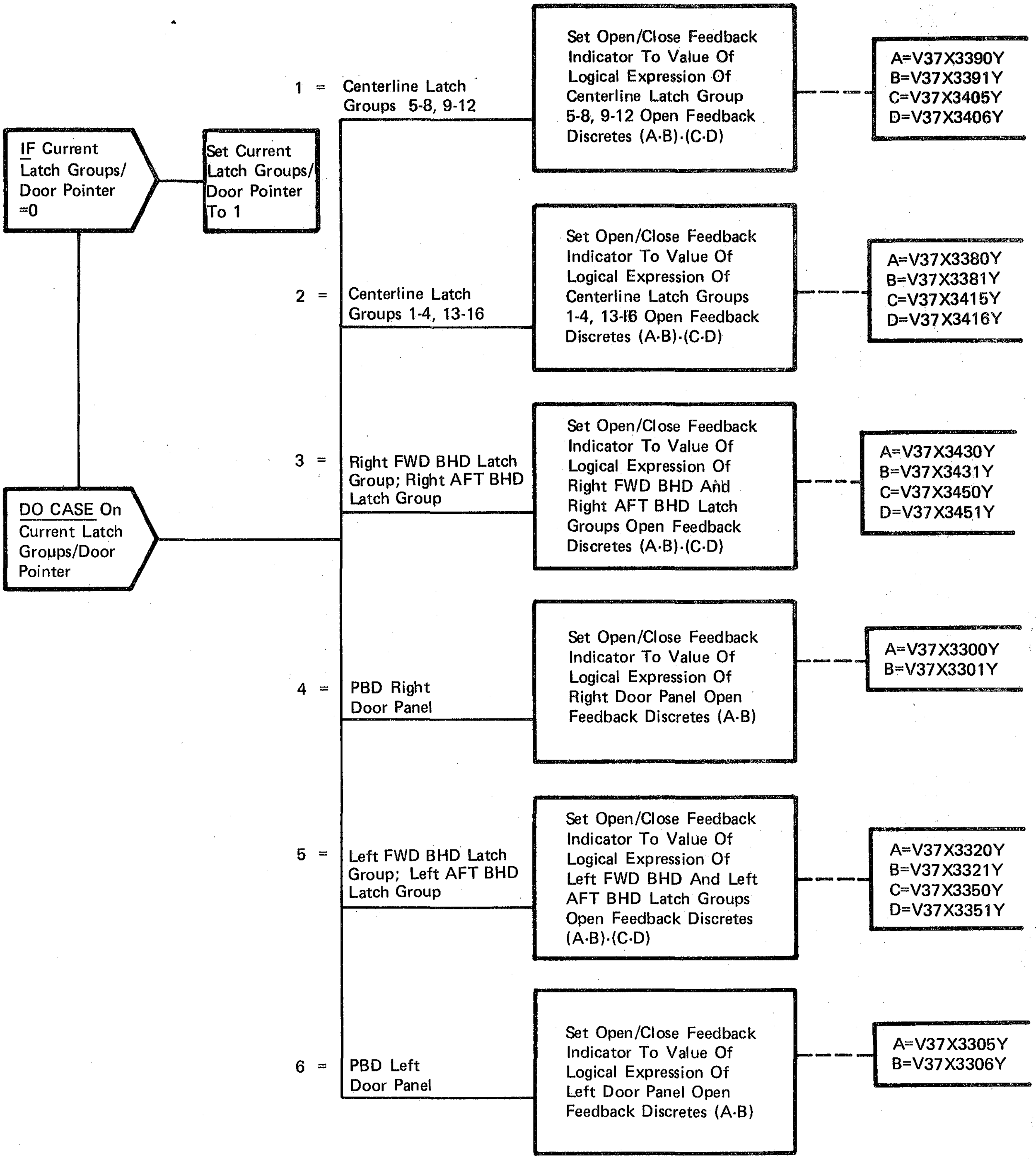

Figure 3.2.1.20-17. Open Feedback

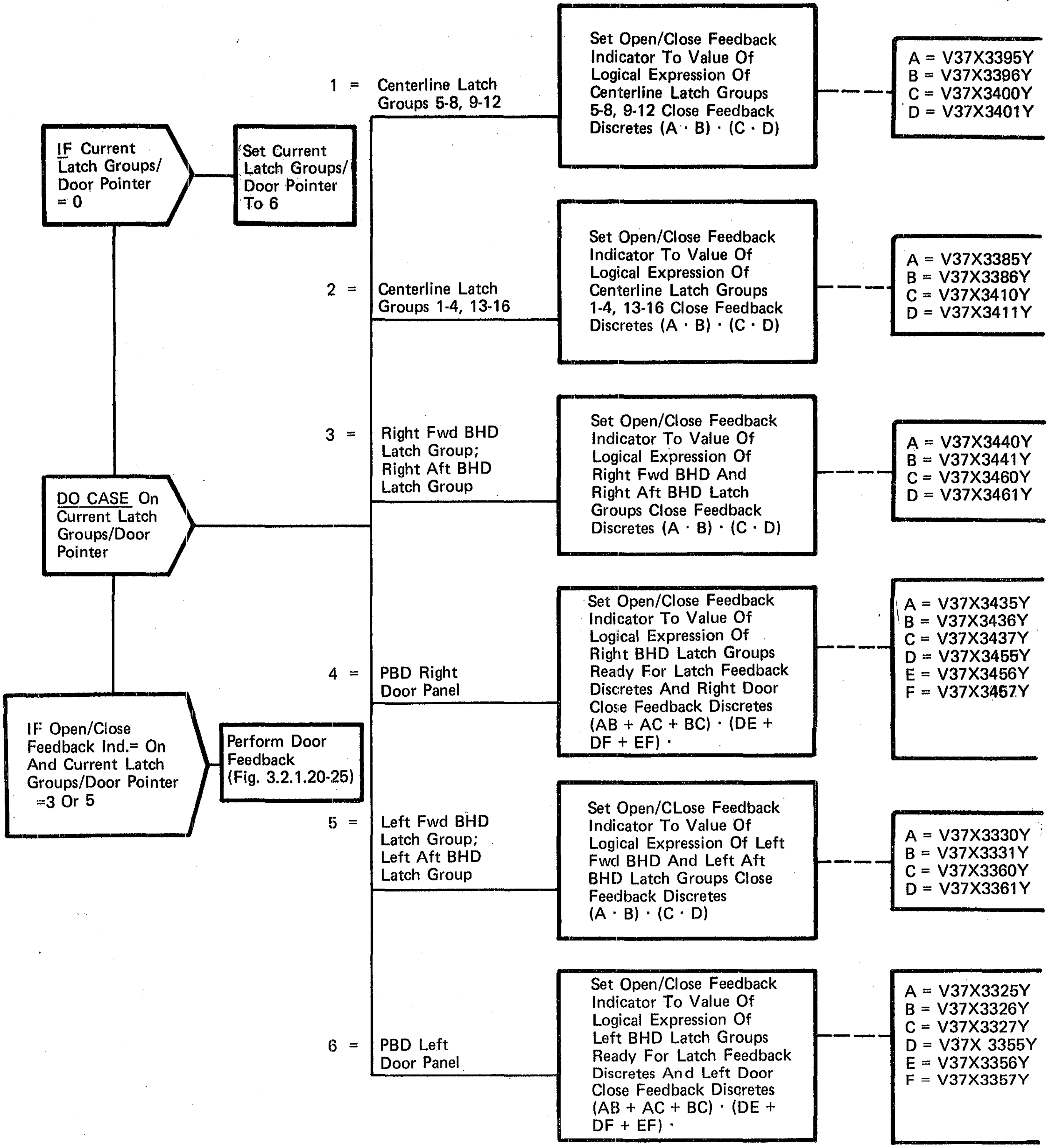

Figure 3.2.1.20-18. Close Feedback

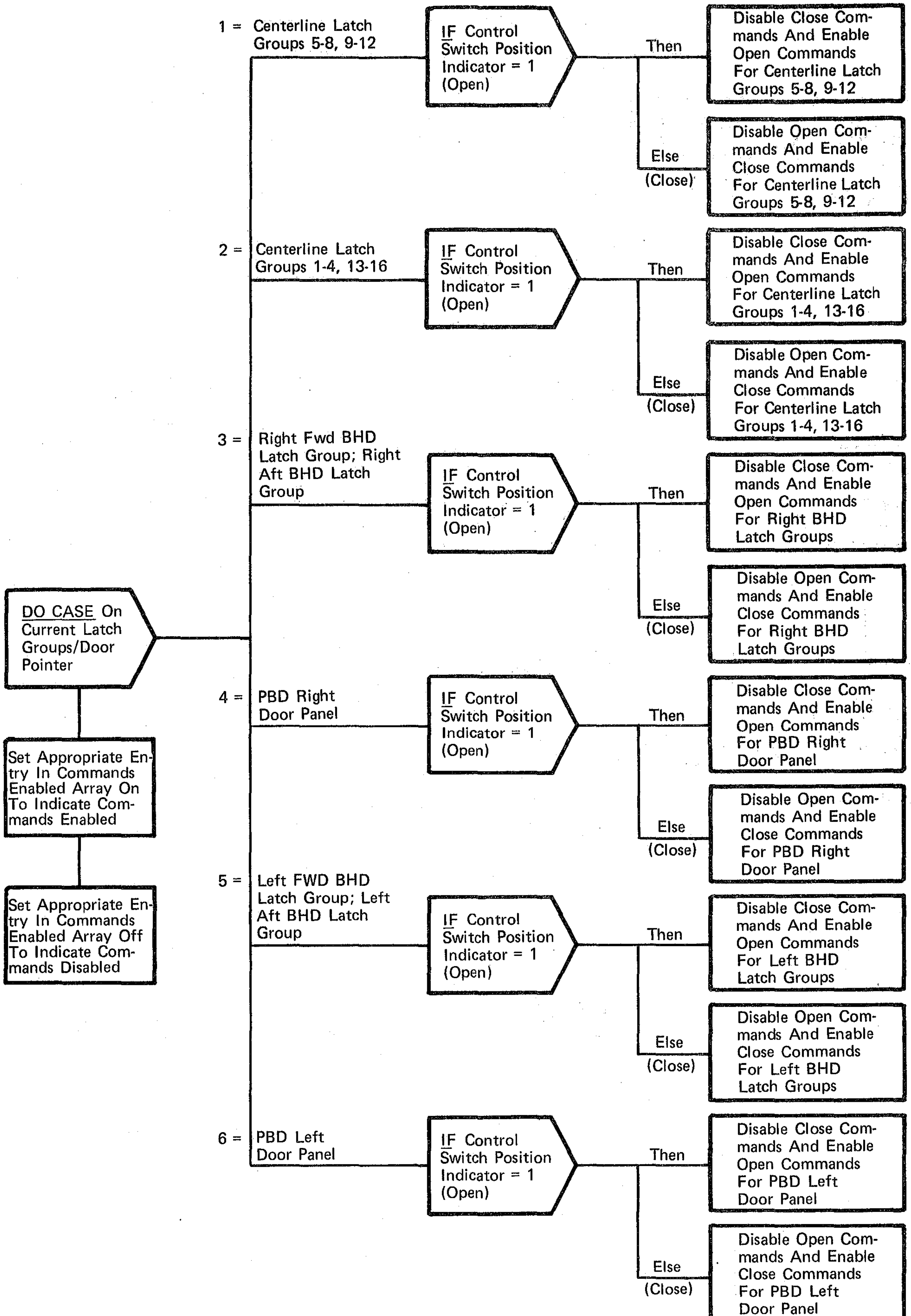

Figure 3.2.1.20-19. Enable Commands

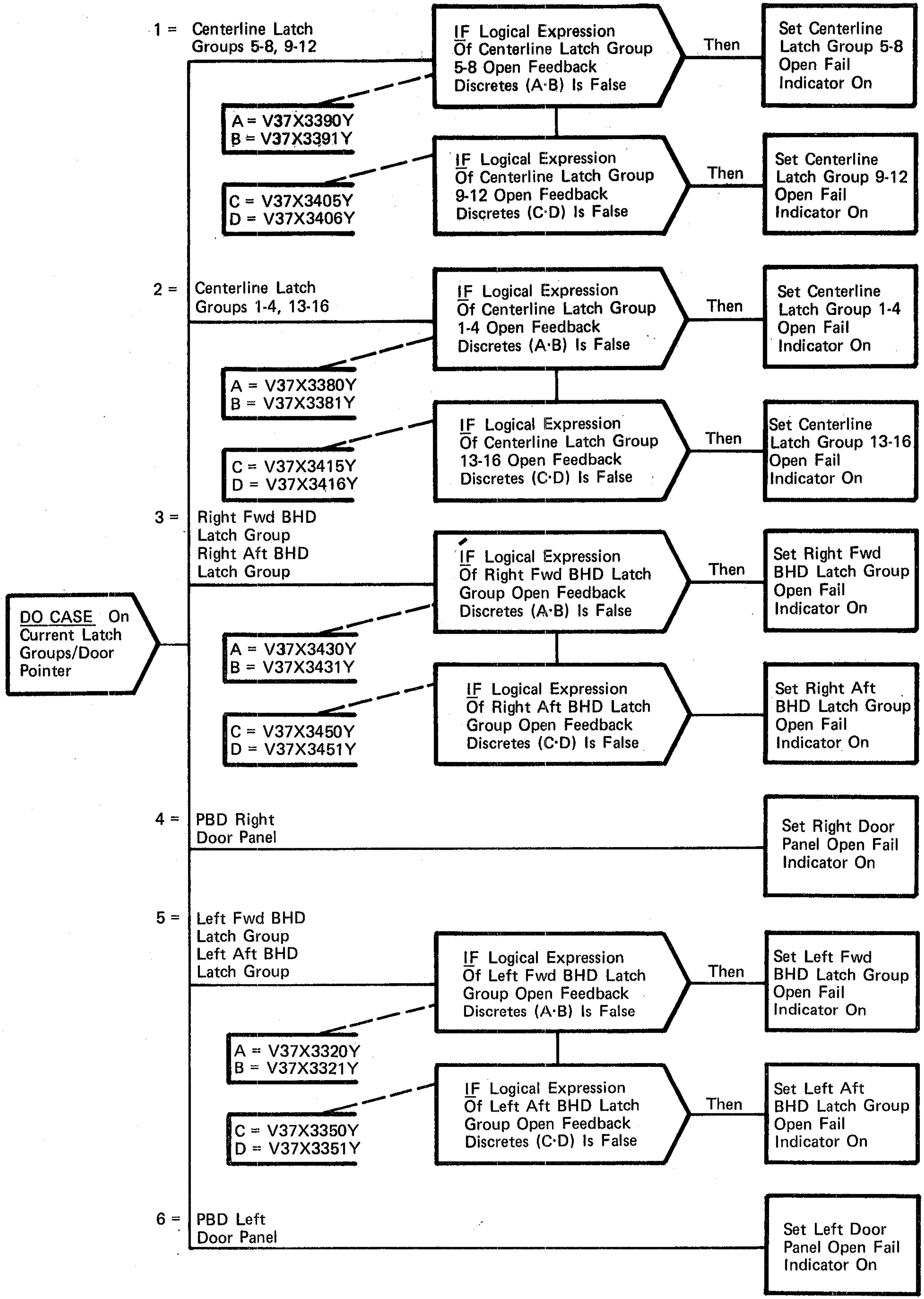

Figure 3.2.1.20-20. Set Open Fail Indicators

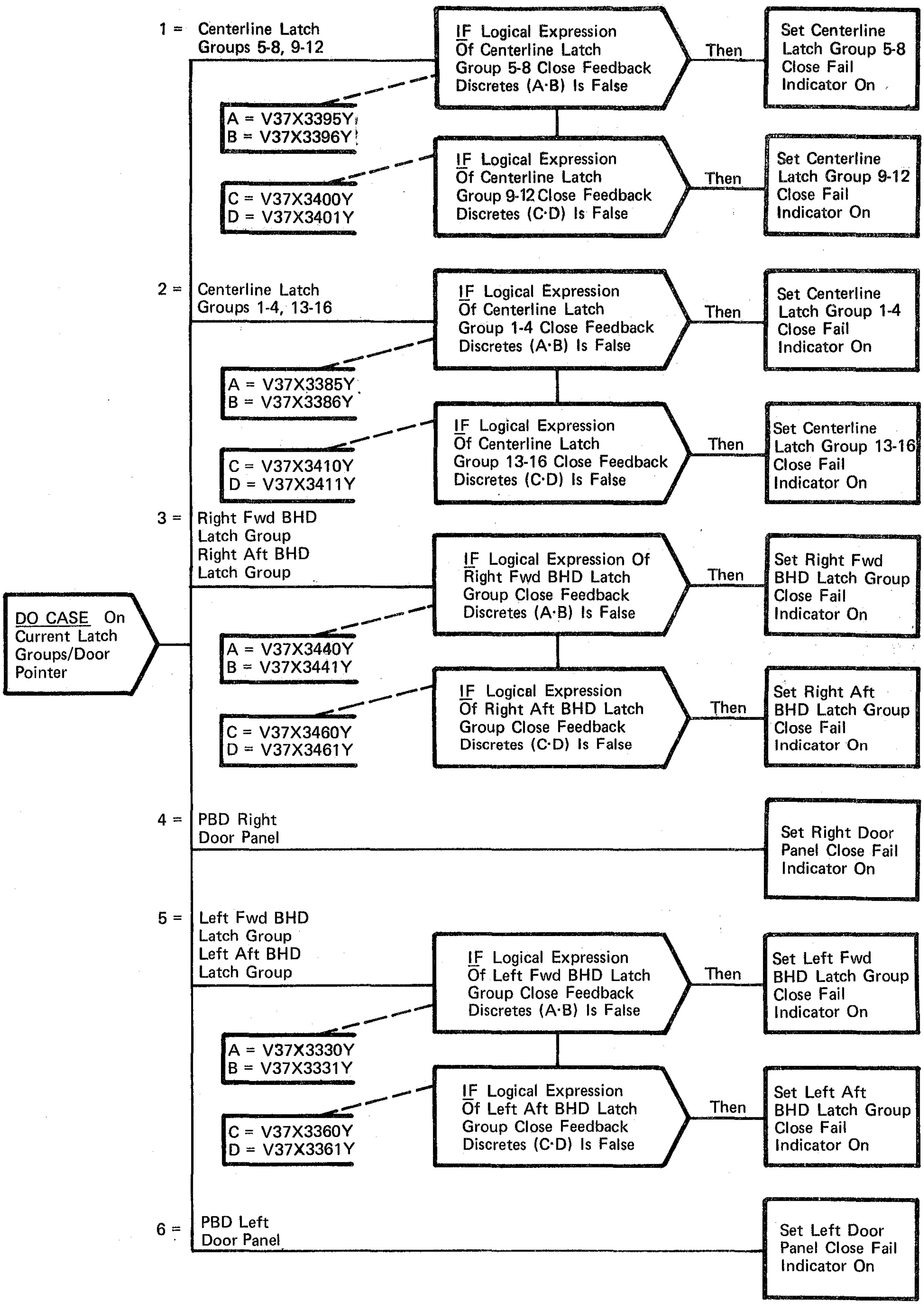

Figure 3.2.1.20-21. Set Close Fail Indicators

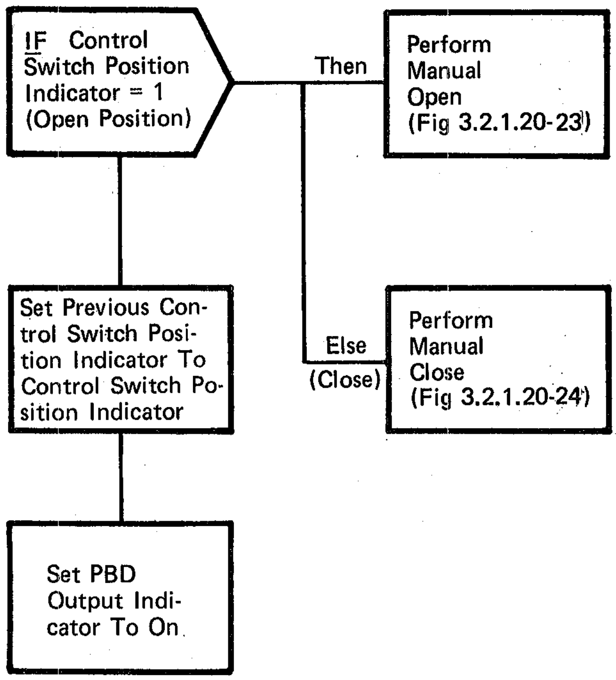

Figure 3.2.1.20-22. Manual Sequence

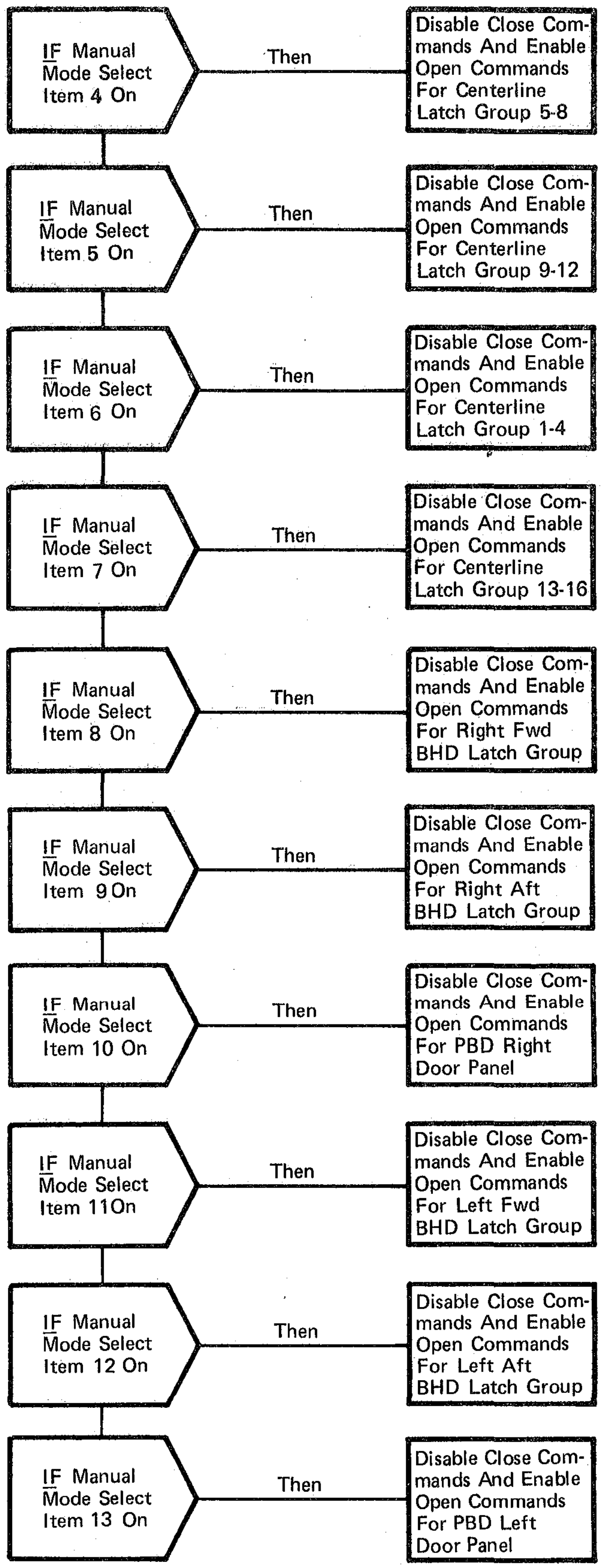

Figure 3.2.1.20-23. Manual Open

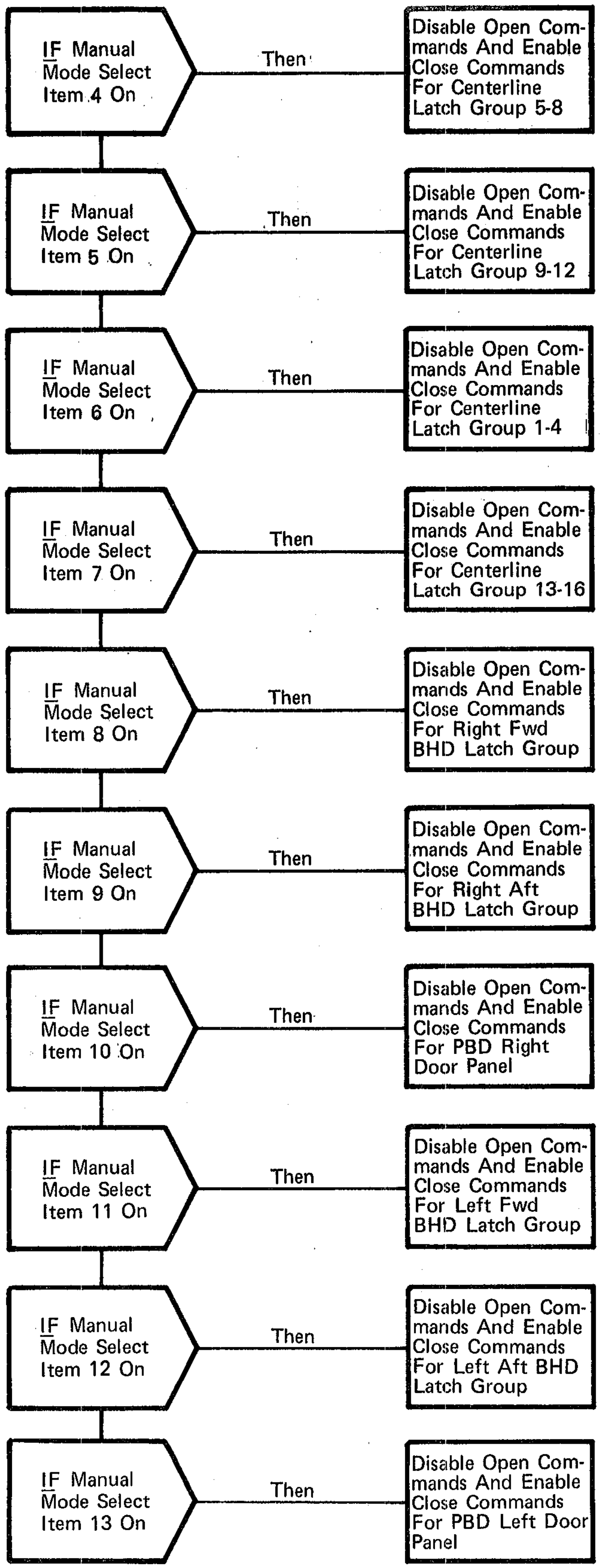

Figure 3.2.1.20-24. Manual Close

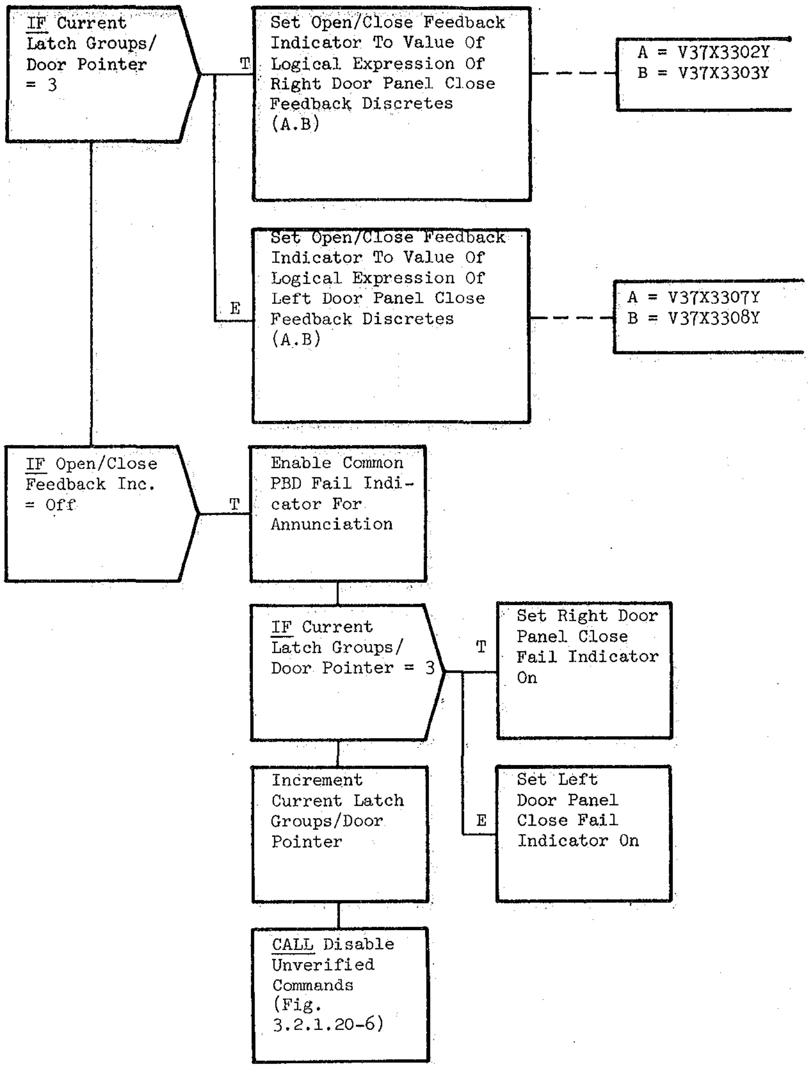

Figure 3.2.1.20-25. Door Feedback

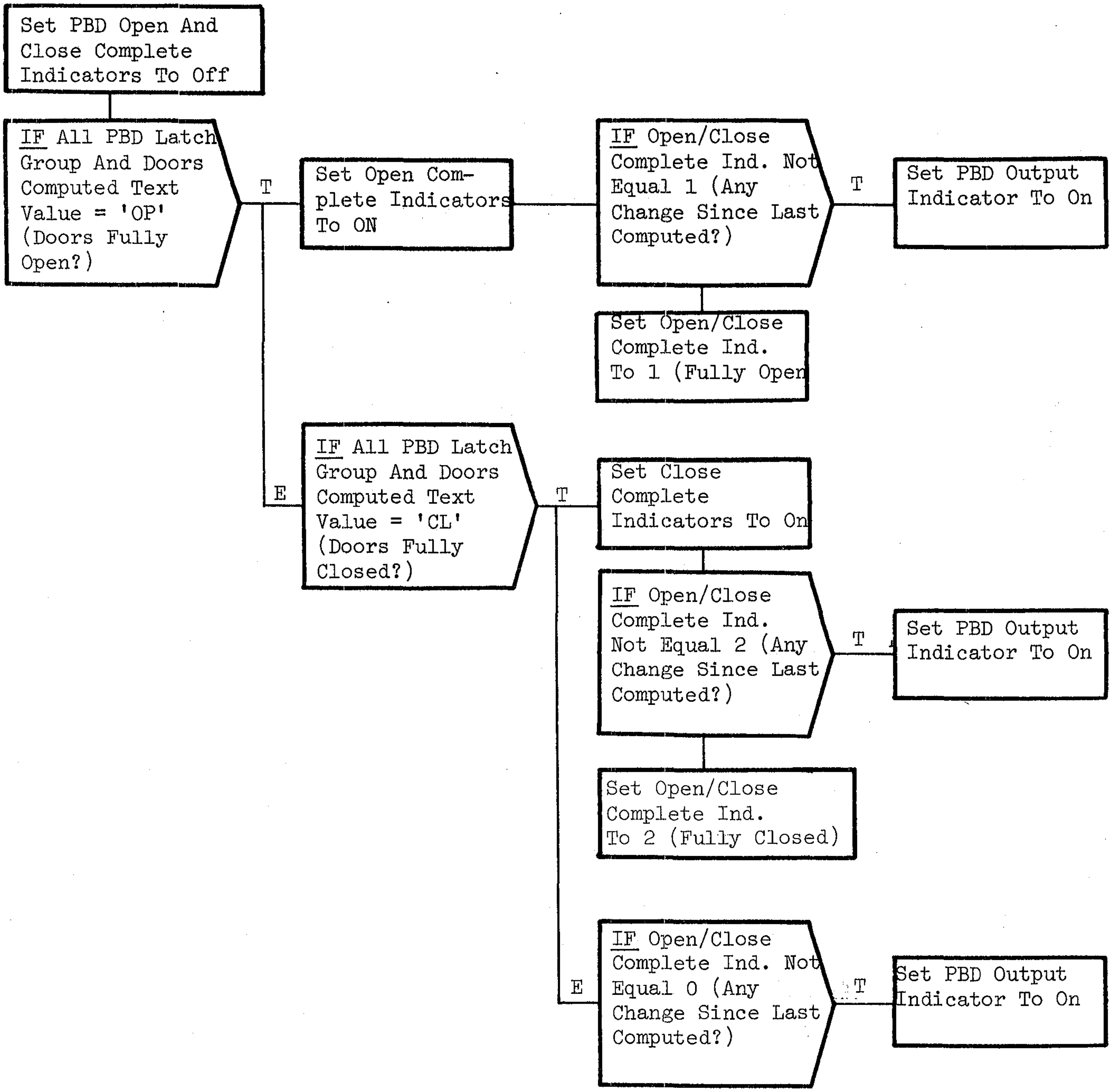

Figure 3.2.1.20-26. PBD Talkback

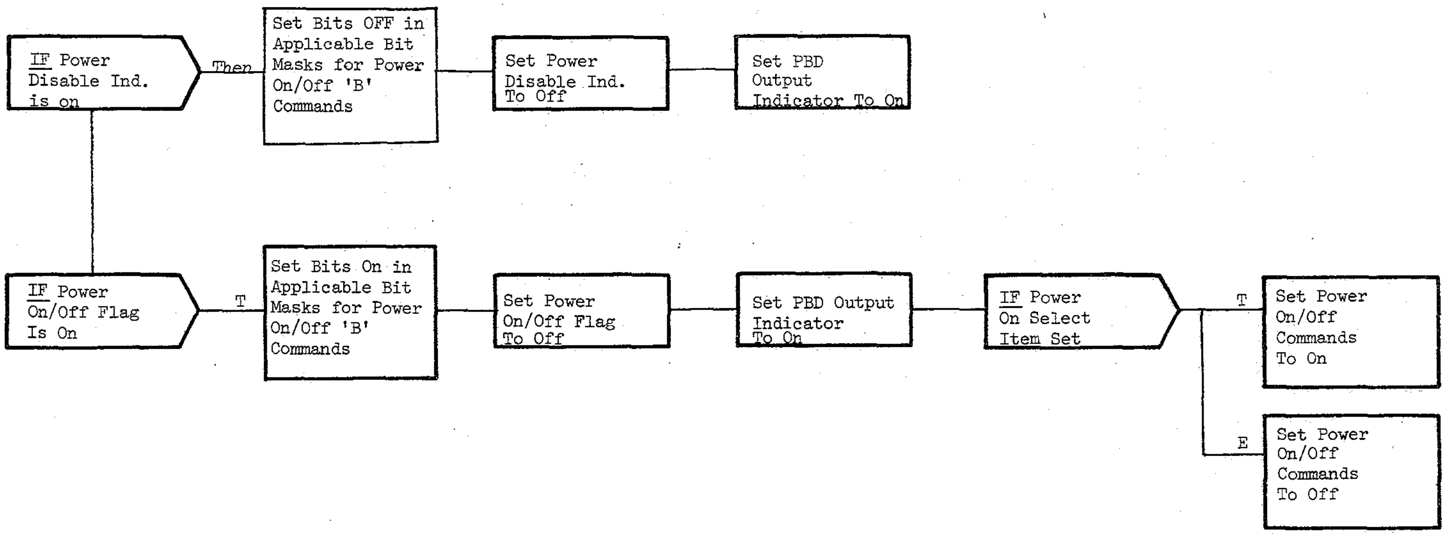

FIGURE 3.2.1.20.-27. POWER ON/OFF PROCESSING

BOOK: OFT SM Detailed Design Specification

3.2.1.21 Standby Water Coolant Loop Control (SSS_STAND_H_2O_COOL)

The Standby Water Coolant Loop Control module periodically operates the water coolant pumps to circulate water in the Standby Water Loop to prevent it from freezing.

a. Control Interface - The Standby Water Coolant Loop Control module is CALL'ed by the Special Processes Executive once every two seconds.

Invocation: CASS SSS_STAND_H_2O COOL

b. Inputs - Inputs to this module are specified in Table 3.2.1.21-1.

c. Process Description - The control flow for this module is shown in Figure 3.2.1.21-1. The Standby Water Coolant Loop Control module first determines if the control timer has expired (current time is greater than or equal to the control timer). If it has expired, the pump indicator is checked to determine whether to turn the pumps on or off. If the pump indicator is on, the pump indicator is turned off, the pump ON/OFF command indicators are set to turn off the pumps and the control timer is updated with the time to turn on the pumps. If the pump indicator is off, the pump indicator is turned on, the pump ON/OFF command indicators are set to turn on the pumps and the control timer is updated with the time to turn off the pumps. At OPS initialization (Section 3.2.1.1) the control timer is set to zero and the pump indicator is turned off. This causes the commands to turn on the pumps to be enabled on the first execution of this module. There is no OPS cleanup processing.

The elapsed time for the pumps to remain on (y time constant) and the elapsed time for the pumps to remain off (x time constant) are changeable by Table Maintenance.

d. Outputs - Outputs from this module are specified in Table 3.2.1.21-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References

D INCLUDE TEMPLATE CSS_COT	Constants Table (COT) - values
D INCLUDE TEMPLATE CSS_SPOB	Special Processes Output Buffer
D INCLUDE TEMPLATE CSS_SP_CMT	Special Processes CMT

BOOK: OFT SM Detailed Design Specification

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.21-1 Standby Water Coolant Loop Control MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	SP Current Time	A.2.11	I	SSP	CSSV_SP_CURRENT_TIME	V91M1999P	
2.	Control Timer	A.2.11, D.23	I/O	S2I	CSLV_CONTROL_TIMER		
3.	Pump Indicator	A.2.11, D.23	I	S2I	CSLB_PUMP_ON/OFF		
4.	Pump Command Indicators (Items 5-7)	A.2.16	O	SSO			
5.	Loop 1 Pump A	A.2.16	O	SSO	CSLB_LOOP1A	V61K2611Y	
6.	Loop 1 Pump B	A.2.16	O	SSO	CSLB_LOOP1B	V61K2613Y	
7.	Loops 2 Pump	A.2.16	O	SSO	CSLB_LOOP2	V61K2711Y	
8.	X TIME (H_2O Coolant Loop Cycle Time)	A.2.12, D.12	I	STM	CSLV_OFF_TIME	V92W0640C	
9.	Y TIME (H_2O Coolant Loop Pump ON TIME)	A.2.12, D.12	I	STM	CSLV_ON_TIME	V92W0641C	

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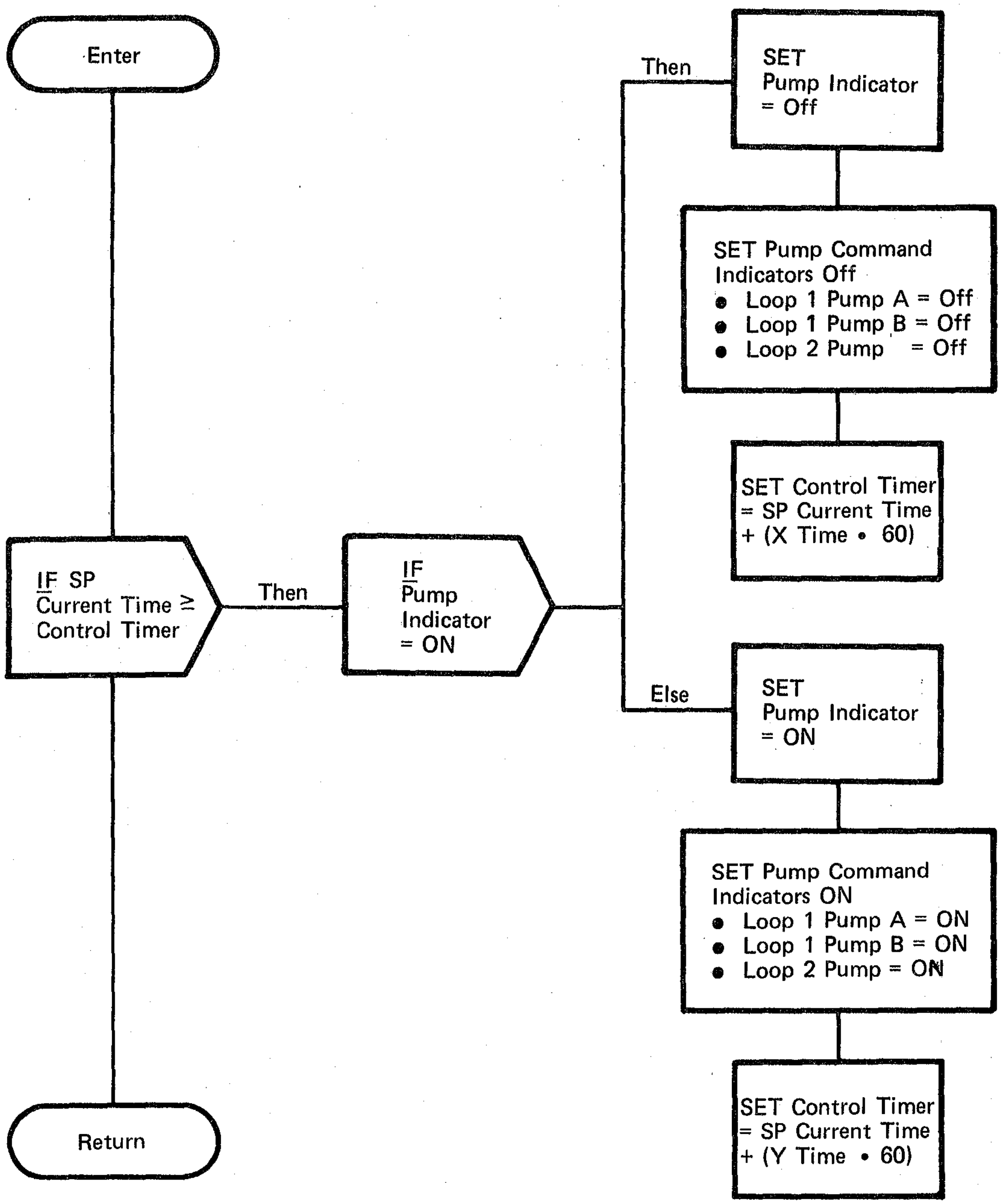

Figure 3.2.1.21-1. Standby Water Coolant Loop Control

BOOK: OFT SM Detailed Design Specification

3.2.1.22 Antenna Management (SSM_ANT_MGMT)

The Antenna Management (AM) module provides functions to select the appropriate S-band quad and hemi antennas and to steer the Ku-band antenna based on the selected targets and target positions.

a. Control Interface - The AM module is CALL'ed by the Special Processes Executive once every two seconds.

b. Inputs - Inputs to this module are specified in Table 3.2.1.22-1.

c. Process Description - The control flows for this module are shown in Figures 3.2.1.22-1 through 3.2.1.22-20. The AM module consists of three primary functions: Tracking and Data Relay Satellite (TDRS) Computations, S-band Antenna Management, and Ku-band Antenna Management.

Within these functions are several references to a set of data acquired from GNC via ICC. This data is moved from the ICC buffer to a local area before it is used for any AM processing. While the data is being moved, the ICC Router is inhibited from updating the input buffer. This, ensures the time homogeneity of the ICC data.

The I/O status of each AM discrete input is checked. If valid, that discrete is moved to a save area; otherwise the save area is not overlayed. All subsequent references to these discretes are from the save area, thereby ensuring that only valid (no I/O errors) values are used.

The first primary function, TDRS Computations, performs the following computations:

1. The position of each TDRS is computed.

2. The visibility of each TDRS from the orbiter is determined and stored for later use.

3. The roll and pitch look angles to each TDRS are computed.

The next primary function to execute is S-band Antenna Management. This function performs the following processes:

1. The quad antenna selected and the hemi antenna selected at the RF switches are determined. If any input parameter for either of these computations has an invalid parameter status indicator, that computation is bypassed. In this case, or if no antenna is selected by either of the computations, the previous output from that computation is retained and given an invalid parameter status indicator.

2. The current ground site is determined based on the ground site select item entry from the AM display and on the ground site table.

BOOK: OFT SM Detailed Design Specification

3. The TDRS to be used by S-band antennas is selected based on the S-band TDRS select item from the AM display and on the TDRS visibility results from the TDRS computations.

4. The S-band quad and hemi antennas selected by the AM module on its last previous execution are compared to the S-band quad and hemi antennas currently selected at the RF switches. Which, if any, of these comparisons to be performed is determined by checking the state of the "Auto S-Band Antenna Select Item" and the positions of the "S-band PM Antenna Switch", the "S-band Mode Switch", and the "S-band FM Antenna Switch".

5. The target to be used by S-band (ground site, east TDRS, or west TDRS) is determined based on the position of the S-band mode switch and on the results of the determinations of the current ground site and the TDRS used by the S-band antennas.

6. Depending on the target selected, either the S-band quad antenna or the S-band quad and hemi antennas which point at that target are determined and commands are set to cause the selection of these antennas at the RF switches.

The last primary function to execute is Ku-band Antenna Management. This function performs the following processes:

1. The TDRS to be used by the Ku-band antenna is selected based on the Ku-band TDRS select item from the AM display and on the TDRS visibility results from the TDRS computations.

2. The target at which the Ku-band antenna is to be pointed (east TDRS, west TDRS, or GNC target*) is determined based on the GNC pointing flag (acquired via ICC) and the results of the determination of the TDRS to be used by the Ku-band antenna.

3. The roll and pitch look angles to the selected target are computed in the Ku-band antenna's coordinate system and made available for output to the antenna.

4. Depending on the position of the Ku-band antenna steering switch, the Ku-band acquisition sequence is initiated and controlled by the Ku-band antenna management function when a new target is selected.

Except where otherwise stated, all of the functions within AM use the latest good update of the input parameters without making any attempt to ascertain their current validity.

There is no OPS initialization or cleanup processing.

*Rendevous radar is not supported until OFT 3.

d. Outputs - Outputs from this module are specified in Table 3.2.1.22-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure

Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

D INCLUDE TEMPLATE	CSS_COT	Constants Table (COT)-Values
D INCLUDE TEMPLATE	CSS_SPINB	Special Processes Input Buffer (SPINB)
D INCLUDE TEMPLATE	CSS_SPOB	Special Processes Output Buffer
D INCLUDE TEMPLATE	CSS_DDT	Display/Downlist Table
D INCLUDE TEMPLATE	CSM_AM_CMT	Antenna Management Display Parameters
D INCLUDE TEMPLATE	CSZ_ICC_CMT	ICC Input Buffers and Flags
D INCLUDE TEMPLATE	CSS_SP_CMT	Special Processes CMT
D INCLUDE TEMPLATE	CZ2_COMMON	UI/FCOS Shared Compool
D INCLUDE TEMPLATE	CZ1_COMMON	System Services Common Compool

h. Error Handling - None

i. Constraints and Assumptions -

- No check is made to determine whether data obtained via ICC was updated. The latest values are always used with compensation being made for time delays.

TABLE 3.2.1.22-1 Antenna Management

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Geocentric Horizon	E	L		SSM_GEO_HORIZON		S_O
2	Geocentric Earth Radius	E	C		CSMK_GEO_EARTH_RAD		a
3	Orbiter Position Vector	A.2.11	I	GNC	CSMV_ORB_POS		$\vec{R}_G$
4	Orbiter X Position	A.2.11	I	GNC	CSMV_ORB_POS$1	V95H0155C	R_X
5	Orbiter Y Position	A.2.11	I	GNC	CSMV_ORB_POS$2	V95H0156C	R_Y
6	Orbiter Z Position	A.2.11	I	GNC	CSMV_ORB_POS$3	V95H0157C	R_Z
7	Sine of Pitch Angle	E	L		SSM_SIN_PTCH		$\sin\theta$
8	Sine of Yaw Angle	E	L		SSM_SIN_YAW		$\sin\psi$
9	Sine of Roll Angle	E	L		SSM_SIN_ROLL		$\sin\phi$
10	Cosine of Pitch Angle	E	L		SSM_COS_PTCH		$\cos\theta$
11	Cosine of Yaw Angle	E	L		SSM_COS_YAW		$\cos\psi$
12	Cosine of Roll Angle	E	L		SSM_COS_ROLL		$\cos\phi$
13	Orbiter Pitch Angle	A.2.11	I	GNC	CSMV_ORB_PTCH	V95L3887C	θ
14	Orbiter Yaw Angle	A.2.11	I	GNC	CSMV_ORB_YAW	V95L3888C	ψ
15	Orbiter Roll Angle	A.2.11	I	GNC	CSMV_ORB_ROLL	V95L3889C	ϕ
16	Coordinates Transformation matrix	E	L		SSM_TRANSFORMATION_MATRIX		M_{BG}
16a	Orbiter Pitch Rate	A.2.11	I	GNC	CSMV_ORB_PTCH_RATE	V95R3897C	q
16b	Orbiter Yaw Rate	A.2.11	I	GNC	CSMV_ORB_YAW_RATE	V95R3898C	r
16c	Orbiter Roll Rate	A.2.11	I	GNC	CSMV_ORB_ROLL_RATE	V95R3899C	p
16d	Attitude Compensation Delay Time	A.2.12, D.12	I	STM	CSMV_ATT_COMP_TIME	V90W1013C	t
16e	Clocktime	E	I	Sys S/W	CLOCKTIME	V91M1999P	GMT_C
16f	Delta Time	E	L		SSM_DELTA_TIME		Δt
16g	Attitude Compensation Matrix	E	L		SSM_ATT_COMP_MATRIX		M_C

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TABLE MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
17	Line-of-Sight Vector to TDRS	E	L		SSM_TDRS_LOS		
18	Line-of-Sight Unit Vector to East TDRS	E	L		SSM_TDRS_UNIT_LOS$(2:*)		
19	Line-Of-Sight Unit Vector to West TDRS	E	L		SSM_TDRS_UNIT_LOS$(1:*)		
20	Line-of-sight Roll Angle to East TDRS-Rasters	A.2.18	O	CRT	CSMV_TDRS_LOS_ROLL_RAS$2	V92H1064C	E_X
21	Line-of-Sight Roll Angle to West TDRS-Rasters	A.2.18	O	CRT	CSMV_TDRS_LOS_ROLL_RAS$1	V92H1066C	W_X
22	Line-of-Sight Pitch Angle to East TDRS-Rasters	A.2.18	O	CRT	CSMV_TDRS_LOS_PTCH_RAS$2	V92H1065C	E_Y

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
23	Line-of-Sight Pitch Angle to West TDRS-Rasters	A.2.18	O	CRT	CSMV_TDRS_LOS_PTCH_RAS$1	V92H1067C	W_Y
24	Total Number of Daily Rotations since TDRS Ascending Node crossing	E	L		SSM_OMEGA_DELTA_T		$\omega\Delta t$
25	Time of East TDRS Ascending Node Crossing	A.2.12, D.32	I	STM, SUL	CSMV_TDRS_TIME_ASC_NODE$2	V92W1020C	GMT_{NE}
26	Time of West TDRS Ascending Node Crossing	A.2.12, D.32	I	STM, SUL	CSMV_TDRS_TIME_ASC_NODE$1	V92W1027C	GMT_{NW}
27	M50 to Body Quat Time	A.2.11	I	GNC	CSMV_M50_BODY_QUAT_TIME	V90W2310C	GMT_S
28	Geocentric Latitude of TDRS	E	L		SSM_TDRS_GEO_LAT		ϕ
29	Geocentric Longitude of TDRS	E	L		SSM_TDRS_GEO_LONG		λ
30	Inclination of East TDRS Orbital Plane	A.2.12, D.32	I	STM, SUL	CSMV_TDRS_INCL$2	V92H1017C	i_{SE}
31	Inclination of West TDRS Orbital Plane	A.2.12, D.32	I	STM, SUL	CSMV_TDRS_INCL$1	V92H1025C	i_{SW}
32	Fractional Part of Uncompleted Rotation	E	L		SSM_FRACTION_ROTATION		U
33	Longitude of East TDRS Ascending Node	A.2.12, D.32	I	STM, SUL	CSMV_TDRS_LONG_ASC_NODE$2	V92H1015C	λ_{NE}
34	Longitude of West TDRS Ascending Node	A.2.12, D.32	I	STM, SUL	CSMV_TDRS_LONG_ASC_NODE$1	V92H1023C	λ_{NW}
35	East TDRS Position Vector	A.2.18	O	CRT, DL	CSMV_TDRS_POS$(2:*)		T_{GE}
36	West TDRS Position Vector	A.2.18	O	CRT, DL	CSMV_TDRS_POS$(1:*)		T_{GW}
37	East TDRS X Position	A.2.18	O	CRT, DL	CSMV_TDRS_POS$(2:1)	V92H1073C	T_{GXE}
38	East TDRS Y Position	A.2.18	O	CRT, DL	CSMV_TDRS_POS$(2:2)	V92H1074C	T_{GYE}
39	East TDRS Z Position	A.2.18	O	CRT, DL	CSMV_TDRS_POS$(2:3)	V92H1075C	T_{GZE}
40	West TDRS X Position	A.2.18	O	CRT, DL	CSMV_TDRS_POS$(1:1)	V92H1076C	T_{GXW}
41	West TDRS Y Position	A.2.18	O	CRT, DL	CSMV_TDRS_POS$(1:2)	V92H1077C	T_{GYW}

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
42	West TDRS Z Position	A.2.18	O	CRT, DL	CSMV_TDRS_POS$(1:3)	V92H1078C	T_{GZW}
43	East TDRS Position Vector Magnitude	A.2.12, D.32	I	STM, SUL	CSMV_TDRS_POS_MAG$2	V92H1001C	r_{SE}
44	West TDRS Position Vector Magnitude	A.2.12, D.32	I	STM, SUL	CSMV_TDRS_POS_MAG$1	V92H1003C	r_{SW}
45	TDRS Elevation From Vertical	E	L		SSM_TDRS_ELEV_VERT		S
46	TDRS Elevation above Horizon	E	L		SSM_TDRS_ELEV_HORIZ		e
47	TDRS Visibility above Horizon	A.2.12, D.12	I	STM	CSMV_TDRS_VIS	V92H1006C	X
48	East TDRS in View Indicator	A.2.18	O	CRT, DL	CSMB_TDRS_IN_VIEW$2	V92X1060X	
49	West TDRS In view Indicator	A.2.18	O	CRT, DL	CSMB_TDRS_IN_VIEW$1	V92X1061X	
50	Line-of-Sight Computations Call List	E	L				
51	Line-of-Sight Vector to Target	E	L		SSM_TGT_LOS		$\frac{\vec{p}_G}{\lvert\vec{p}_G\rvert}$
52	Line-of-Sight Unit Vector	E	L		SSM_TGT_UNIT_LOS		$\vec{L}_B$
53	Line-of-Sight Unit Vector X-Component	E	L		SSM_TGT_UNIT_LOS$1		L_X
54	Line-of-Sight Unit Vector Y-Component	E	L		SSM_TGT_UNIT_LOS$2		L_Y
55	Line-of-Sight Unit Vector Z-Component	E	L		SSM_TGT_UNIT_LOS$3		L_Z
56	Line-of-Sight Roll Angle to Target-Degrees	E	L		SSM_TGT_ROLL_DEG		L_ϕ
57	Line-of-Sight Pitch Angle to Target-Degrees	E	L		SSM_TGT_PTCH_DEG		L_θ
58	Line-of-Sight Roll Angle to Target Rasters	E	L		SSM_TGT_ROLL_RAS		$(\ )_X$

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TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
59	Line-of-Sight Pitch Angle To Target-Rasters	E	L		SSM_TGT_PTCH_RAS		$(\ )_Y$
60	Orbiter Position Vector Magnitude	E	L		SSM_ORB_POS_MAG		$\lvert R_G \rvert$
61	Orbiter Unit Vector	E	L		SSM_ORB_UNIT		$\frac{\vec{R}_G}{\lvert R_G \rvert}$
62	TDRS Index	E	L		SSM_TDRS_INDEX		
63	Line-of-Sight Roll Angle To East TDRS - Degrees	A.2.18	O	CRT,DL	CSMV_TDRS_LOS_ROLL_DEG$2	V92H1064C	L_ϕ
64	Line-of-Sight Roll Angle To West TDRS - Degrees	A.2.18	O	CRT,DL	CSMV_TDRS_LOS_ROLL_DEG$1	V92H1066C	L_ϕ
65	Line-of-Sight Pitch Angle To East TDRS - Degrees	A.2.18	O	CRT,DL	CSMV_TDRS_LOS_PTCH_DEG$2	V92H1065C	L_θ
66	Line-of-Sight Pitch Angle to West TDRS - Degrees	A.2.18	O	CRT,DL	CSMV_TDRS_LOS_PTCH_DEG$1	V92H1067C	L_θ
67	Ku-Band TDRS Select Item	A.2.11	I	SAM	CSMB_KUBAND_TDRS_SEL		
68	Previous Ku-Band TDRS Select Item	E	L		SSM_KUBAND_PREV_TDRS_SEL		
69	TDRS Selected For Ku-Band	A.2.18	O	CRT,DL	CSMV_KUBAND_TDRS_SELECTED	V92J1052C	
70	TDRS Used For Ku-Band	E	L		SSM_KUBAND_TDRS_USED		
71	TDRS Not Last Selected For Ku-Band	E	L		SSM_KUBAND_TDRS_NOT_LAST_SEL		
72	TDRS Selection Call List	E	L				
73	TDRS Select Item	E	L		SSM_TDRS_SEL		

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TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
74	TDRS Select Auto	E	L		SSM_TDRS_SEL$1		
75	TDRS Select West	E	L		SSM_TDRS_SEL$3		
76	Previous TDRS Select Item	E	L		SSM_TDRS_PREV_SEL		
77	Previous TDRS Select Auto	E	L		SSM_TDRS_PREV_SEL$1		
78	TDRS Selected	E	L		SSM_TDRS_SELECTED		
79	GNC Pointing Flag	A.2.11	I/O	GNC/CRT, DL	CSMB_GNC_POINTING	V93X6859X	
80	Range To GNC Target	A.2.18	O	CRT,DL	CSMV_KUBAND_RANGE	V74U2651J	R
81	Ku-Band Range Command	A.2.16	O	SSO	CSMV_KUBAND_RANGE_CMD	V74U2651J	
82	Line-of-Sight Unit Vector To Ku-Band Target	E	L		SSM_KUBAND_TGT_LOS		L_B, L_A
83	Line-of-Sight Unit Vector To Ku-Band Target X-Component	E	L		SSM_KUBAND_TGT_LOS$1		L_X
84	Line-of-Sight Unit Vector To Ku-Band Target Y-Component	E	L		SSM_KUBAND_TGT_LOS$2		L_Y
85	Line-of-Sight Unit Vector To Ku-Band Target Z-Component	E	L		SSM_KUBAND_TGT_LOS$3		L_Z
86	GNC Target Vector	A.2.11	I	GNC	CSMV_GNC_TGT_VEC		$\begin{bmatrix} X_B \\ Y_B \\ Z_B \end{bmatrix}$
87	GNC Target Vector X-Component	A.2.11	I	GNC	CSMV_GNC_TGT_VEC$1	V95H3893C	X_B

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TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
88	GNC Target Vector Y-Component	A.2.11	I	GNC	CSMV_GNC_TGT_VEC$2	V95H3894C	Y_B
89	GNC Target Vector Z-Component	A.2.11	I	GNC	CSMV_GNC_TGT_VEC$3	V95H3895C	Z_B
90	Ku-Band Bias Correction Matrix	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX		M_{AB}
91	Ku-Band Bias Correction Matrix Element 1-1	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(1,1)	V92U1034C	
92	Ku-Band Bias Correction Matrix Element 1-2	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(1,2)	V92U1035C	
93	Ku-Band Bias Correction Matrix Element 1-3	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(1,3)	V92U1036C	
94	Ku-Band Bias Correction Matrix Element 2-1	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(2,1)		
95	Ku-Band Bias Correction Matrix Element 2-2	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(2,2)	V92U1041C	
96	Ku-Band Bias Correction Matrix Element 2-3	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(2,3)	V92U1042C	
97	Ku-Band Bias Correction Matrix Element 3-1	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(3,1)	V92U1045C	
98	Ku-Band Bias Correction Matrix Element 3-2	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(3,2)	V92U1046C	
99	Ku-Band Bias Correction Matrix Element 3-3	A.2.12,D.32	I	STM,SUL	CSMV_KUBAND_BIAS_MATRIX$(3,3)	V92U1047C	
100	Ku-Band Roll Look Angle To Target	A.2.18	O	CRT,DL	CSMV_KUBAND_ROLL	V74H2648J	L_ϕ
101	Ku-Band Roll Angle Command	A.2.16	O	SSO	CSMV_KUBAND_ROLL_CMD	V74H2648J	
102	Ku-Band Pitch Look Angle To Target	A.2.18	O	CRT,DL	CSMV_KUBAND_PTCH	V74H2650J	L_θ
103	Ku-Band Pitch Angle Command	A.2.16	O	SSO	CSMV_KUBAND_PTCH_CMD	V74H2650J	

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
104	Ku-Band Steering Switch GPC Acq Indicator-input location	A.2.17	I	SSD	CSSV_SPINB_D10080201$4	V74X2587J	
104A	KU-Band Steering Switch GPC Acq Indicator	A.2.17	I/O	SSD/CRT, DL	CSMB_KUBAND_STEERING_GPC_ACQ		
105	Acquisition Sequence Flag	E	L		SSM_KUBAND_ACQ_SEQ		
106	TDRS Used For Ku-Band Last Cycle	E	L		SSM_KUBAND_TDRS_USED_LAST		
107	TDRS West Select Discrete	A.2.16	O	SSO,CRT,DL	CSMB_KUBAND_TDRS_WEST_SEL_CMD	V74X2633J	
108	TDRS East Select Discrete	A.2.16	O	SSO,CRT,DL	CSMB_KUBAND_TDRS_EAST_SEL_CMD	V74X2632J	
109	Detect Flag-input location	A.2.17	I	SSD	CSSV_SPINB_D10080202$2	V74X2602J	
109A	Detect Flag	A.2.17	I/O	SSD/CRT,DL	CSMB_KUBAND_DETECT		
110	GNC Pointing Flag Last Cycle	E	L		SSM_GNC_POINTING_LAST_CYCLE		
111	Search-Initiate Discrete	!.2.16	O	SSO	CSMB_SEARCH_INT_CMD	V74K2631J	
112	Search-In-Progress Flag	E	L		SSM_SEARCH_IN_PROGRESS		
113	Time to Initiate Search	E	L		SSM_SEARCH_INIT_TIME		
114	Special Processes Current Time	A.2.11	I	SSP	CSSV_SP_CURRENT_TIME		
115	X-Second Delay	A.2.12,D.12	I	STM	CSMV_KUBAND_X_SEC_DELAY	V92W1010C	
116	Search Discrete-input location	A.2.17	I	SSD	CSSV_SPINB_D10080202$1	V74X2601J	
116A	Search Discrete	A.2.17	I/O	SSD/CRT, DL	CSMB_KUBAND_SEARCH_DISC		
117	Search Discrete Previous Cycle	E	L		SSM_KUBAND_SEARCH_LAST_CYCLE		
118	AM ICC Input Buffer	A.2.11,D.15	I	GNC	CSMV_AM_ICC		
119	AM ICC Enable Flag	E	O	U/I	ENABLE_AM_DATA_MSG		

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TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
120	S-Band TDRS Select Item	A.2.11	I	SAM	CSMB_SBAND_TDRS_SEL		
121	Previous S-Band TDRS Select Item	E	L		SSM_SBAND_PREV_TDRS_SEL		
122	TDRS Selected For S-Band	A.2.18	O	CRT,DL	CSMV_SBAND_TDRS_SELECTED	V92J1055C	
123	Auto S-Band Select Enabled	A.2.11	I	SAM	CSMB_SBAND_AUTO_SEL$1	V93X5625X	
124	Quad Verification Fail Indicator	A.2.16	O	CRT,DL	CSMB_SBAND_QUAD_VERIF_FAIL	V92X1049X	
125	Hemi Verification Fail Indicator	A.2.16	O	CRT,DL	CSMB_SBAND_HEMI_VERIF_FAIL	V92X1050X	
126	S-Band Quad Selected Discretes	A.2.17	I	SSD			
127	S-Band Quad S1A Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_A	V74X7070E	a
128	S-Band Quad S1B Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_B	V74X7072E	b
129	S-Band Quad S2A Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_C	V74X7074E	c
130	S-Band Quad S2B Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_D	V74X7076E	d
131	S-Band Quad S3A Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_E	V74X7078E	e
132	S-Band Quad S3B Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_F	V74X7080E	f
133	S-Band Quad S4A Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_G	V74X7082E	g
134	S-Band Quad S4B Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_H	V74X7084E	h
135	S-Band Quad Transponder 1 Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_L	V74X4780E	l
136	S-Band Quad Transponder 2 Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_M	V74X4781E	m

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
137	S-Band Quad Preamp High Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_N	V74X4779E	n
138	S-Band Quad Preamp Low Selected	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_P	V74X4778E	p
139	S-Band Hemi Selected Discretes	A.2.17	I	SSD			
140	S-Band Hemi S5A Selected	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_J	V74X6675E	j
141	S-Band Hemi S5B Selected	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_K	V74X6676E	k
142	S-Band Hemi Transmitter -1 Selected	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_Q	V74X6120E	q
143	S-Band Hemi Transmitter 2 Selected	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_R	V74X6121E	r
144	S-Band Quad S1A Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_A_STATUS		
145	S-Band Quad S1B Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_B_STATUS		
146	S-Band Quad S2A Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_C_STATUS		
147	S-Band Quad S2B Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_D_STATUS		
148	S-Band Quad S3A Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_E_STATUS		
149	S-Band Quad S3B Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_F_STATUS		
150	S-Band Quad S4A Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_G_STATUS		
151	S-Band Quad S4B Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_H_STATUS		
152	S=Band Quad Transponder 1 Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_L_STATUS		
153	S-Band Quad Transponder 2 Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_M_STATUS		

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TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
154	S-Band Quad Preamp High Selected Status	A.2.17	I	SSD	CSMB_SBAND_QUAD_SEL_N_STATUS		
155	S-Band Quad Preamp Low Selected Status	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_P_STATUS		
156	S-Band Hemi S5A Selected Status	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_J_STATUS		
157	S-Band Hemi S5B Selected Status	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_K_STATUS		
158	S-Band Hemi Transmitter 1 Selected Status	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_Q_STATUS		
159	S-Band Hemi Transmitter 2 Selected Status	A.2.17	I	SSD	CSMB_SBAND_HEMI_SEL_R_STATUS		
160	S-Band Quad Selected	A.2.18	O	CRT	CSMV_SBAND_QUAD_SELECTED	V92J1057C	
161	S-Band Quad Selected Status	A.2.18	O	CRT	CSMV_SBAND_QUAD_SELECTED_ STATUS		
162	S-Band Hemi Selected	A.2.18	O	CRT	CSMV_SBAND_HEMI_SELECTED	V92J1056C	
163	S-Band Hemi Selected Status	A.2.18	O	CRT	CSMV_SBAND_HEMI_SELECTED_ STATUS		
164	S-Band Site Select Next	A.2.11	I/O	SAM/CRT	CSMB_SBAND_SITE_SEL$2	V93X5622X	
165	S-Band Site Select Auto	A.2.11	O	CRT	CSMB_SBAND_SITE_SEL$1	V93X5620X	
166	Current Site Pointer	E	L		SSM_CURRENT_SITE_PTR		
167	Sine of Site Visibility	E	L		SSM_SIN_SITE_VIS		sin E
168	Site Visibility Above Horizon	A.2.12,D.12	I	STM	CSMV_SITE_VIS_ABOVE_HORIZON	V92H1005C	E
169	Site Selected Flag	E	L		SSM_SITE_SEL_FLAG		
169A	Site In View Flag	A.2.18	O	CRT,DL	CSMB_SITE_IN_VIEW		
170	Site Counter	E	L		SSM_SITE_CTR		

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TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
171	Site Inhibit Flags	A.2.12,D.12	I	STM	CSMB_SITE_INH		
172	Site 1 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(1:)	V92X0976X	
173	Site 2 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(2:)	V92X0977X	
174	Site 3 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(3:)	V92X0978X	
175	Site 4 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(4:)	V92X0979X	
176	Site 5 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(5:)	V92X0980X	
177	Site 6 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(6:)	V92X0981X	
178	Site 7 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(7:)	V92X0982X	
179	Site 8 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(8:)	V92X0983X	
180	Site 9 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(9:)	V92X0984X	
181	Site 10 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(10:)	V92X0985X	
182	Site 11 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(11:)	V92X0986X	
183	Site 12 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(12:)	V92X0987X	
184	Site 13 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(13:)	V92X0988X	
185	Site 14 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(14:)	V92X0989X	
185a	Site 15 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(15:)	V92X0990X	
185b	Site 16 Inhibit Flag	A.2.12,D.12	I	STM	CSMB_SITE_INH$(16:)	V92X0991X	
186	Line-of-Sight Vector To Site	E	L		SSM_SITE_LOS		$\frac{\vec{D}_G}{\lvert D_G \rvert}$

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TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
187	Site Vectors	A.2.11	I		CSMK_SITE_POS		
188	Site 1 Vector	A.2.11	I		CSMK_SITE_POS$(1:*)		T_G
189	Site 1 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(1:1)	V98U5001C	
190	Site 1 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(1:2)	V98U5002C	
191	Site 1 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(1:3)	V98U5003C	
192	Site 2 Vector	A.2.11	I		CSMK_SITE_POS$(2:*)		T_G
193	Site 2 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(2:1)	V98U5005C	
194	Site 2 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(2:2)	V98U5006C	
195	Site 2 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(2:3)	V98U5007C	
196	Site 3 Vector	A.2.11	I		CSMK_SITE_POS$(3:*)		T_G
197	Site 3 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(3:1)	V98U5009C	
198	Site 3 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(3:2)	V98U5010C	
199	Site 3 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(3:3)	V98U5011C	
200	Site 4 Vector	A.2.11	I		CSMK_SITE_POS$(4:*)		T_G
201	Site 4 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(4:1)	V98U5013C	
202	Site 4 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(4:2)	V98U5014C	
203	Site 4 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(4:3)	V98U5015C	
204	Site 5 Vector	A.2.11	I		CSMK_SITE_POS$(5:*)		T_G

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
205	Site 5 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(5:1)	V98U5017C	
206	Site 5 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(5:2)	V98U5018C	
207	Site 5 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(5:3)	V98U5019C	
208	Site 6 Vector	A.2.11	I		CSMK_SITE_POS$(6:*)		T_G
209	Site 6 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(6:1)	V98U5021C	
210	Site 6 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(6:2)	V98U5022C	
211	Site 6 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(6:3)	V98U5023C	
212	Site 7 Vector	A.2.11	I		CSMK_SITE_POS$(7:*)		T_G
213	Site 7 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(7:1)	V98U5025C	
214	Site 7 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(7:2)	V98U5026C	
215	Site 7 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(7:3)	V98U5027C	
216	Site 8 Vector	A.2.11	I		CSMK_SITE_POS$(8:*)		T_G
217	Site 8 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(8:1)	V98U5029C	
218	Site 8 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(8:2)	V98U5030C	
219	Site 8 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(8:3)	V98U5031C	
220	Site 9 Vector	A.2.11	I		CSMK_SITE_POS$(9:*)		T_G
221	Site 9 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(9:1)	V98U5033C	

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
222	Site 9 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(9:2)	V98U5034C	
223	Site 9 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(9:3)	V98U5035C	
224	Site 10 Vector	A.2.11	I		CSMK_SITE_POS$(10:*)		T_G
225	Site 10 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(10:1)	V98U5037C	
226	Site 10 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(10:2)	V98U5038C	
227	Site 10 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(10:3)	V98U5039C	
228	Site 11 Vector	A.2.11	I		CSMK_SITE_POS$(11:*)		T_G
229	Site 11 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(11:1)	V98U5041C	
230	Site 11 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(11:2)	V98U5042C	
231	Site 11 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(11:3)	V98U5043C	
232	Site 12 Vector	A.2.11	I		CSMK_SITE_POS$(12:*)		T_G
233	Site 12 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(12:1)	V98U5045C	
234	Site 12 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(12:2)	V98U5046C	
235	Site 12 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(12:3)	V98U5047C	
236	Site 13 Vector	A.2.11	I		CSMK_SITE_POS$(13:*)		T_G
237	Site 13 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(13:1)	V98U5049C	
238	Site 13 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(13:2)	V98U5050C	

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
239	Site 13 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(13:3)	V98U5051C	
240	Site 14 Vector	A.2.11	I		CSMK_SITE_POS$(14:*)		T_G
241	Site 14 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(14:1)	V98U5053C	
242	Site 14 Vector Y-Component	A.2.11	I		CSMK_SITE_POS$(14:2)	V98U5054C	
243	Site 14 Vector	A.2.11	I		CSMK_SITE_POS$(14:3)	V98U5055C	
243a	Site 15 Vector	A.2.11	I		CSMK_SITE_POS$(15:*)		T_G
243b	Site 15 Vector X-Component	A.2.11	I		CSMK_SITE_POS$(15:1)	V98U5057C	
243c	Site 15 Vector Y-Conponent	A.2.11	I		CSMK_SITE_POS$(15:2)	V98U5058C	
243d	Site 15 Vector Z-Component	A.2.11	I		CSMK_SITE_POS$(15:3)	V98U5059C	
243e	Site 16 Vector	A.2.11	I	STM	CSMK_SITE_POS$(16:*)		T_G
243f	Site 16 Vector X-Component	A.2.11	I	STM	CSMK_SITE_POS$(16:1)	V98U5061C	
243g	Site 16 Vector Y-Component	A.2.11	I	STM	CSMK_SITE_POS$(16:2)	V98U5062C	
243h	Site 16 Vector Z-Component	A.2.11	I	STM	CSMK_SITE_POS$(16:3)	V98U5063C	
243i	Constants Site 16 Vector	A.2.12	I	STM	CMSV_SITE_16_POS$(*)	V98U5061C V98U5062C V98U5063C	
244	Sine of Elevation Angle	E	L		SSM_SIN_SITE_ELEV		C
245	Current Ground Site	A.2.18	O	CRT,DL	CSMV_CURRENT_GROUND_SITE	V92J1054C	
246	Line-of-Sight Roll Angle to Current Site - Degrees	A.2.18	O	CRT,DL	CSMV_SITE_LOS_ROLL_DEG	V92H1069C	S_X
247	Line-of-Sight Pitch Angle to Current Site - Degrees	A.2.18	O	CRT,DL	CSMV_SITE_LOS_PTCH_DEG	V92H1068C	S_Y
248	Line-of-Sight Roll Angle to Current site - Rasters	A.2.18	O	CRT	CSMV_SITE_LOS_ROLL_RAS	V92H1069C	$(\ )_X$
249	Line-of-Sight Pitch Angle to Current Site-Rasters	A.2.18	O	CRT	CSMV_SITE_LOS_PTCH_RAS	V92H1068C	$(\ )_Y$

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
250	No Quad Selected Flag	E	L	SSM_NO_QUAD_SEL			
251	No Hemi Selected Flag	E	L	SSM_NO_HEMI_SEL			
252	S-Band PM Antenna Switch GPC Indicator-input location	A.2.17	I	SSD	CSSV_SPINB_D4065$7	V74S7014E	
252A	S-Band PM Antenna Switch GPC Indicator	A.2.17	I/O	SSD/CRT, DL	CSMB_SBAND_PM_ANT_SW_GPC		
253	Quad Selected By GPC	E	L		SSM_QUAD_SEL_BY_GPC		
254	S-Band Mode Switch TDRS Indicator-input location	A.2.17	I	SSD	CSSV_SPINB_D4026$5	V74X4786E	
254A	S-Band Mode Switch TDRS Indicator	A.2.17	I/O	SSD/CRT,DL	CSMB_SBAND_MODE_TDRS		

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TABLE 3.2.1.22-1 Antenna Management (Cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
255	S-Band FM Antenna Switch Upper Indicator-input location	A.2.17	I	SSD	CSSV_SPINB_D4060$9	V74S6503E	
255A	S-Band FM Antenna Switch Upper Indicator	A.2.17	I/O	SSD/CRT,DL	CSMB_SBAND_FM_ANT_SW_UPPER		
256	S-Band FM Antenna Switch Lower Indicator-input location	A.2.17	I	SSD	CSSV_SPINB_D4074$3	V74S6504E	
256A	S-Band FM Antenna Switch Lower Indicator	A.2.17	I/O	SSD/CRT,DL	CSMB_SBAND_FM_ANT_SW_LOWER		
257	Hemi Selected By GPC	E	L		SSM_HEMI_SEL_BY_GPC		
258	Target Quadrant	E	L		SSM_TARGET_QUADRANT		Q_T
259	Quad Antenna Quadrant Array	E	L		SSM_QUAD_ANT_QUADRANT		
260	Hemi Antenna Quadrant Array	E	L		SSM_HEMI_ANT_QUADRANT		
261	S-Band Quad Select Commands	A.2.16	O	SSO,CRT,DL			
262	S-Band Upper Right Quad Select Command-1	A.2.16	O	SSO,CRT,DL	CSMB_SBAND,UR_QUAD_CMD_1	V74K7055Y	
263	S-Band Upper Right Quad Select Command-2	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_UR_QUAD_CMD_2	V74K7056Y	
264	S-Band Lower Right Quad Select Command-1	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_LR_QUAD_CMD_1	V74K7065Y	
265	S-Band Lower Right Quad select Command-2	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_LR_QUAD_CMD_2	V74K7066Y	
266	S-Band Lower Left Quad Select Command-1	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_LL_QUAD_CMD_1	V74K7060Y	
267	S-Band Lower Left Quad Select Command-2	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_LL_QUAD_CMD_2	V74K7061Y	
268	S-Band Upper Left Quad Select Command-1	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_UL_QUAD_CMD_1	V74K7050Y	
269	S-Band Upper Left Quad Select Command-2	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_UL_QUAD_CMD_2	V74K7051Y	
270	S-Band Upper Hemi Select Command-1	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_UPPER_HEMI_CMD_1	V74K6510Y	
271	S-Band Upper Hemi Select Command-2	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_UPPER_HEMI_CMD_2	V74K6511Y	

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
272	S-Band Lower Hemi Select Command-1	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_LOWER_HEMI_CMD_1	V74K6515Y	
273	S-Band Lower Hemi Select Command-2	A.2.16	O	SSO,CRT,DL	CSMB_SBAND_LOWER_HEMI_CMD_1	V74K6516Y	
274	Ku-Band Actual Roll Angle (in Degrees)	A.2.18	O	CRT	CSMV_KUBAND_ACT_ROLL_DEG	V74H2618J	
274A	Ku-Band Actual Roll Angle (in Rasters)	A.2.18	O	CRT	CSMV_KUBAND_ACT_ROLL_RAS		
275	Ku-Band Actual Pitch Angle (in Degrees)	A.2.18	O	CRT	CSMV_KUBAND_ACT_PTCH_DEG	V74H2619J	
275A	Ku-Band Actual Pitch Angle (in Rasters)	A.2.18	O	CRT	CSMV_KUBAND_ACT_PTCH_RAS		
276	Ku-band Feedback Roll Angle-input location	A.2.17	I	SSD	CSSV_SPINB_D742618	V74H2618J	
276A	Ku-Band Feedback Roll Angle	A.2.17	I/O	SSD/CRT,DL	CSMV_KUBAND_FDBK_ROLL		
277	Ku-Band Feedback Pitch Angle-input location	A.2.17	I	SSD	CSSV_SPINB_D742619	V74H2619J	
277A	Ku-Band Feedback Pitch Angle	A.2.17	I/O	SSD/CRT,DL	CSMV_KUBAND_FDBK_PTCH		
278	TDRS West Feedback Discrete-input location	A.2.17	I	SSD	CSSV_SPINB_D10080202$9	V74X2609J	
278A	TDRS West Feedback Discrete	A.2.17	I/O	SSD/CRT,DL	CSMB_KUBAND_TDRS_WEST_FDBK		
279	TDRS East Feedback Discrete-input location	A.2.17	I	SSD	CSSV_SPINB_D10080202$10	V74X2610J	
279A	TDRS East Feedback Discrete	A.2.17	I/O	SSD/CRT,DL	CSMB_KUBAND_TDRS_EAST_FDBK		
280	Ku-Band Uplink Command Word	A.2.11,D.31	I	SUL	CSMV_KUBAND_UL_CMD_WRD		
281	Ku_Band Uplink Output Commands	A.2.16	O	SSO	CSMV_KUBAND_UL_OUT_CMDS		
282	S-Band Hemi Applicable Bit Masks	A.2.16	O	SSO			
283	S-Band Upper Hemi-1 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_UPPER_HEMI1_APPL		
284	S-Band Upper Hemi - 2 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_UPPER_HEMI2_APPL		
285	S-Band Lower Hemi - 1 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_LOWER_HEMI_1_APPL		

TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
286	S-Band Lower Hemi-2 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_LOWER_HEMI_2_APPL		
287	S-Band Quad Applicable Bit Masks	A.2.16	O	SSO			
288	S-BAnd Upper Right Quad - 1 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_UR_QUAD_1_APPL		

TABLE 3.2.1.-2-2 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
289	S-Band Quad Applicable Bit Masks	A.2.16	O	SSO			
290	S-Band Upper Right Quad - 1 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_UR_QUAD_1_APPL		
291	S-Band Upper Right Quad - 2 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_UR_QUAD_2_APPL		
292	S-Band Lower Right Quad-1 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_LR_QUAD_1_APPL		
293	S-Band Lower Right Quad - 2 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_LR_QUAD_2_APPL		
294	S-Band Lower Left Quad-1 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_LL_QUAD_1_APPL		
295	S-Band Lower Left Quad-2 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_LL_QUAD_2_APPL		
296	S-Band Upper Left Quad-1 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_UL_QUAD_1_APPL		
297	S-Band Upper Left Quad-2 Applicable Bit Mask	A.2.16	O	SSO	CSMB_SBAND_UL_QUAD_2_APPL		
298	Converted Line-of-Sight Roll Angle to Target	E	L		SSM_TGT_ROLL_CON		L_O
299	Quadrant-Number	E	L		SSM_QUANDRANT_NUM		Q
300	Fractional Part of Quadrant Number	E	L		SSM_FRAC_QUAD		Q_F
301	S-Band PM Antenna Switch GPC Indicator Status				CSSV_INSTAT_D4065		
302	S-Band Mode Switch TDRS Indicator Status				CSSV_INSTAT_D4026		
303	S-Band FM Antenna Switch Upper Indicator Status				CSSV_INSTAT_D4060		
304	S-Band FM Antenna Switch Lower Indicator Status				CSSV_INSTAT_D4074		
305	Serial Channel Status				CSSV_INSTAT_10080201		

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TABLE 3.2.1.22-1 Antenna Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
306	KU-Band TDRS Selected ID	A.2.11	0	CRT	CSMV_KUBAND_TDRS_SEL_ID	V92J1052C	
307	S-Band TDRS Selected ID	A.2.11	0	CRT	CSMV_SBAND_TDRS_SEL_ID	V92J1055C	
308	S-Band QUAD Selected ID	A.2.11	0	CRT	CSMV_SBAND_QUAD_SEL_ID	V92J1057C	
309	S-Band HEMI Selected ID	A.2.11	0	CRT	CSMV_SBAND_HEMI_SEL_ID	V92J1056C	
310	Current Site Selected ID	A.2.11	0	CRT	CSMV_CURRENT_SITE_ID	V92J1054C	
311	TDRS ID ARRAY	A.2.11	Z		CSMK_TDRS_IDS		
312	QUAD ID ARRAY	A.2.11	Z		CSMK_QUAD_IDS		
313	HEMI ID ARRAY	A.2.11	Z		CSMK_HEMI_IDS		
314	Site ID ARRAY	A.2.11	Z		CSMK_SITE_IDS		
315	Downlist Site Inhibit bits	A.2.11	0	DL	CSMB_DL_SITE_INH		
316	Radar Range Estimate Min	A.2.11	I	CRT, DL	CSMB_RADAR_RANGE_EST$2	V93X5641X	
317	(Deleted)						
318	Uplink Control Site In Flag	E	0	UI	CZ1B_D_UL_CNTL$4		
319	Uplink Control ICC Enable	E	0	UI	ICC_CZ1B_B_UL_CNTL		

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Enter

Move Valid AM Discretes From Input Locations To Save Area

Move Constants Site 16 Vector to Site 16 Vector in A.M. CMT

Set AM ICC Enable Flag To 0

Set Orbiter Position Vector, Orbiter Pitch, Yaw,& Roll Angles, Orbiter Pitch Yaw, and Roll Rates, GNC Pointing Flag, GNC Target Vector, & M50 To Body Quat Time To Corresponding Values From AM ICC Input Buffer

Set AM ICC Enable Flag To 1

Perform Initial Computations Figure 3.2.1.22-22)

Perform TDRS Computations Figure 3.2.1.22-3)

Perform S-Band Antenna Management Figure 3.2.1.22-3)

Perform KU-Band Antenna Management (Figure 3.2.1.22-7)

PERFORM DISPLAY / DOWNLIST PREPARATION (FIGURE 3.2.1.22-20)

Return

Figure 3.2.1.22-1. Antenna Management

IF
$(R_x^2 + R_y^2 + R_z^2) > 0$

Where $\vec{R}_G = \begin{bmatrix} R_x \\ R_y \\ R_z \end{bmatrix}$ Is The Orbiter Position Vector

Then

Compute Orbiter Position Vector Magnitude Using Orbiter Position Vector Components:

$$|R_G| = (R_x^2 + R_y^2 + R_z^2)^{1/2}$$

Compute Orbiter Unit Vector Using Orbiter Position Vector:

$$\left(\frac{\vec{R}_G}{|R_G|}\right)$$

Compute Geocentric Horizon Using Geocentric Earth Radius And Orbiter Position Vector Magnitude:

$$S_o = \text{Arcsin}\left(\frac{a}{|R_G|}\right)$$

The Arcsin Will Have The Following Limiting Values:

For Arguments:	Limiting Values:
≤ -1	$-\pi/2$
≥ 1	$\pi/2$

Compute The Sine And Cosine Of Each Of The Orbiter Pitch, Yaw, And Roll Angles (θ, ψ, ϕ) For Later Use

Compute Coordinates Transformation Matrix Using The Sines And Cosines Of The Orbiter Pitch, Yaw, And Roll Angles:

$$M_{BG} = \begin{bmatrix} \cos\psi\cos\theta & \sin\psi & -\cos\psi\sin\theta \\ -\cos\phi\sin\psi\cos\theta + \sin\phi\sin\theta & \cos\phi\cos\psi & \cos\phi\sin\psi\sin\theta + \sin\phi\cos\theta \\ \sin\phi\sin\psi\cos\theta + \cos\phi\sin\theta & -\sin\phi\cos\psi & -\sin\phi\sin\psi\sin\theta + \cos\phi\cos\theta \end{bmatrix}$$

Compute the Delta Time Using The Clocktime, M50 To Body Quat Time And Attitude Compensation Time:

$$\Delta t = GMT_c - GMT_s + t$$

Compute The Attitude Compensation Matrix Using The Delta Time And Orbiter Pitch, Yaw, And Roll Rates:

$$M_c = \begin{bmatrix} 1 & -r\Delta t & q\Delta t \\ r\Delta t & 1 & -p\Delta t \\ -q\Delta t & p\Delta t & 1 \end{bmatrix}$$

Figure 3.2.1.22-2. Initial Computations

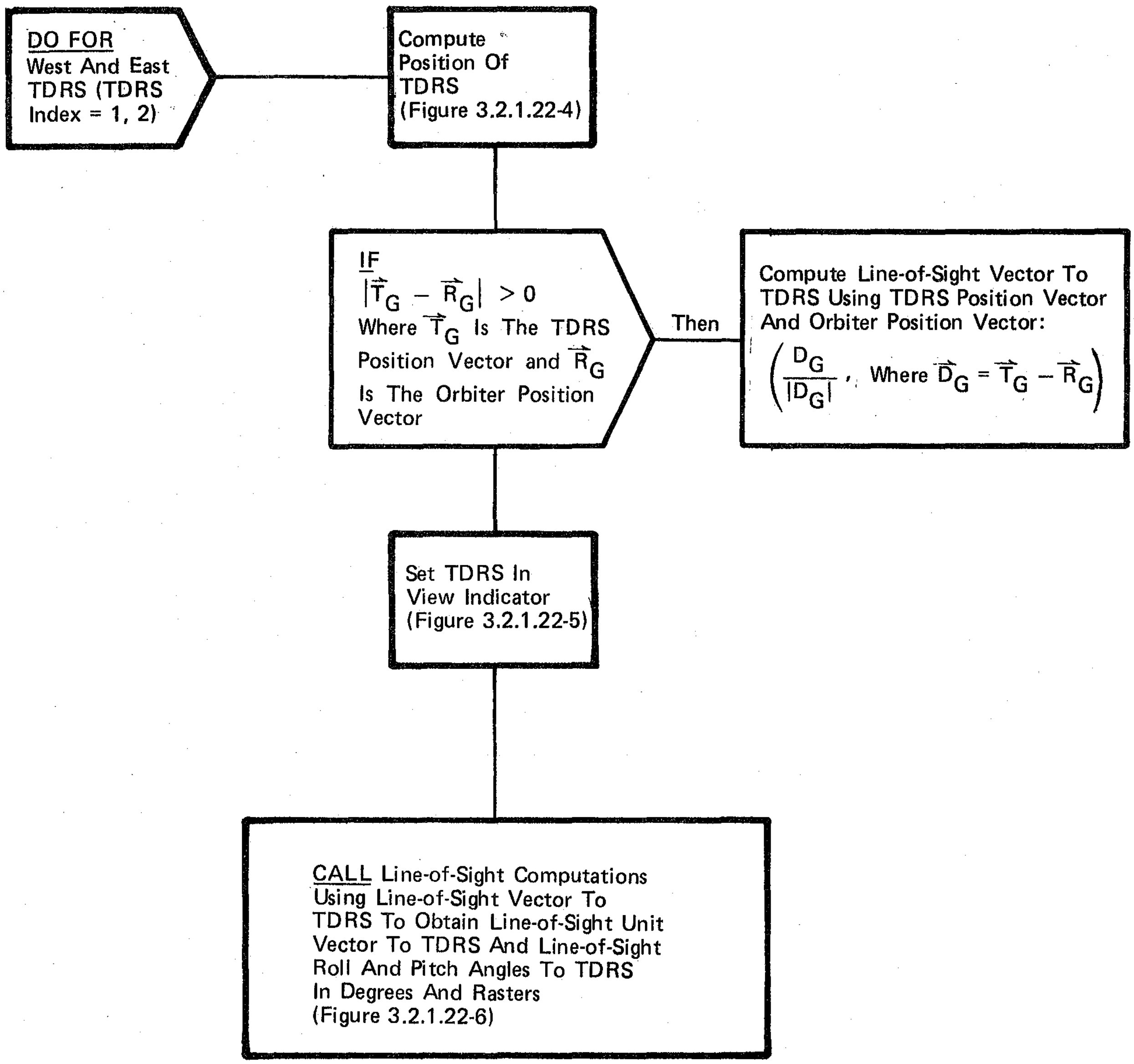

Figure 3.2.1.22-3. TDRS Computations

Compute Total Number Of Daily Rotations Since The TDRS Ascending Node Crossing:

$\omega\Delta t = 1.1605762 \times 10^{-5} (GMT_S - GMTN)$

Compute Fractional Part Of Uncompleted Rotation (Radians):

$u = 2\pi\ [\omega\Delta t - \text{INTEGER PART } (\omega\Delta t)]$

Compute Geocentric Latitude Of TDRS Using Inclination Of TDRS Orbital Plane And The Fractional Part Of The Uncompleted Rotation:

$\phi = \text{Arcsin}[\sin i_s \sin u]$

Compute Geocentric Longitude Of TDRS Using Inclination Of TDRS Orbital Plane, Longitude of TDRS Ascending Node, And Fractional Part Of Uncompleted Rotation:

$\lambda = \lambda_n - u + \text{Arctan}[\cos i_s \tan u]$

Arctan Will Be Computed As Follows:

$x = \arctan [\cos i_s \tan u]$

```
If u > (3π/2 + .000145)
  x = x + 2π
Else
  If u ≥ (3π/2 – .000145)
    x = 3π/2
  Else
    If u > (π/2 + .000145)
      x = x + π
    Else
      If u ≥ (π/2 – .000145)
        x = π/2
Return x
```

Compute TDRS Position Vector Using Geocentric Latitude And Longitude Of TDRS And TDRS Position Vector Magnitude:

$$\vec{T}_G = r_s \begin{bmatrix} \cos\phi \cos \lambda \\ \cos\phi \sin \lambda \\ \sin \phi \end{bmatrix}$$

Figure 3.2.1.22-4. Position Of TDRS

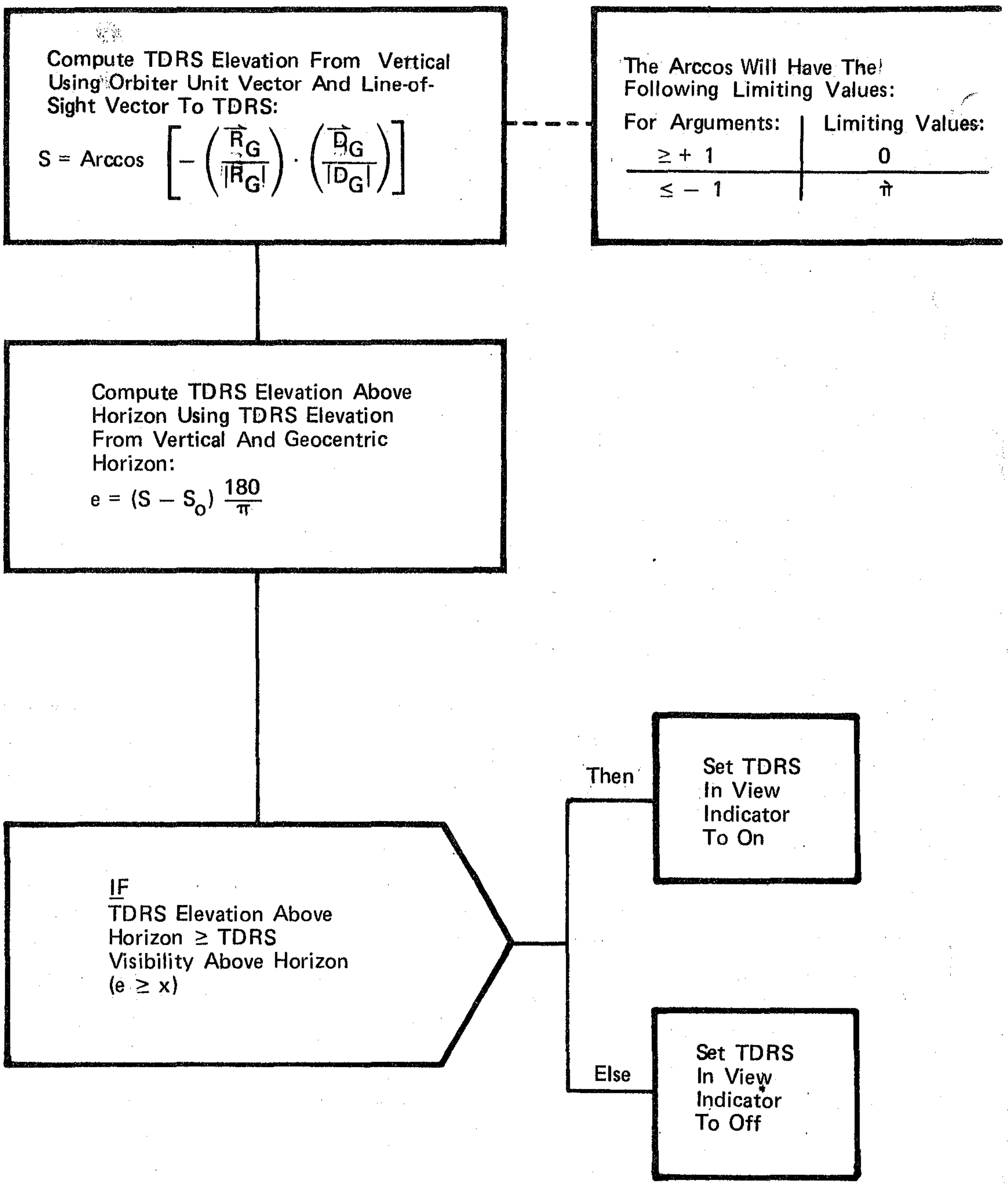

Figure 3.2.1.22-5. Set TDRS In View Indicator

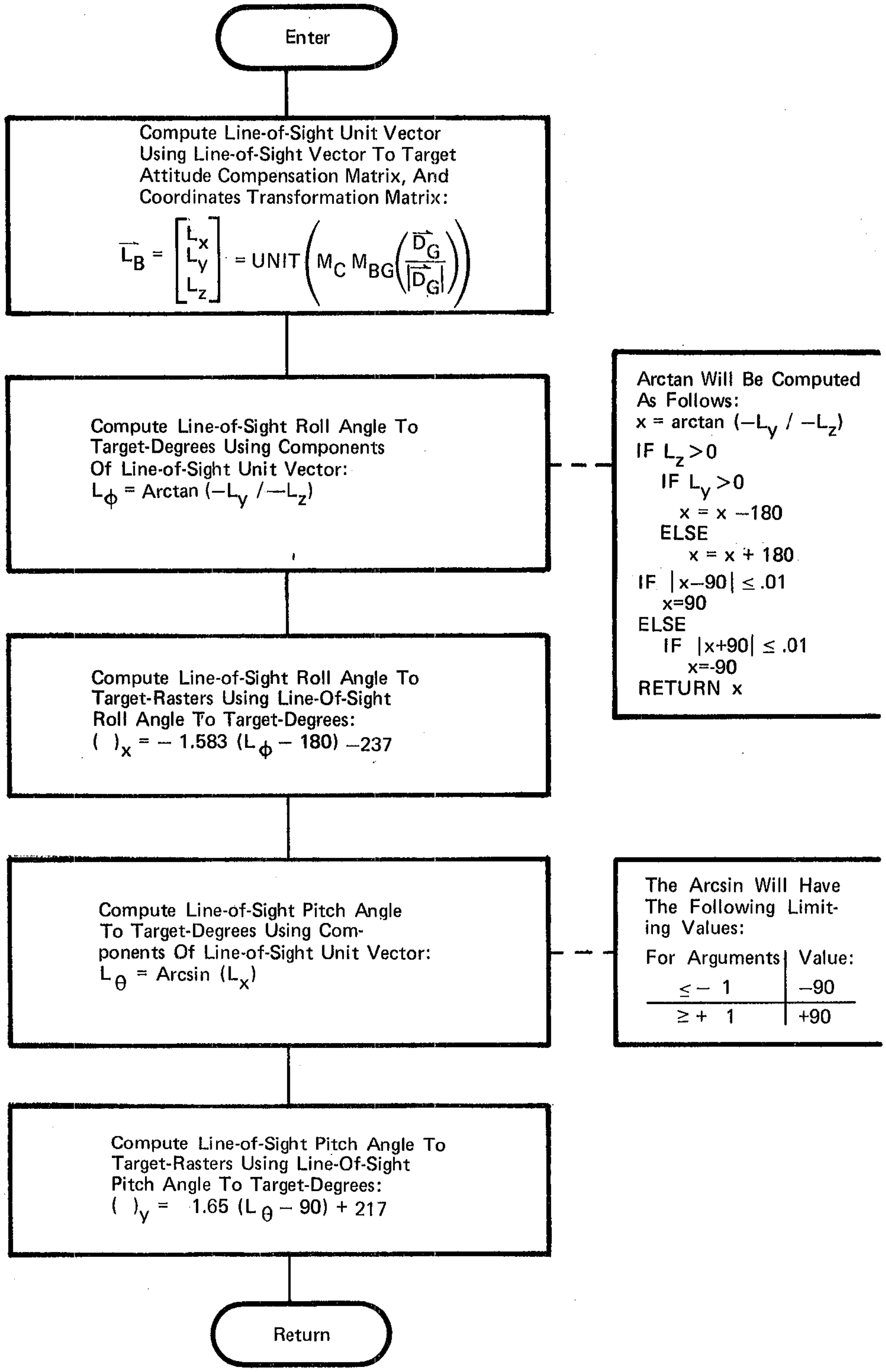

Figure 3.2.1.22-6. Line-of-Sight Computations

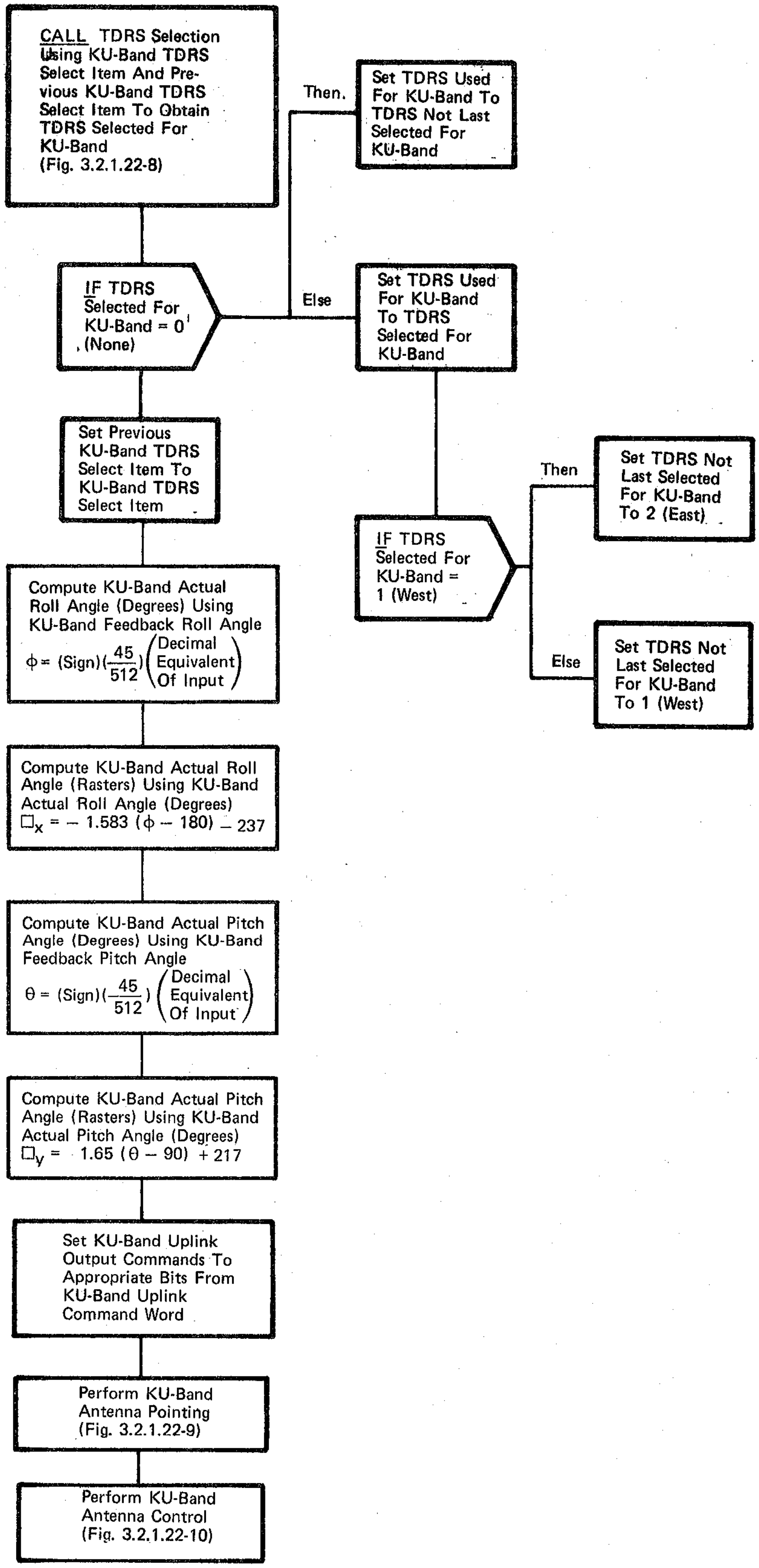

Figure 3.2.1.22-7. KU-Band Antenna Management

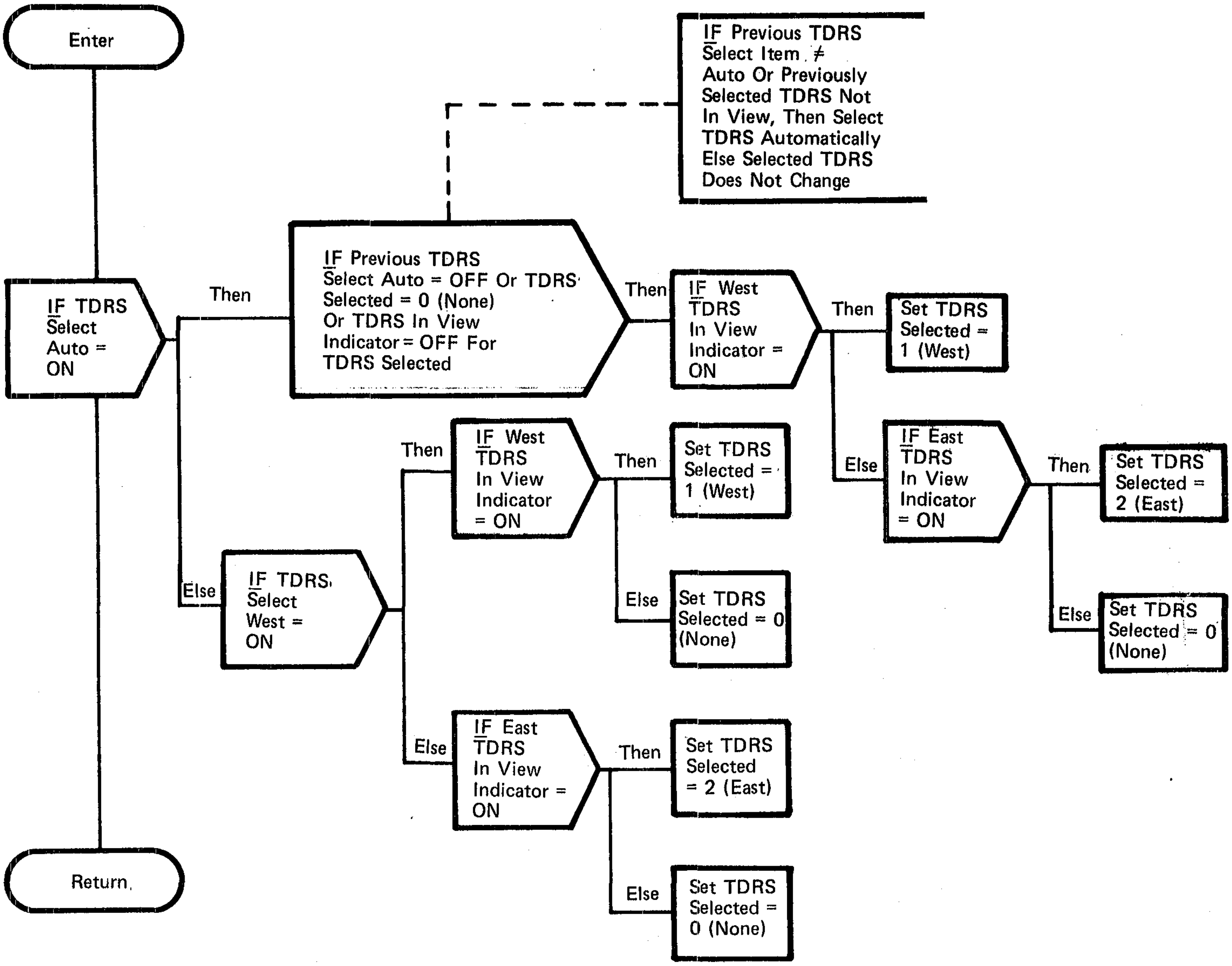

Figure 3.2.1.22-8. TDRS Selection

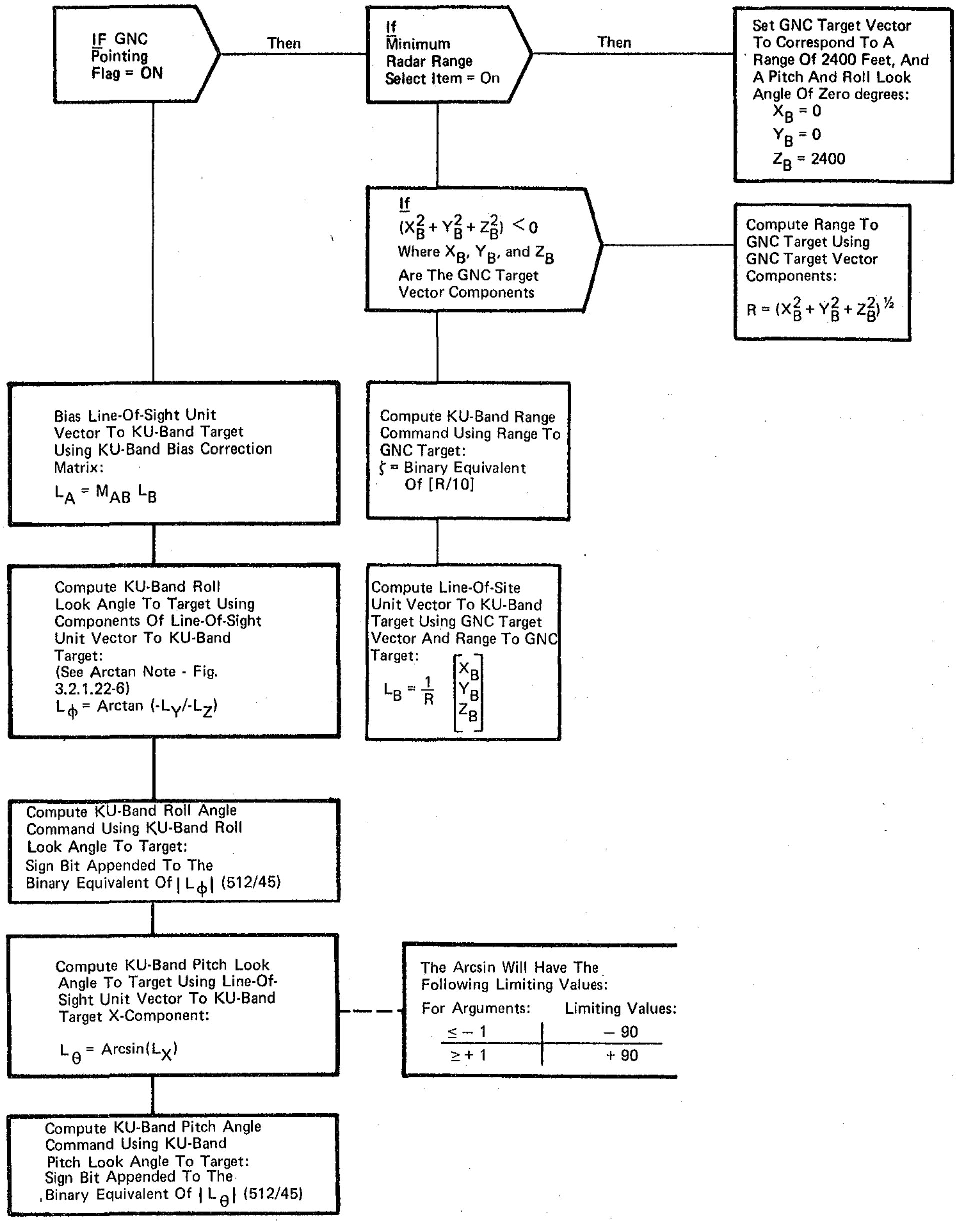

Figure 3.2.1.22-9. KU-Band Antenna Pointing

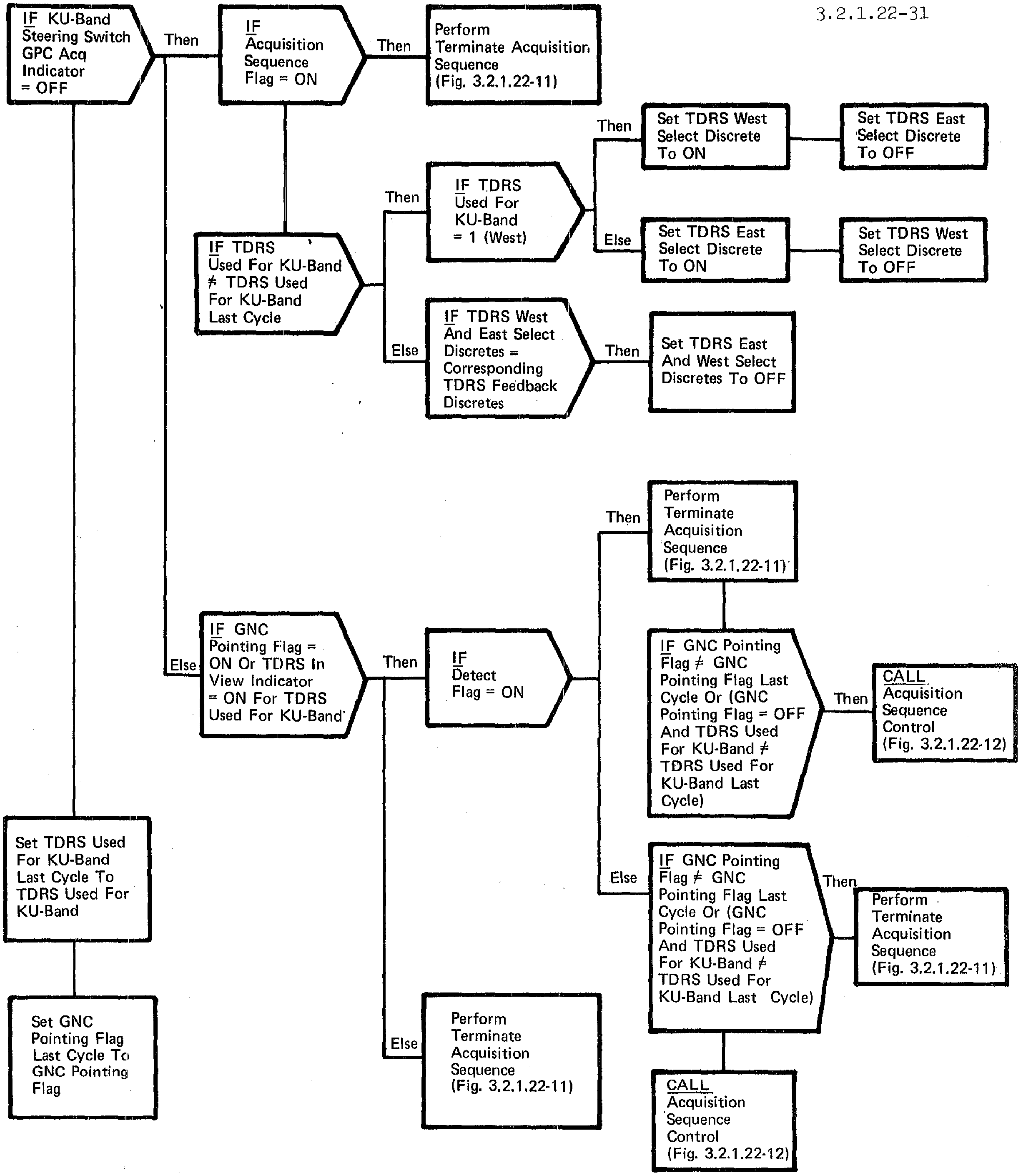

Figure 3.2.1.22-10. KU-Band Antenna Control

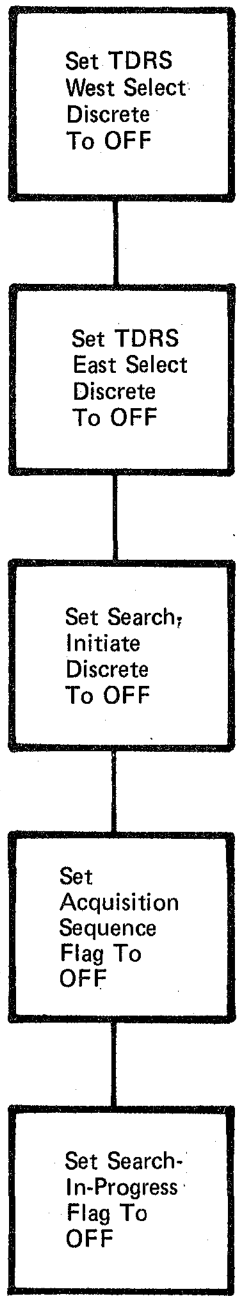

Figure 3.2.1.22-11. Terminate Acquisition Sequence

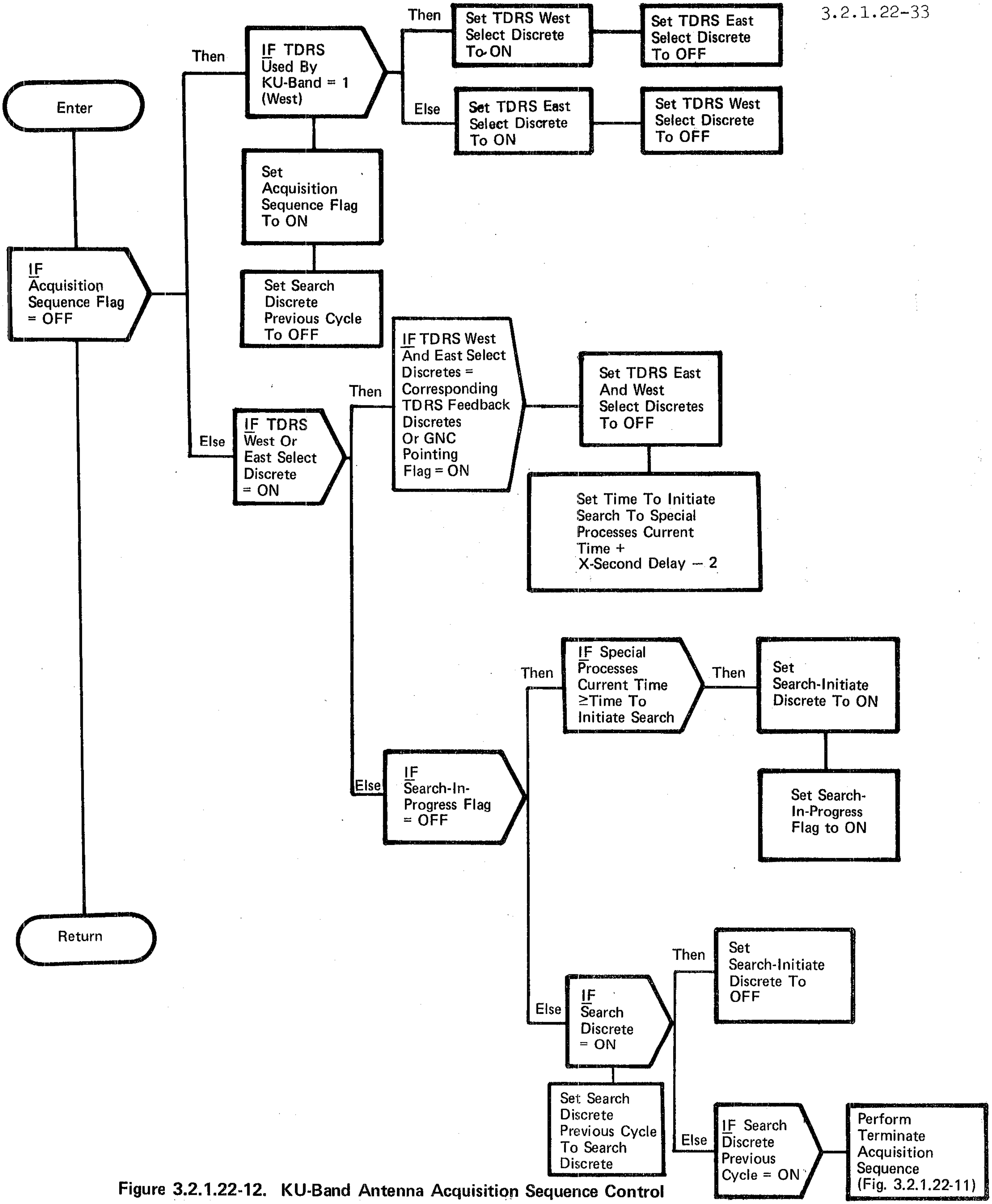

Figure 3.2.1.22-12. KU-Band Antenna Acquisition Sequence Control

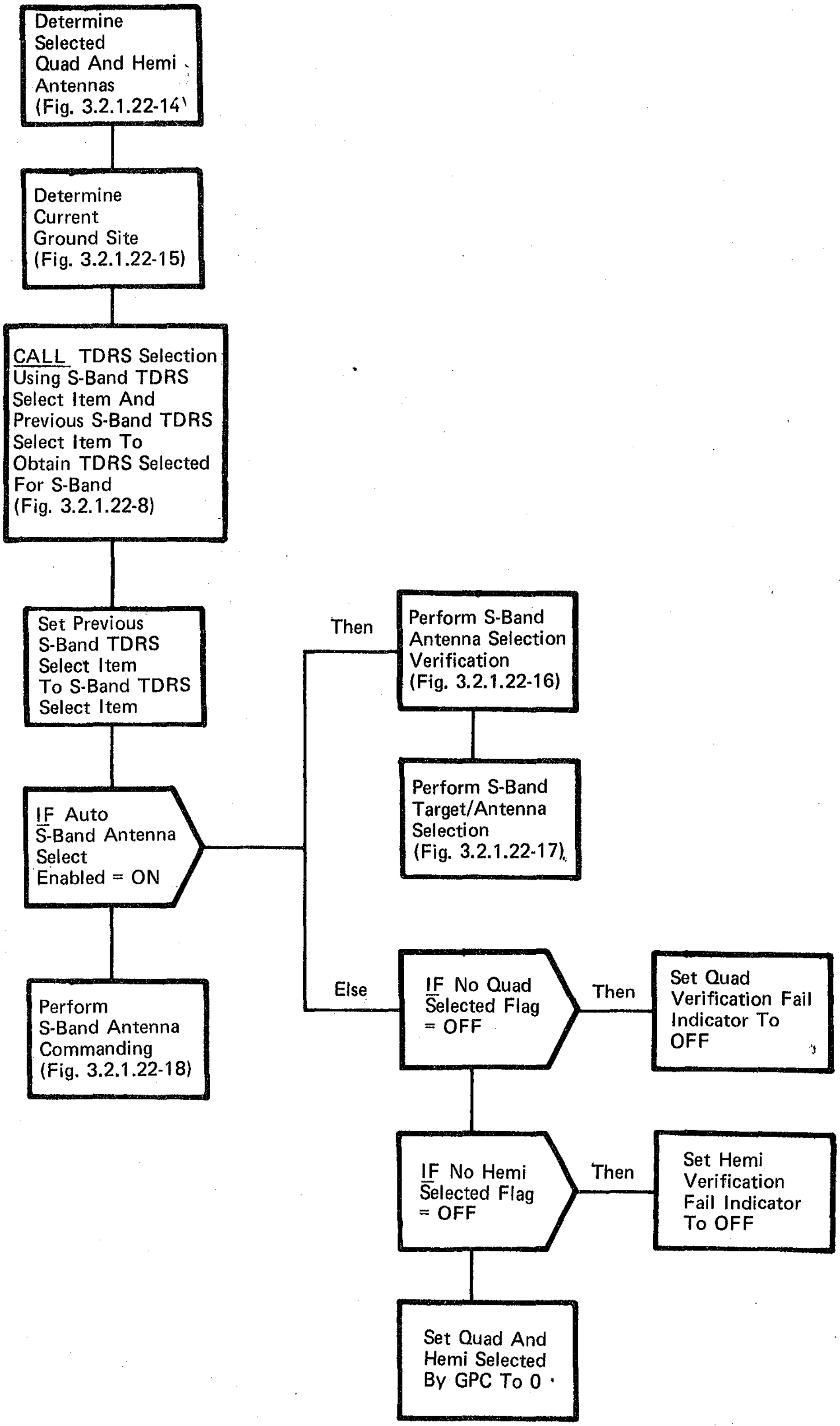

Figure 3.2.1.22-13. S-Band Antenna Management

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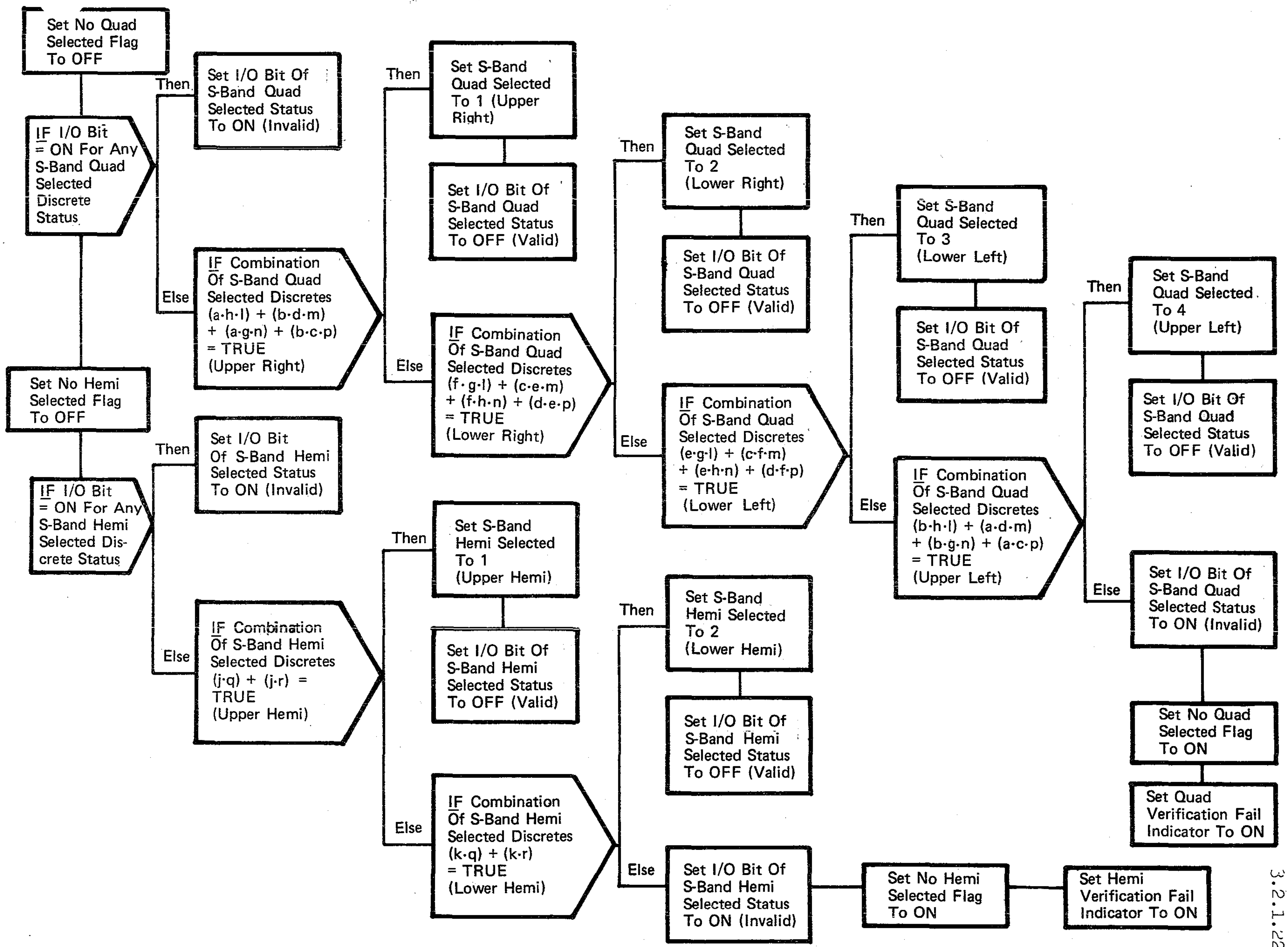

Figure 3.2.1.22-14. Determine Selected Quad And Hemi Antennas

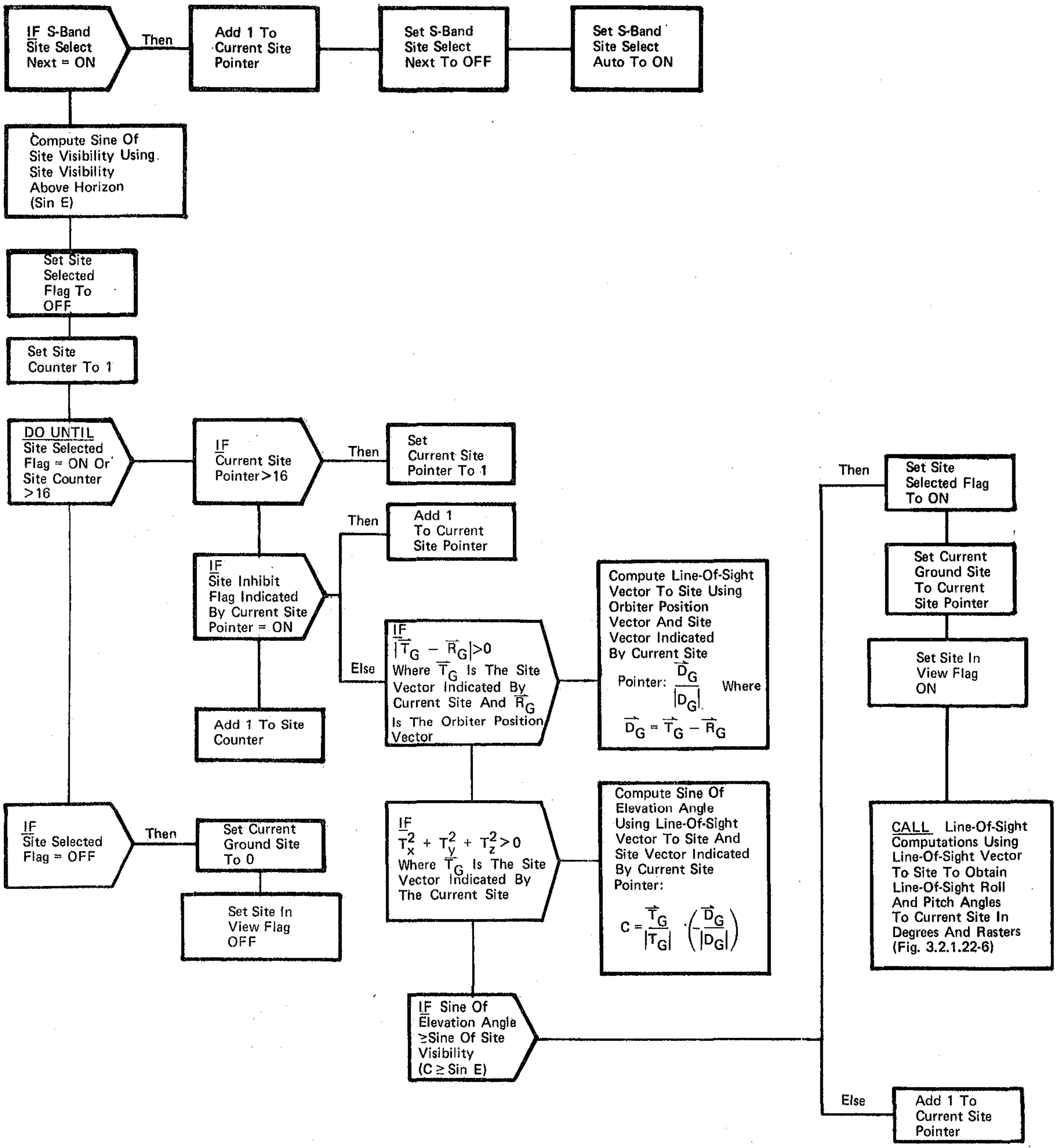

Figure 3.2.1.22-15. Determine Current Ground Site

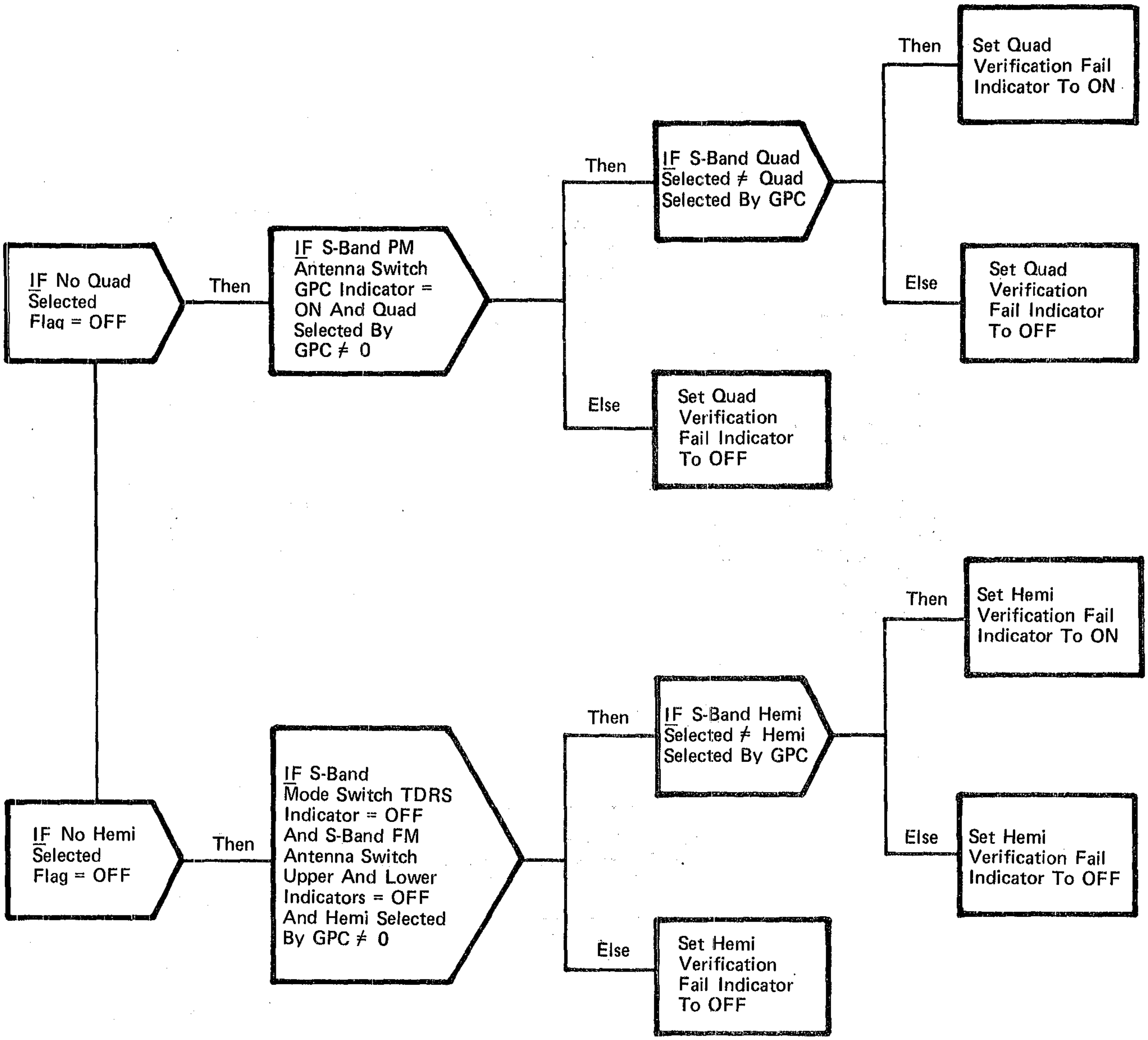

Figure 3.2.1.22-16. S-Band Antenna Selection Verification

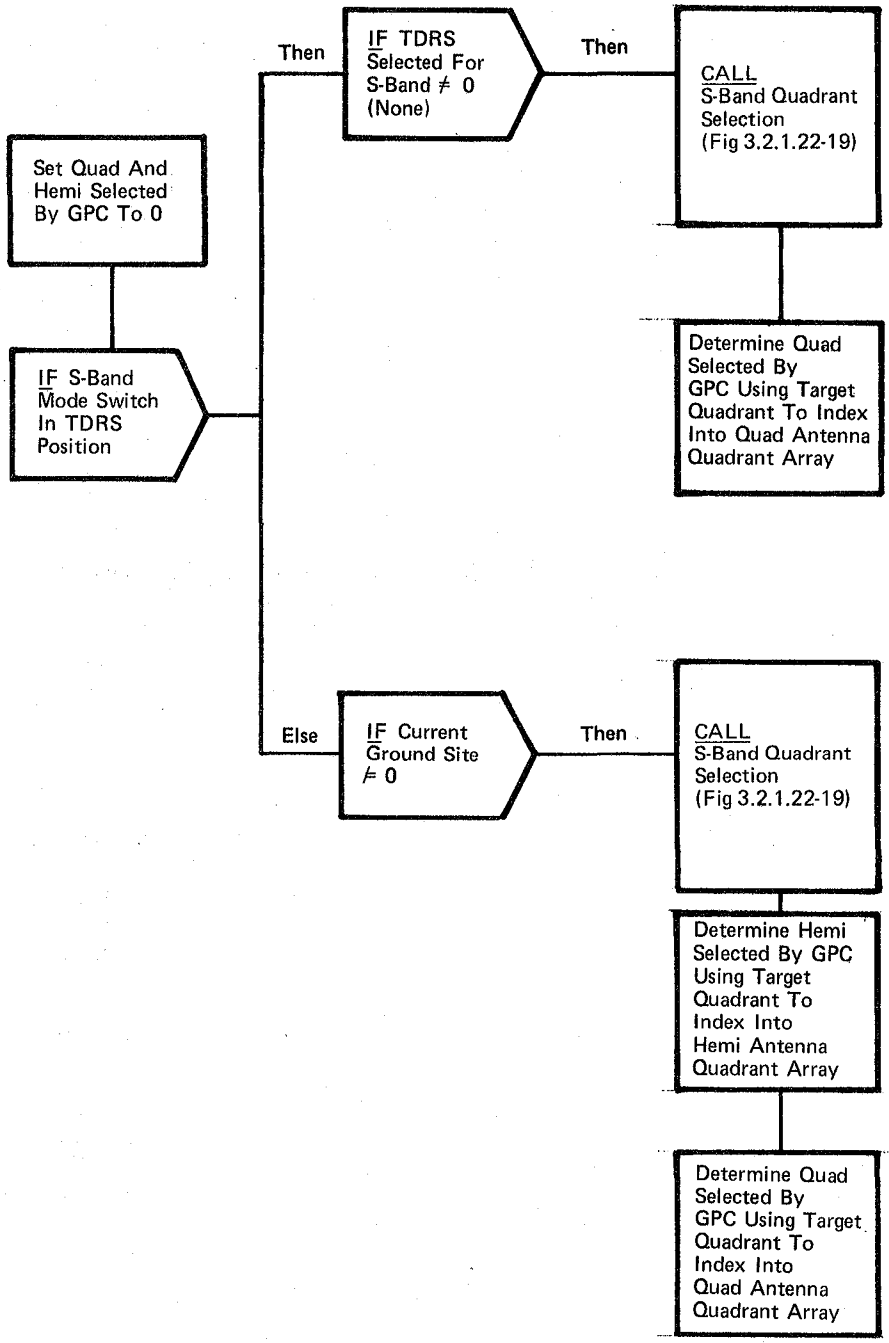

Figure 3.2.1.22-17. S-Band Target/Antenna Selection

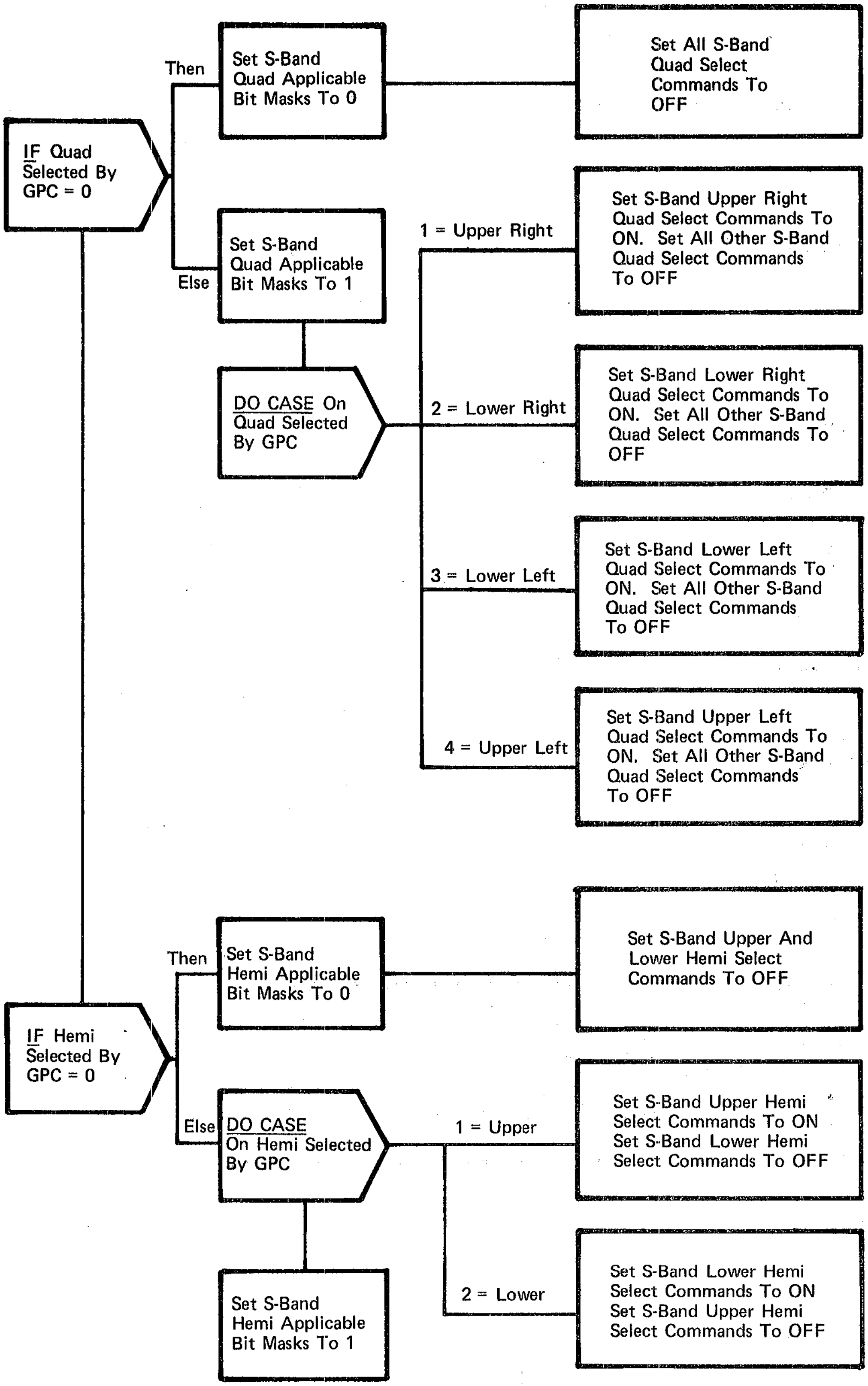

Figure 3.2.1.22-18. S-Band Antenna Commanding

Convert Line-of-sight Roll angle such that $0^{\circ} \leq L\phi' < 360^{\circ}$ Rather than $-180^{\circ} < L\phi \leq 180^{\circ}$

Determine Quadrant Number Using the Converted Line-of Sight Roll Angle:

$$Q = \frac{L\phi'}{90} + 1$$

Determine Fractional Part of Quadrant Number:

$$Q_f = Q - \text{Integer Part } (Q)$$

IF Fractional Part of Quadrant Number is Not in Transition Region ($.022 \leq Q_f \leq .978$) or Target Quadrant = 0 (This is first pass)

THEN

Compute Target Quadrant:

$$Q_t = \text{Integer Part } (Q)$$

Figure 3.2.1.22-19. S-Band Quadrant Selection

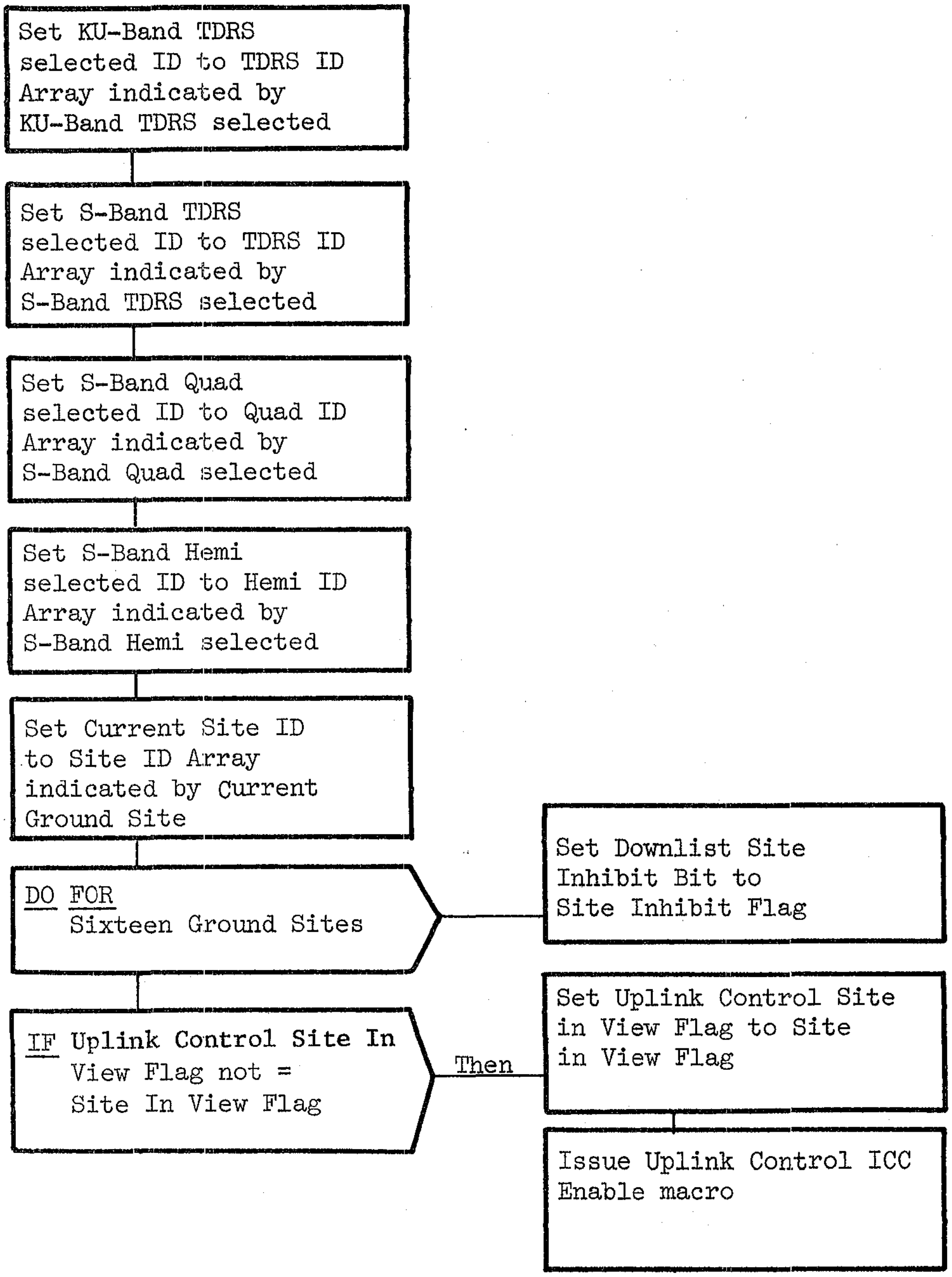

Figure 3.2.1.22-20 Display/Downlist Preparation

BOOK: OFT SM Detailed Design Specification

3.2.1.23 Uplink Processor (SUL_UPLINK)

The Uplink Processor provides the interface between the system services uplink software and the SM functions with uplink inputs.

a. Control Interface - The Uplink Processor is SCHEDULE'd by the OPS 2 Control Segment.

SCHEDULE SUL_UPLINK PRIORITY (PRIO_SUL)

b. Inputs - Inputs to this module are specified in Table 3.2.1.23-1.

c. Process Description - The control flows for this module are shown in Figures 3.2.1.23-1 through 3.2.1.23-6. The Uplink Processor WAIT's either for UI to signal that an uplink load is available for processing or for the OPS control segment to signal that the OPS has been terminated. In the latter case, this module exits. Otherwise, the uplink load is moved to a local area and the UI area is freed for further UI use. Then the Uplink Processor performs the necessary processing for the uplinked OP code. In most cases this processing consists of moving the correct number of words from the uplink buffer to the affected function's COMPOOL for later use by that function. In the case of a Table Maintenance Block Update load, the processing consists of various error checking coupled with invocations of the Table Maintenance Process to perform updates to SM tables.

At OPS initialization the Uplink Cancel Flag must be turned Off. At OPS cleanup the Uplink Cancel Flag must be turned ON.

d. Outputs - Outputs from this module are specified in Table 3.2.1.23-1.

e. Module References -

Process	Section	Reference
Table Maintenance Process	3.3.1.2	SCHEDULE

f. Module Type and Attributes -

Type: Program
Attributes: N/A

g. Template References -

D INCLUDE TEMPLATE STM_TABLE_MAIN	- Table Maintenance Process
D INCLUDE TEMPLATE CSA_SM_CMT	- Basic Processes CMT
D INCLUDE TEMPLATE CSM_AM_CMT	- Antenna Management Display Parameters
D INCLUDE TEMPLATE CST_TM_CMT	- Table Maintenance Display Parameters
D INCLUDE TEMPLATE CSS_COT	- Constants Table (COT)-Values
D INCLUDE TEMPLATE CDU_LNK	- UI Uplink COMPOOL
D INCLUDE TEMPLATE CDI_MM_ UTILITY	- Used For MM Utility Operations
D INCLUDE TEMPLATE DMP_MM_ MSG_PROC	- MM Message Processor
D INCLUDE TEMPLATE CDH_MM_ UTILITY	- Used With CDI_MM_Utility For MM Utility Operations

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.2.1.23-1 Uplink Processor **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Uplink Cancel Flag	A.2.11, D.30	I	S2I	CSVF_UL_CANCEL		
2	SM Uplink Event	E	I/O	UI/UI			
3	Two-Stage Buffer	E	I/O	UI/UI			
4	SM Uplink Buffer	E.	L		SUL_BUFFER		
5	Op Code	E	L		SUL_OP_CODE		
6	MMU Patch Op Code	E	L		SUL_MMU_OP		
7	Ku-Band Antenna Control Op Code	E	L		SUL_KU_CNTL_OP		
8	TDRS State Vector Load Op Code	E	L		SUL_TDRS_STATE_OP		
9	Ku-Band Bias Matrix Load Op Code	E	L		SUL_KU_BIAS_OP		
10	Payload Data Load Op Code	E	L		SUL_PL_DATA_OP		
11	PSP Configuration Op Code	E	L		SUL_PSP_CON_OP		
12	TM Block Update Op Code	E	L		SUL_TMBU_OP		
13	Ku-Band Uplink Command Word	A.2.11, D.31	O	SSO	CSMV_KUBAND_UL_CMD_WRD		
14	Ku-Band Uplink Reset Mask	E	L		SUL_KU_CNTL_RESET		
15	Ku-Band Uplink Set Mask	E	L		SUL_KU_CNTL_SET		
16	Inclination of East TDRS Orbital Plane	A.2.11, D.32	O	SSM	CSMV_TDRS_INCL$2	V92H1017C	
17	Inclination of West TDRS Orbital Plane	A.2.11, D.32	O	SSM	CSMV_TDRS_INCL$1	V92H1025C	
18	Uplink Inclination of East TDRS	E	L		SUL_INCL_EAST_TDRS		
19	Uplink Inclination of West TDRS	E	L		SUL_INCL_WEST_TDRS		
20	Longitude of East TDRS Ascending Node	A.2.11, D.32	O	SSM	CSMV_TDRS_LONG_ASC_NODE$2	V92H1015C	

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TABLE 3.2.1.23-1 (Cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
21	Longitude of West TDRS Ascending Node	A.2.11, D.32	O	SSM	CSMV_TDRS_LONG_ASC_NODE$1	V92H1023C	
22	Uplink Longitude of East TDRS	E	L		SUL_LONG_EAST_TDRS		
23	Uplink Longitude of West TDRS	E	L		SUL_LONG_WEST_TDRS		
24	Time of East TDRS Ascending Node Crossing	A.2.11, D.32	O	SSM	CSMV_TDRS_TIME_ASC_NODE$2	V92H1020C	
25	Time of West TDRS Ascending Node Crossing	A.2.11, D.32	O	SSM	CSMV_TDRS_TIME_ASC_NODE$1	V92H1027C	
26	Uplink Time of East TDRS Crossing	E	L		SUL_TIME_EAST_TDRS		
27	Uplink Time of West TDRS Crossing	E	L		SUL_TIME_WEST_TDRS		
28	East TDRS Position Vector Magnitude	A.2.11, D.32	O	SSM	CSMV_TDRS_POS_MAG$2	V92H1001C	
29	West TDRS Position Vector Magnitude	A.2.11, D.32	O	SSM	CSMV_TDRS_POS_MAG$1	V92H1003C	
30	Uplink East TDRS Position Magnitude	E	L		SUL_EAST_TDRS_POS_MAG		
31	Uplink West TDRS Position Magnitude	E	L		SUL_WEST_TDRS_POS_MAG		
32	Ku-Band Bias Correction Matrix	A.2.12, D.32	O	SSM	CSMV_KUBAND_BIAS_MATRIX		
33	Ku-Band Uplink Bias Matrix	E	L		SUL_KU_BIAS_MATRIX		
34	TMBU Load Reject Flag	A.2.11	O	DL, CRT	CSVV_TMBU_LOAD_REJECT		
35	TM Spec Active Flag	A.2.11, D.33	I	STI	CSTB_TM_SPEC_ACTIVE		
36	TM Uplink Active Flag	A.2.11, D.34	O	STS, CRT	CSVB_TM_UL_ACTIVE		
37	Number of Data Sets	E	L		SUL_TMBU_NUM_DS		
38	Data Set Index	E	L		SUL_DS_INDEX		
39	Valid Data Set Type Flag	E	L		SUL_VAL_DS_FLAG		

TABLE 3.2.1.23-1 (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
40	Type Index	E	L		SUL_TYPE_INDEX		
41	Valid DS Type Array	E	L		SUL_VAL_DS_TYPE		
42	TM Uplink Error Flag	A.2.11, D.35	I/O	STM/STM	CSTB_TM_ERR		
43	Data Set Type	E	L		SUL_DS_TYPE		
44	TM Constant Value Item Number	E	C		CSTK_CON_VAL_ITEM		
45	TM Item Number	A.2.11, D.36	O	STM	CSTV_ITEM_NO		
46	TM Integer Value	A.2.11, D.36	O	STM	CSTV_ITEM_I		
47	TMBU Parameter ID	E	L		SUL_TMBU_PARMID		
48	Table Maintenance Process Event	E	I	FCOS	STM_TABLE_MAIN		
49	TM Scalar Value	A.2.11, D.36	O	STM	CSTV_ITEM_S		
50	TMBU Parameter Value	E	L		SUL_TMBU_PARM_VALUE		
51	TM Constant ID Item Number	E	C		CSTK_CON_ID_ITEM		
52	TM Parameter ID Item	E	C		CSTK_PARM_ID_ITEM		
53	Number of Valid Data Set Types	E	L		SUL_NUM_VAL_DS		
54	TM Store Subscript	A.2.11	I	STM	CSTV_STORE_INDEX		
55	Header Buffer	E	O	DMP	CDHV_PATCH_REQUEST		
56	MM Utility Buffer	E	O	DMP	CDIV_RW_BUFFER		
57	Patch Comp	E	O	DMP	CDHB_PATCH_COMP		
58	Patch Dump	E	O	DMP	CDHB_PATCH_DUMP		
59	MM Request OP Code	E	O	DMP	CDHB_PATCH_OPCODE		
60	GND/Display Mode Indicator	E	O	DMP	CDHV_PATCH_RHW		
61	Uplink Message Flag	E	O	DMP	CDHB_UL_MSG		

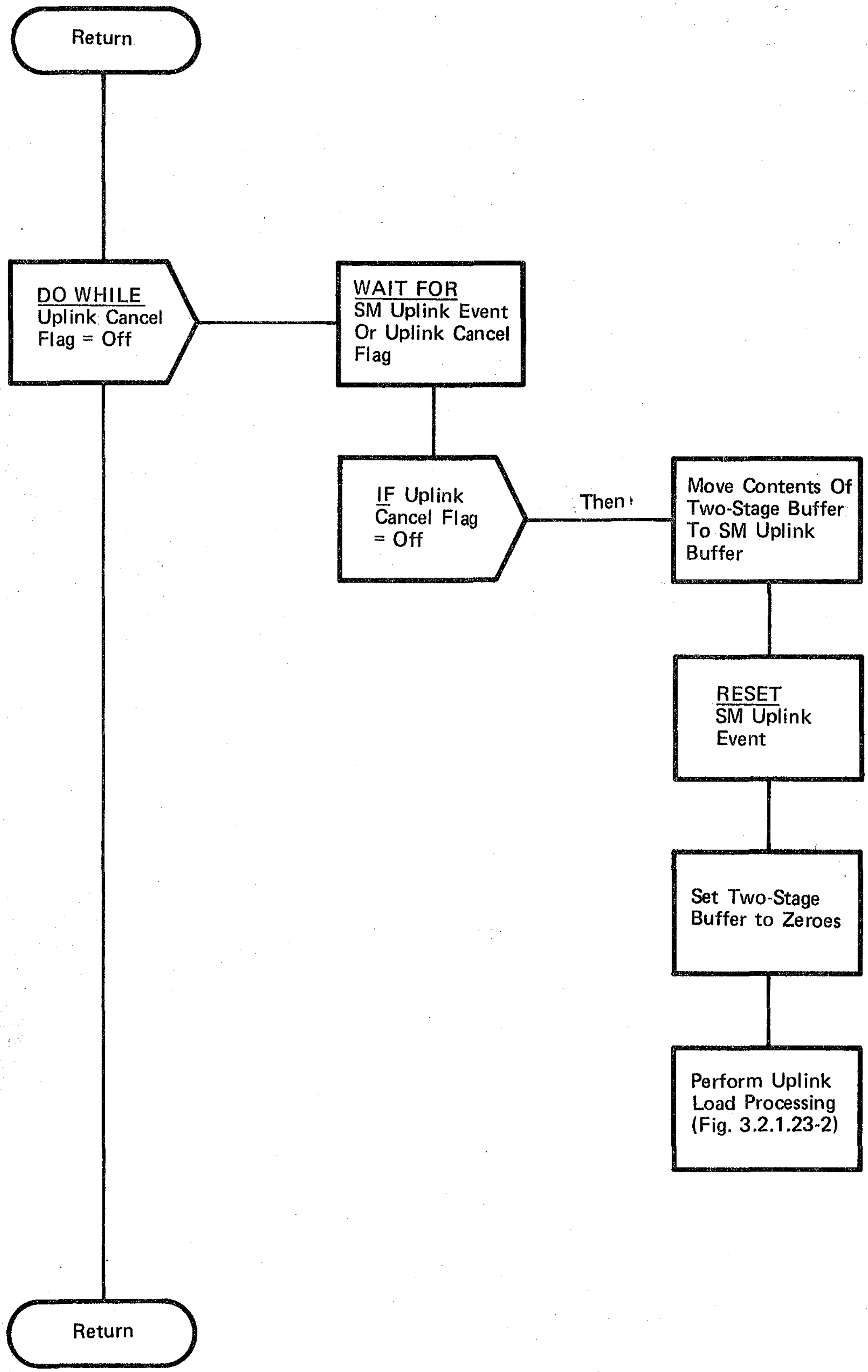

Figure 3.2.1.23-1. Uplink Processor

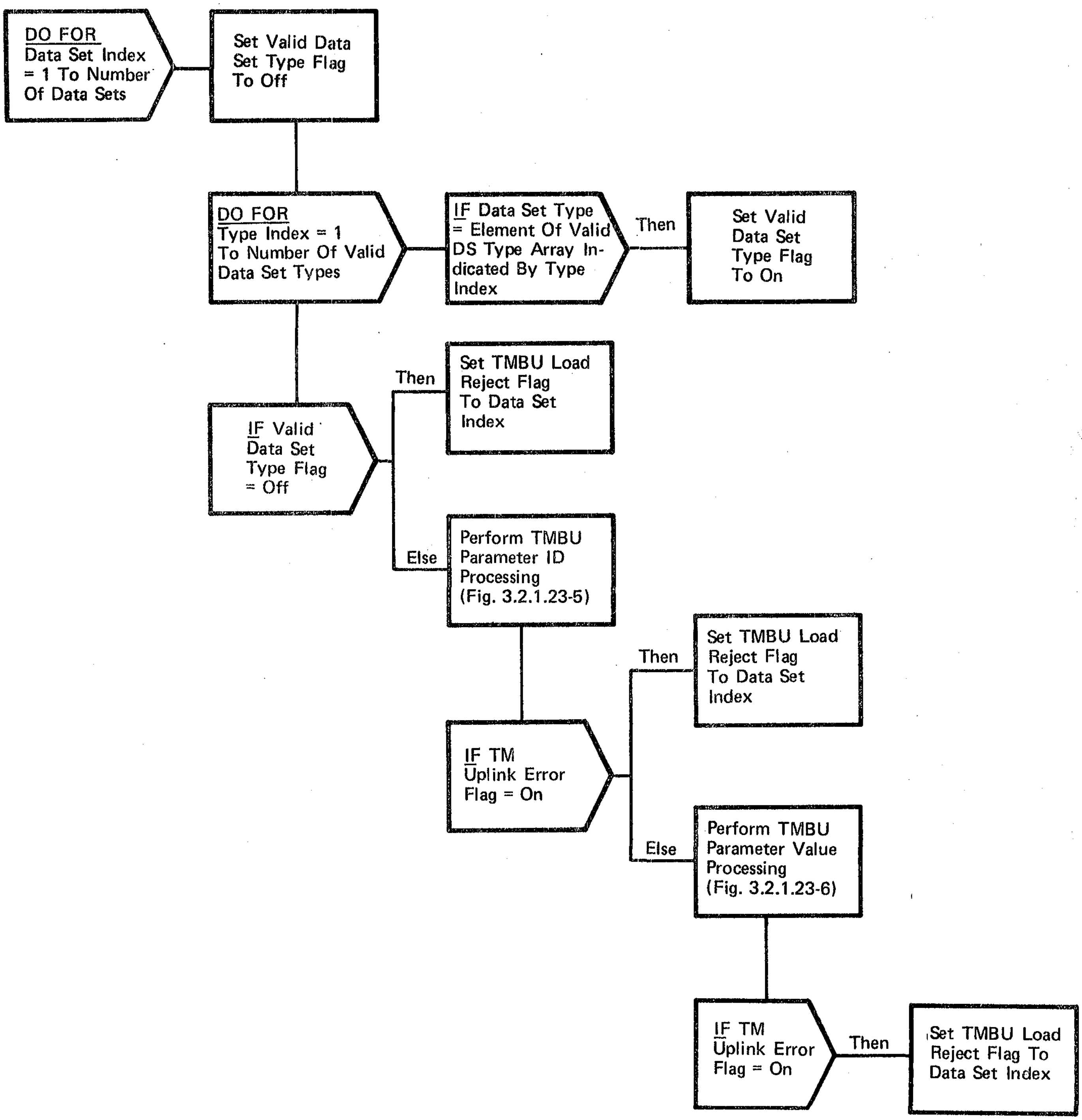

Figure 3.2.1.23-4. TMBU Data Set Processing

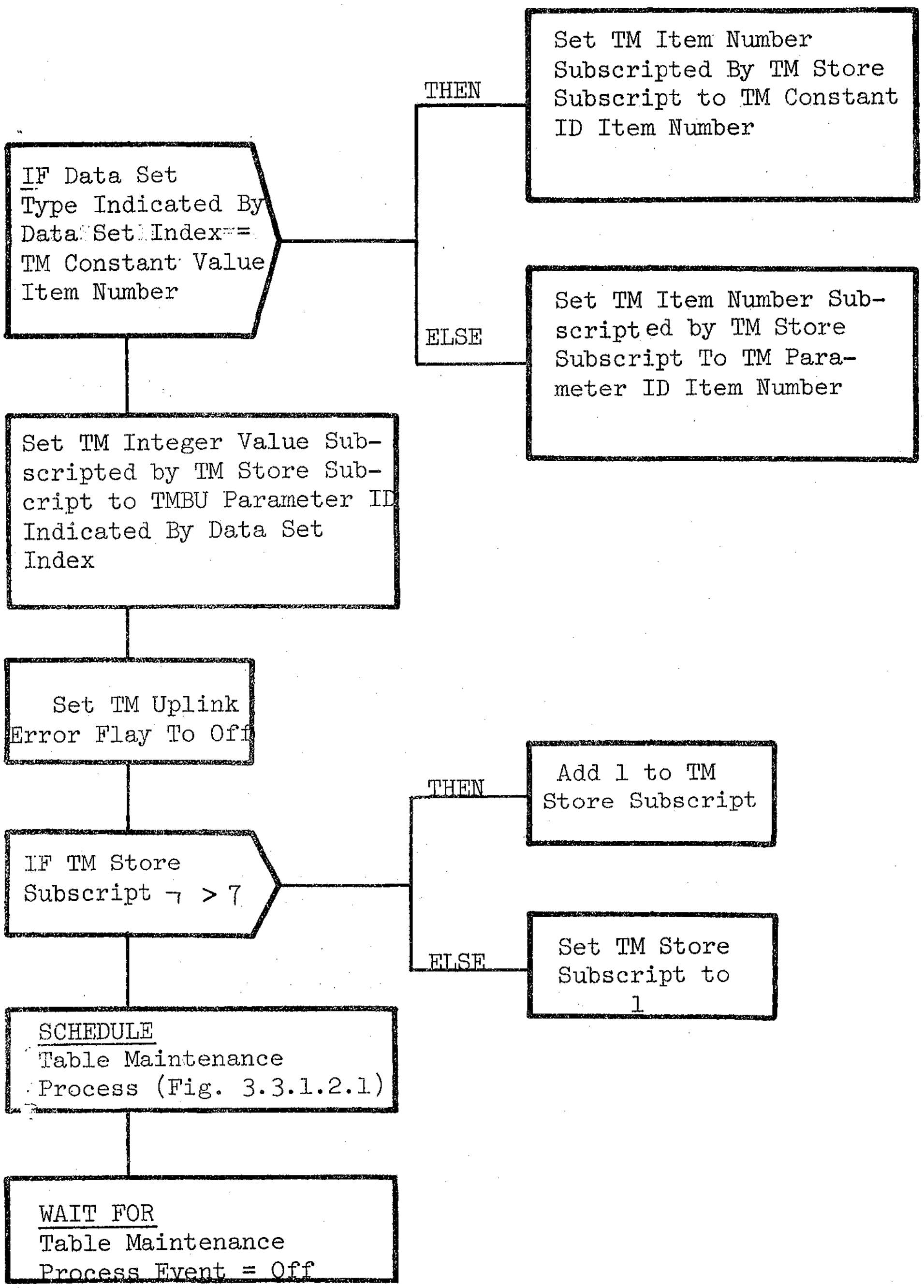

Figure 3.2.1.23-5. TMBU Parameter ID Processing

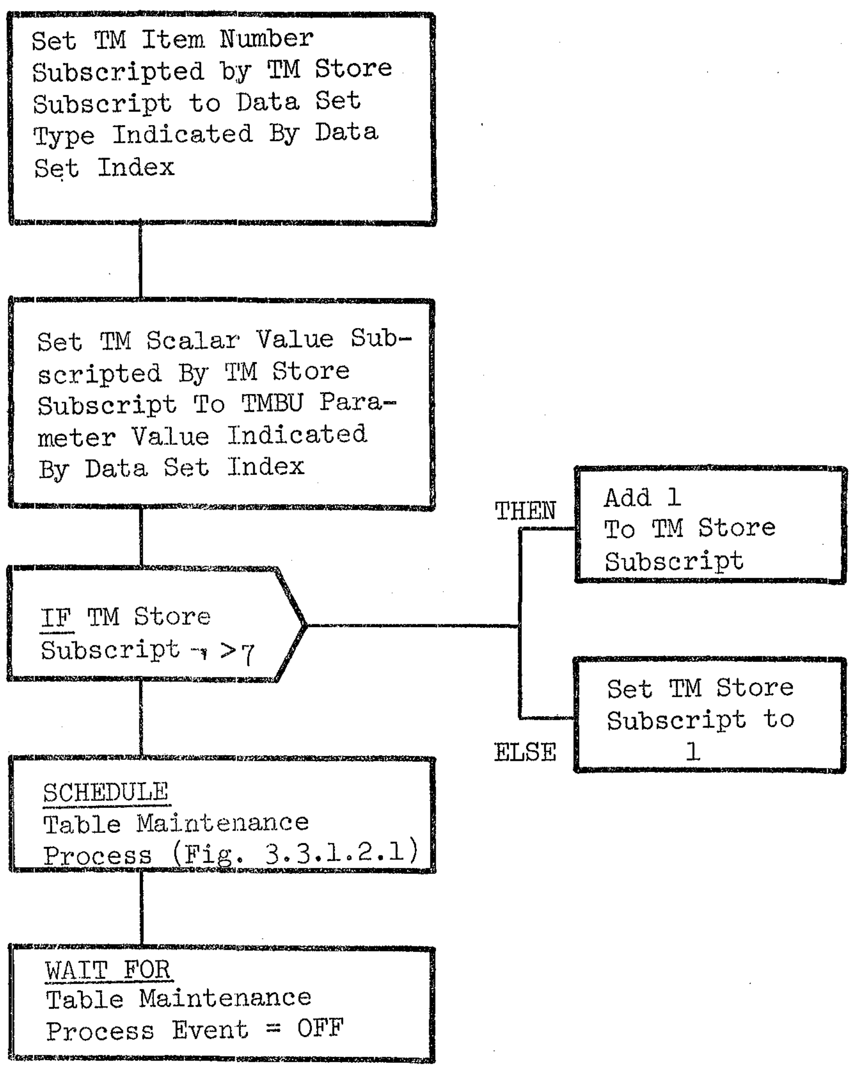

Figure 3.2.1.23-6. TMBU Parameter Value Processing

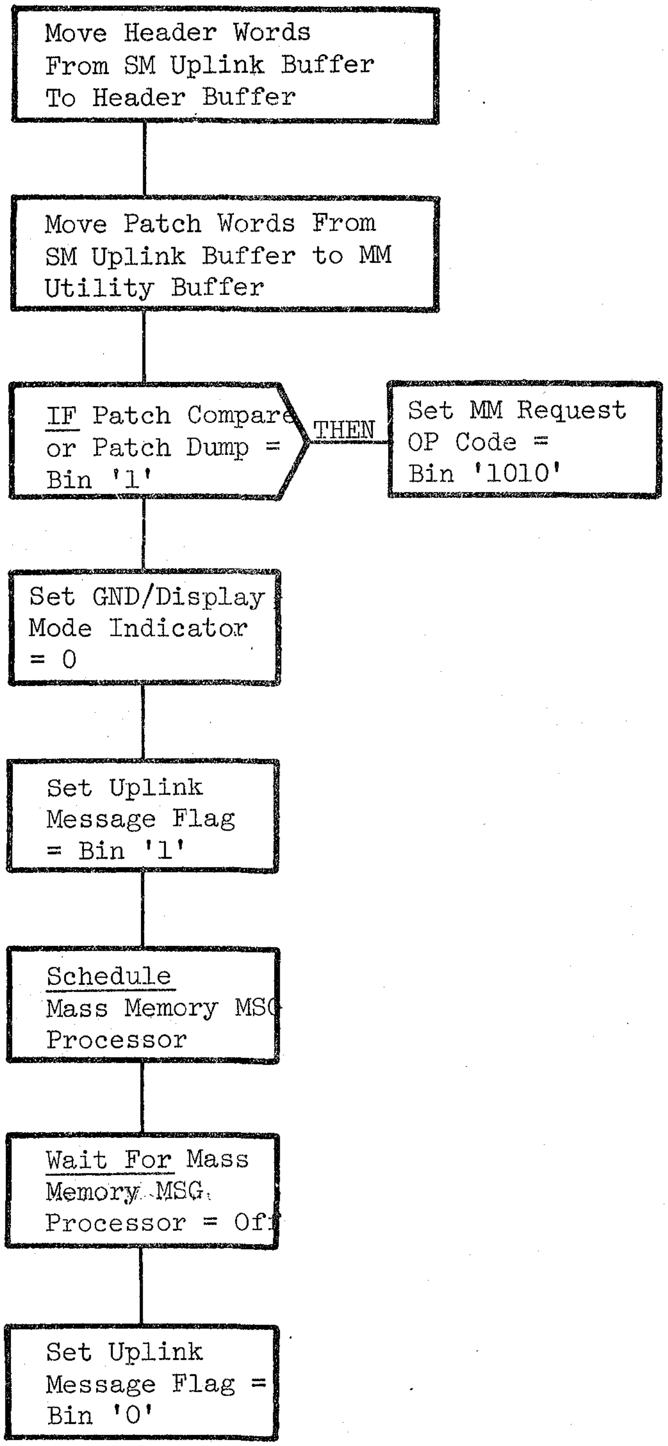

Figure 3.2.1.23-7. MMU Patch Uplink

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3.3 DISPLAY CONTROLLED PROCESSES

This section describes the Specialist Function (SPEC) control segments and the display controlled processes. The display controlled processes are "on-demand" processes that are involved by either an OPS or SPEC control segment as a direct result of an item entry to a display. Valid Specialist Functions within each OPS are shown in Table 3.2-2. Two unique Specialist Functions may be active within each OPS. An entry of a new SPEC or RESUME from the controlling CRT causes termination of the SPEC in process.

There is a generic capability to cyclically display analog, EU and discrete parameter values and statuses on the displays pertaining to this section. This capability (SMM) is discussed in Section 3.1.4.

3.3.1 Table Maintenance

The Table Maintenance Function allows the crew limited control over limit sensing and selected computation and sequences. SM Checkpoint/Restore is controlled by Table Maintenance.

3.3.1.1 Table Maintenance Specialist Function Control Segment (STS_SPEC)

The Table Maintenance Specialist Function Control Segment presents the Table Maintenance Display and controls execution of the Table Maintenance Process. The Control Segment acts as the interface between the crew and the Table Maintenance Process.

a. Control Interface - The Table Maintenance Control Segment is SCHEDULE'd by the User Interface Sequence Request Processor upon user request.

   INVOCATION: SCHEDULE STS_SPEC PRIORITY (PRIO-STS)

b. Inputs - Inputs to this module are specified in Table 3.3.1.1-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.1.1-1. Upon initialization of the Table Maintenace Specialist Function, the TM display is initialized by blanking out all the variable data fields in the TM display, except the FDA Enable/Inhibit and the checkpoint time tag. These two parameters are left unchanged. The parameter display flag is set OFF and the TM SPEC active flag is set ON. The cyclic parameter update is then scheduled. This function allows the CRT buffer to be cyclically updated once a parameter ID has been selected as an input item entry. The Table Maintenance Display is then presented and the system waits for the selection of a new OPS, new SPEC, Resume, or an item entry. In the event there is an item entry, and the TM Uplink active flag is OFF, then the Table Maintenance process is SCHEDULE'd and passed the item entries indicating the processing to be performed. If the TM Uplink active flag is ON, a class 5 error message is issued.

   The cyclic parameter update is cancelled when a new OPS, new SPEC, or Resume is selected. The TM Spec Active Flag is turned OFF after the cancellation of the cyclic parameter update program.

d. Outputs - Outputs from this module are specified in Table 3.3.1.1-1.

e. Module Reference - Process

Process	Section	Reference
Table Maintenance Process	3.3.1.2	Schedule
Cyclic Parameter Update	3.3.3.3	Schedule

f. Module Type and Attributes

Type: Program

Attributes: N/A

g. Template References -

D INCLUDE TEMPLATE CZ1_COMMON	Systems Services Common Compool
D INCLUDE TEMPLATE CST_TM_CMT	TM Communication Compool
D INCLUDE TEMPLATE DIS_PLAY	Systems Services Display Presentation and Control Routine
D INCLUDE DNX_BMS	Systems Services Application Moding and Sequencing Routine
D INCLUDE TEMPLATE CSA_SM_CMT	Basic SM Communication Compool
D INCLUDE DAG_RAM	OPS Control Segment Grammar Macro Set
D INCLUDE DCG_RAM	SPEC Control Segment Grammar Macro Set
D INCLUDE DDG_RAM	Allows References to MCDS Keyboard Inputs
D INCLUDE TEMPLATE STM_TABLE_MAIN	Table Maintenance Module
D INCLUDE ZPRIOTIM	Contains Replace names for baseline priorities, Phasing and rates of scheduled processes.
D INCLUDE TEMPLATE STC_CYCL_UPDATE	TM Parm Cyclic Update
D INCLUDE TEMPLATE CDL_ANNUN	Systems Services Annunciation Compool
D INCLUDE TEMPLATE DMA_MAC	Systems Services Annunciation Routine
D INCLUDE DMA#MACS	Systems Services Error Annunciation Macro Replace Statements

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.3.1.1-1 Table Maintenance Specialist Function Control Segment

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	Display Variable Data Fields	A.2.11	O	CRT			
2.	Checkpoint Success/Fail Indicator	A.2.11	O	CRT	CSAV_CMT_CKPNT_IND		
3.	Parameter Display Flag	A.2.11	I/O	CRT/CRT	CSAV_CMT_PARM_DSPLY		
4.	TM Spec Active Flag	A.2.11	O	SUL	CSTB_TM_SPEC_ACTIVE		
5.	TM Uplink Active Flag	A.2.11	I	SUL	CSUB_TM_UL_ACTIVE		
6.	Item Entry Table	A.2.11	O	STM	CSTV_ITEM_NO		
7.	Item Entry Integer Table	A.2.11	O	STM	CSTV_ITEM_I		
8.	Item Entry Scalar Table	A.2.11	O	STM	CSTV_ITEM_S		
9.	Item Entry Store Index	A.2.11	L		CSTV_STORE_INDEX		
10.	Deu Number	A.2.11	O	CRT	CSTV_D_DEU_NUMBER		

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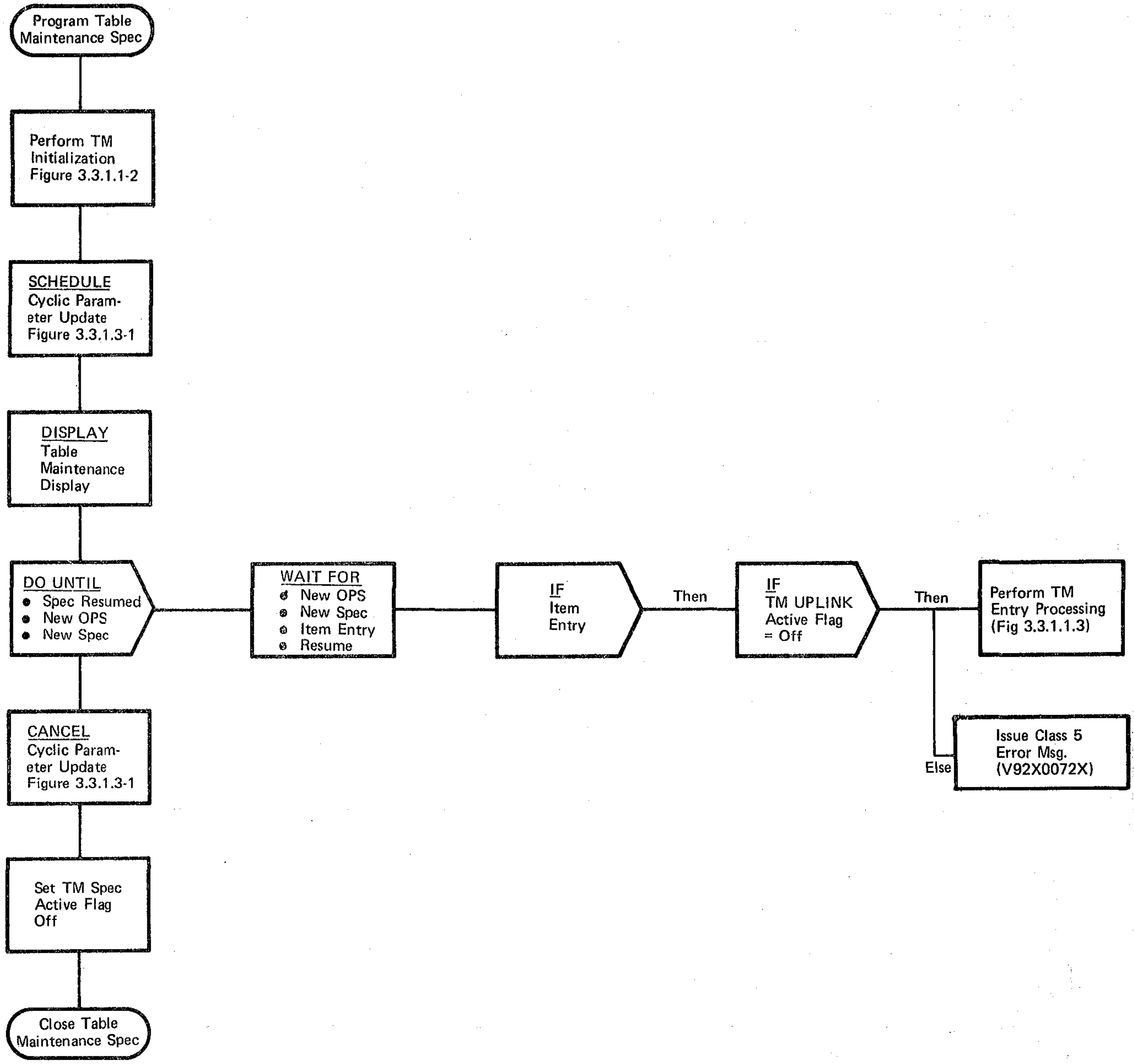

Figure 3.3.1.1-1. Table Maintenance Specialist Function Control Segment

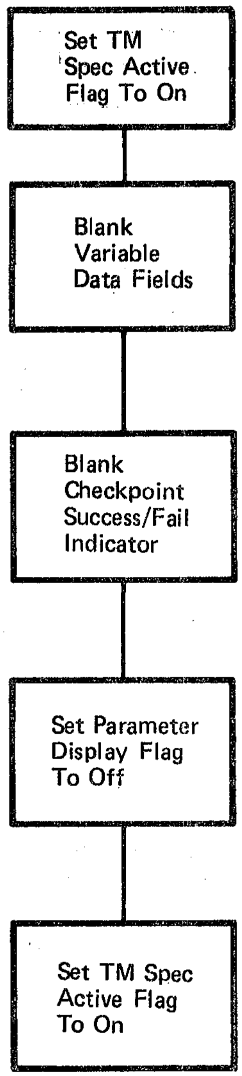

Figure 3.3.1.1-2. Table Maintenance Initialization

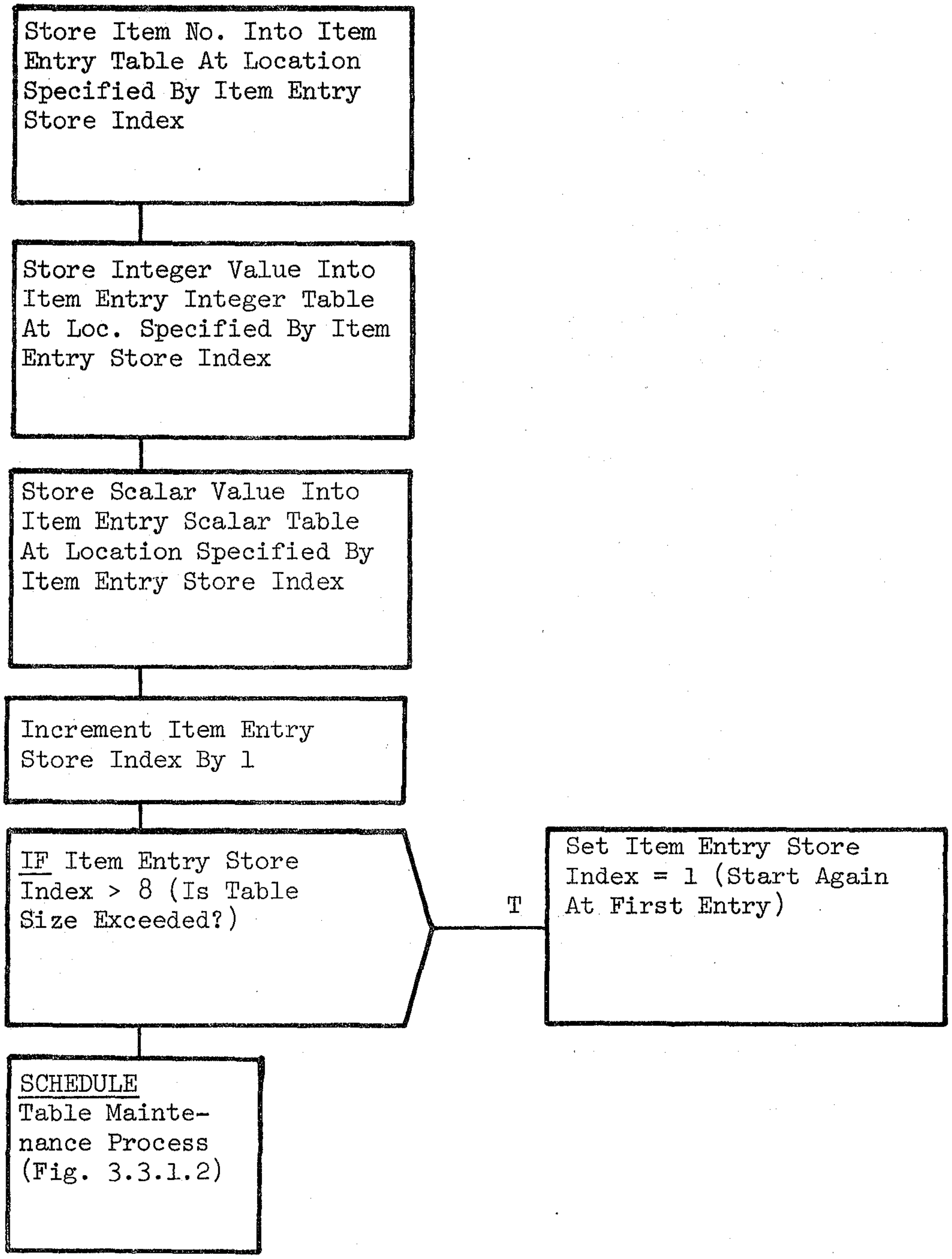

Figure 3.3.1.1-3. TM Entry Processing

3.3.1.2 Table Maintenance Process (STM_TABLE_MAIN)

The Table Maintenance (TM) Process module retrieves the current parameter value, limits, noise filter, annunciation enable/inhibit status, and constant value to be displayed and updates these items when new values are entered via the keyboard. Table Maintenance also controls Checkpoint and enabling/inhibiting the FDA process.

a. Control Interface - Table Maintenance is SCHEDULE'd by the Table Maintenance Specialist Function Control Segment when an item entry is entered.

INVOCATION: Schedule STM_TABLE_MAIN PRIORITY (PRIO_STM)

b. Inputs - Inputs to this module are specified in Table 3.3.1.2-1.

c. Process Description - The control flows for this module are shown in Figure 3.3.1.2-1 through 3.3.1.2-13.

The Table Maintenance module interrogates the item entry to determine which type of processing to perform.

If a limit value, noise filter or annunciation enable/inhibit is to be changed, a parameter ID item input must first be entered. The associated value may then be entered. A parameter ID is valid if it has an entry in the PIT. If the parameter ID is invalid, a Class 5 error message is enabled. If the ID is valid, relevant information about that parameter is retrieved from the various SM tables and buffers and moved to the TM display buffer. The Alarm Class 2 and Alarm Class 3 FDA information (limits, noise filter and parameter annunciation inhibit indicator) is maintained in separate display fields. The current value, status, and limit set in use of each entered parameter are updated cyclically after a parameter ID is entered. The ID is also made available for display. Control is then returned to the control segment.

If a constant value is to be changed, a constant ID item input must first be entered. The associated value may then be entered. A constant ID is valid if it has an entry in the COT. If the constant ID is invalid, a Class 5 error message is enabled. If the ID is valid, the constant value and constant ID are made available for display.

Item entry request are communicated to the TM process through an item entry table. When scheduled, TM process indexes through processing each non-zero entry. It is through this mechanism that multiple entries are processed.

Subsequent calls to TM can be requests to update various values or indicators for the requested parameter. If a request is made without a previous parameter or constant ID being entered, processing stops and a Class 5 error message is enabled for display. It should be noted that a parameter ID entry is valid at all times and indicates to TM that all subsequent parametric entries (prior to the next valid ID entry) are for the requested parameter or constant. Processing for each type of request is:

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1. Limit Values - An existing limit value may be changed for any parameter that is processed by Fault Detection and Annunciation. (Each parameter may have up to three sets of Alarm Class 3 or 4 limits and one set of Class 2 limits.)

   If a limit value is within valid range, the value is stored in the target table (LIT for EU and A nalog and PIT for Discrete). Analog limit values are converted from engineering units to PCM counts prior to storage. All the new limit values are moved to the TM display buffer before control is returned to the control segment. A Class 5 error message is output for an analog or EU limit value entry that is not within a valid range.

2. Noise Filter - If the entered noise filter (max noise count) is not within the valid range (1 to 15) a Class 5 error message is enabled. If the max noise count is valid for this parameter, the max 'n' count field in the PIT entry for this parameter is updated and the current noise count associated with this parameter is reinitialized. The new max noise count is then moved to the Table Maintenance display buffer.

3. Parameter Annunciation Status - The annunciation inhibit indicator in the PIT entry for this parameter is enabled or disabled according to the item entered.

4. Constants Change - If an item entry is made to change a constant, this process accepts the value change for the parameter specified and updates the current value of the parameter in the COT. This updated value is then made available for display.

5. FDA Enable/Inhibit - The FDA Enable/Inhibit Indicator in the CMT is enabled or disabled according to the item entered.

6. Checkpoint - The checkpoint item entry causes the predefined set of SM checkpoint data to be stored to mass memory. If the operation is successful, the current time and a 'success' indicator are displayed. If the operation is not successful, "fail" indicator is displayed.

If there are no errors in the last request, TM display update flag is set on signaling UI to generate a fresh display.

d. Outputs - Outputs from this module are specified in Table 3.3.1.2-1.

e. Module References -

Process	Section	Reference
Forward Scaling	3.2.1.7	CALL
Backward Scaling	3.2.1.8	CALL

f. Module Type and Attributes

Type: Program

Attributes: N/A

g. Template References -

D INCLUDE TEMPLATE CZ1_COMMON	Systems Services Common Compool
D INCLUDE TEMPLATE CST_TM_CMT	TM Communication Compool
D INCLUDE TEMPLATE DIS_PLAY	Systems Services Display Presentation and Control Routine
D INCLUDE TEMPLATE DNX_BMS	Systems Services Application Moding and Sequencing Routine
D INCLUDE TEMPLATE CDL_ANNUN	Systems Services Annunciation Control
D INCLUDE TEMPLATE DMA_MAC	Systems Services Annunciation Routine
D INCLUDE TEMPLATE SFS_FOR_SCALE	Forward Scaling
D INCLUDE TEMPLATE SBS_BACK_SCALE	Backward Scaling
D INCLUDE TEMPLATE CSA_SM_CMT	Basic SM Communication Compool
D INCLUDE CSAPIT	Parameter Information Table
D INCLUDE CSACDA	Current Data Array
D INCLUDE CSALIT	Limit Sense Table (LIT)
D INCLUDE CSCCOTSRC	Constants Table Source Member
D INCLUDE IOMACS	Contains I/O Macro Flags
D INCLUDE MMUMACS	Contains MM Read/Write Macros
D INCLUDE SUMMACS	Contains FCOS Checksum Generation Macros
D INCLUDE DMA#MACS	Systems Services error annunciation macro replace statements
D INCLUDE TEMPLATE CVN_MM UTILITY	Contains SM common buffer
D INCLUDE PROTMACS	System services portection macros

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.3.1.2-1 Table Maintenance Process

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	Parameter ID	A.2.1	I/O	CRT/CRT	CSAS_PITA_PARM_ID CSAS_PITE_PARM_ID CSAS_PITS_PARM_ID		
2.	Constant ID	A.2.12	I/O	CRT/CRT	CSAS_COT_SCALAR_PARMID CSAS_COT_DISCRETE_PARMID CSAS_COT_INTEGER_PARMID		
3.	Constant Value	A.2.12,D.12	I/O	CRT/CRT	CSAS_COT_SCAL_VALUE CSAS_COT_DIS_VALUE CSAS_COT_INT_VALUE		
4.	Limit Values	A.2.1,D.9,A.2.8,D.8	I/O	CRT/CRT,SFD	CSAS_LIT_ANALOG_LOW_LIMIT CSAS_LIT_ANALOG_HIGH_LIMIT CSAS_LIT_EU_LOW_LIMIT CSAS_LIT_EU_HIGH_LIMIT CSAS_PITS_LIM_STATES		
5.	Current Noise Count('N' Count)	A.2.1,D.11	I/O	CRT/CRT,SFD	CSAS_PITA_CUR_N_CT CSAS_PITE_CUR_N_CT CSAS_PITS_CUR_N_CT		
6.	Maximum Noise Count	A.2.1,D.11	I/O	CRT/CRT,SFD	CSAS_PITA_MAX_N_CT CSAS_PITE_MAX_N_CT CSAS_PITS_MAX_N_CT		
7.	Annunciation Inhibit	A.2.1,D.11	I/O	CRT/CRT,SFD	CSAS_PITA_ALARM_INH_IND CSAS_PITE_ALARM_INH_IND CSAS_PITS_ALARM_INH_IND		
8.	FDA Enable/Inhibit Indicator	A.2.11,D.6	I/O	CRT/CRT,SPM	CSAV_CMT_FDA_IND		
9.	Checkpoint Status On Display	A.2.11	O	CRT	CSTV_CHKPT_STATUS		
10.	Checkpoint Time	A.2.11	O	CRT	CSTV_CHKPT_STATUS		
11.	Hard Fail Indicator	A.2.1,D.10	O	CRT	CSAS_PITA_HARD_FAIL CSAS_PITE_HARD_FAIL CSAS_PITS_HARD_FAIL		
12.	Backward Scaling Call List	E.3.2.1.8	O				
13.	Alarm. Class	System Services Fault Message Parameter Table (FMPT)	I		STM_FMPT.CLASS		
14.	Limit Set In Use Indicators	TM Display Buffer	O	CRT			

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TABLE 3.3.1.2-1 Table Maintenance Process (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
15.	Active Limit Set	A.2.1	O	CRT	CSAS_PITA_ACT_LIM_SET CSAS_PITE_ACT_LIM_SET CSAS_PITS_ACT_LIM_SET		
16.	(deleted)						
17.	(deleted)						
18.	PIT Index	A.2.11	I		CSTS_CMT_PIT_INDEX		
19.	COT Index	E	L		STM_COT_INDEX		
20.	Number of Limit Sets	A.2.1	I	CRT/CRT,SFD	CSAS_PITA_LIM_SET CSAS_PITE_LIM_SET		
21.	Invalid Indicator	E	L		STM_INVALID_IND		
22.	Parameter Display Flag	A.2.11	I/O	CRT/CRT	CSAV_CMT_PARM_DSPLY		
23.	Parm Type	TM Display Buffer	O		CSTV_CMT_PARM_TYPE		
24.	Number of Limit Sets Save	E	L		STM_LIM_SET_SAVE		
25.	Class 2 Limit Indicator	E	L		STM_CLASS2_LIM_IND		
26.	Class 0,3,4 Limit Indicator	E	L		STM_CLASS034_LIM_IND		
27.	PIT Subindex	A.2.11	I		CSTS_CMT_PIT_SUBINDX		
28.	Current Value	A.2.7	I	SFS			
29.	Current Parm Status	A.2.7	I	SFS			
30.	Parm Count	A.2.1	I	CRT	CSAS_PITP_NUM_PARMS		
31.	Dummy, I/O Status For Limits	A.2.7	O	SFS			
32.	ID Found Flag	E	L		STM_ID_FOUND		
33.	Item Table	E	L		STM_ITEM_TABLE		
34.	Item Type	E	L		STM_ITEM_TYPE		
35.	Constant Type	TM Display Buffer	L		CSTV_CMT_CONST_TYPE		
36.	Parm ID (Display)	A.2.11	O	CRT	CSTV_PARM_ID		
37.	Constant ID (Display)	A.2.11	O	CRT	CSTV_CONST_ID		

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TABLE 3.3.1.2-1 Table Maintenance Process (Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
38.	TM Uplink Active Flag	A.2.11	I	SUL	CSVB_TM_UL_ACTIVE		
39.	TM Uplink Error Flag	A.2.11	O	SUL	CSTB_TM_ERR		
40.	SM Common Buffer in use Flag	A.2.25	I,O	Various Users of the SM Common Buffer	CDHB_COM_BUF_INUSE		
41.	Common Buffer In Use Flag For Checkpoint	A.2.25	L		STM_COM_BUF_FREE		
42.	Checkpoint Buffer	A.2.25	O	MMU	CDHV_BLOCKS		
43.	Pointer To Next Available Halfword	E			STM_BUFR_IND		
44.	I/O Error Field	A.2.25	I	FCOS	CSZV_RW_TSW		
45.	Number Of Analog PIT Entries	A.2.1	I		CSAS_PITA_NUM_ENTRIES		
46.	Number of EU PIT Entries	A.2.1	I		CSAS_PITE_NUM_ENTRIES		
47.	Number of Parent Entries In PIT	A.2.1	I		CSAS_PITP_NUM_ENTRIES		
48.	Parent Limit Value	A.2.1	I		CSAS_PITP_LIMIT_STATUS		
49.	Time of Successful Checkpoint	E	I,O	CRT	CZ1V_D_MISSION_TIME$(1:)		
50.	Size of LIT	E	L		STM_LIT_SIZE		
51.	Number of Words	E	L		STM_NUM_SCALARS		
52.	Tm Display Update Flag	A.2.11	O	FCOS	CSTV_TM_DISP_UPD		
53.	Item Entry Table	A.2.11	I	STS	CSTV_ITEM_NO		
54.	Item Entry Integer Table	A.2.11	I	STS	CSTV_ITEM_I		
55.	Item Entry Scalar Table	A.2.11	I	STS	CSTV_ITEM_S		
56.	Item Entry Process Index	A.2.11	L		CSTV_PROCESS_INDEX		
57.	Common Buffer Address	UI Compool Table CZ1_ COMMON	I	UI	CZ1V_MM_ADDR_TBL$2		

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TABLE 3.3.1.2-1 Table Maintenance Process (cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
58	Total Number Entries in Cot	E	L		STM_NUM_ENTRIES		
59	Current Search Position	E	L		STM_CUR_POS		
60	Doublescalar Value	E	L		STM_COT_DBL_SCAL_VALUE		
61	PARM Blanking Bit	A.2.11	O		CSTB_PARM_ID_STAT		
62	TM PARM ID	A.2.11	O	CRT	CSTV_PARM_ID		
63	Entered ID	E	L		STM_ITEM11		
64	Const Scal Blanking Bit	A.2.11	O		CSTB_CONST_SCAL_STAT		
65	Const Disc Blanking Bit	A.2.11	O		CSTB_CONST_DISC_STAT		
66	Const Scal Value	A.2.11	O	CRT	CSTV_CONST_VAL_SCAL		
67	Const Disc Value	A.2.11	O	CRT	CSTV_CONST_VAL_DISC		
68	COT Position Pointer	E	L		STM_COT_INCR		

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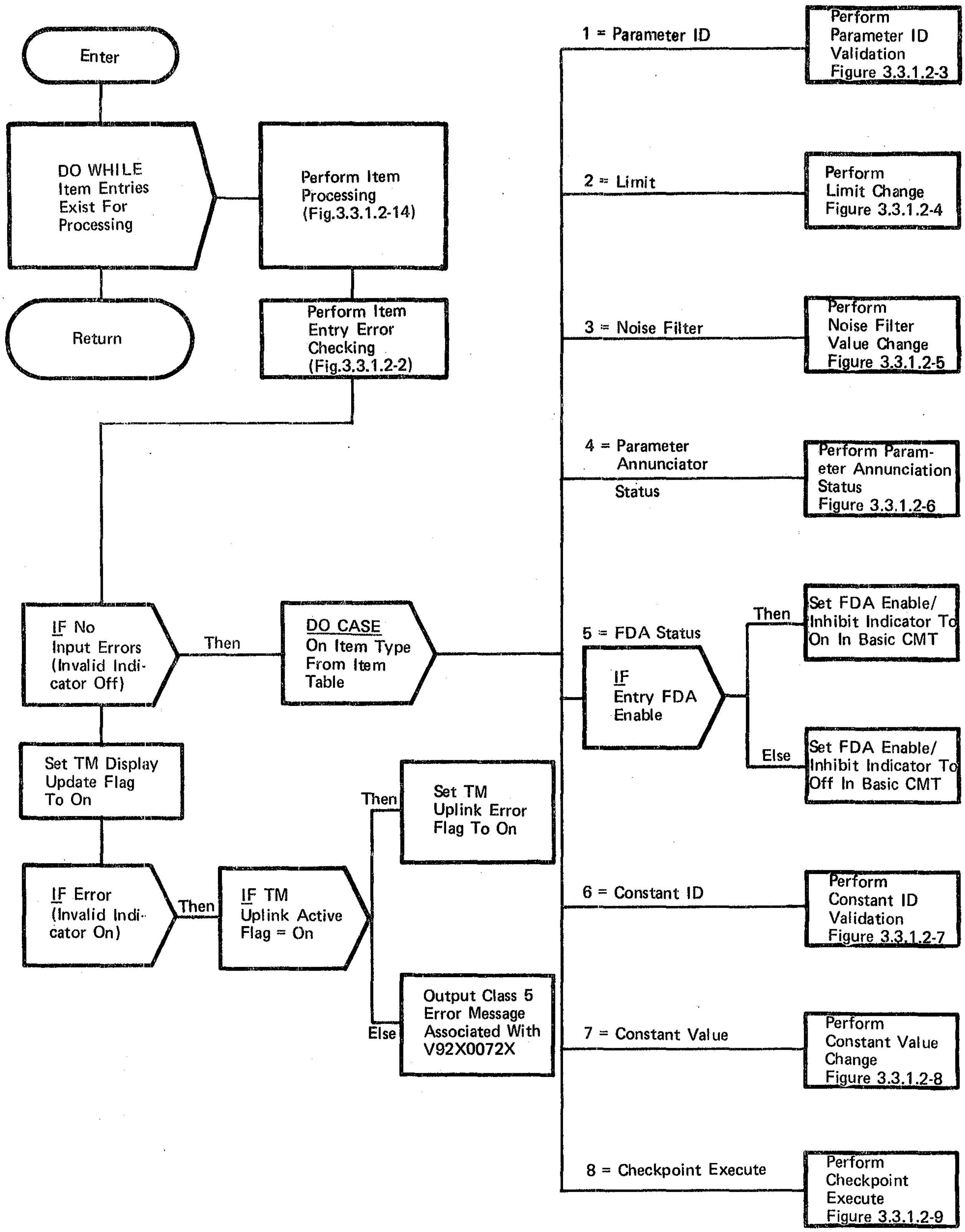

Figure 3.3.1.2-1. Table Maintenance Process

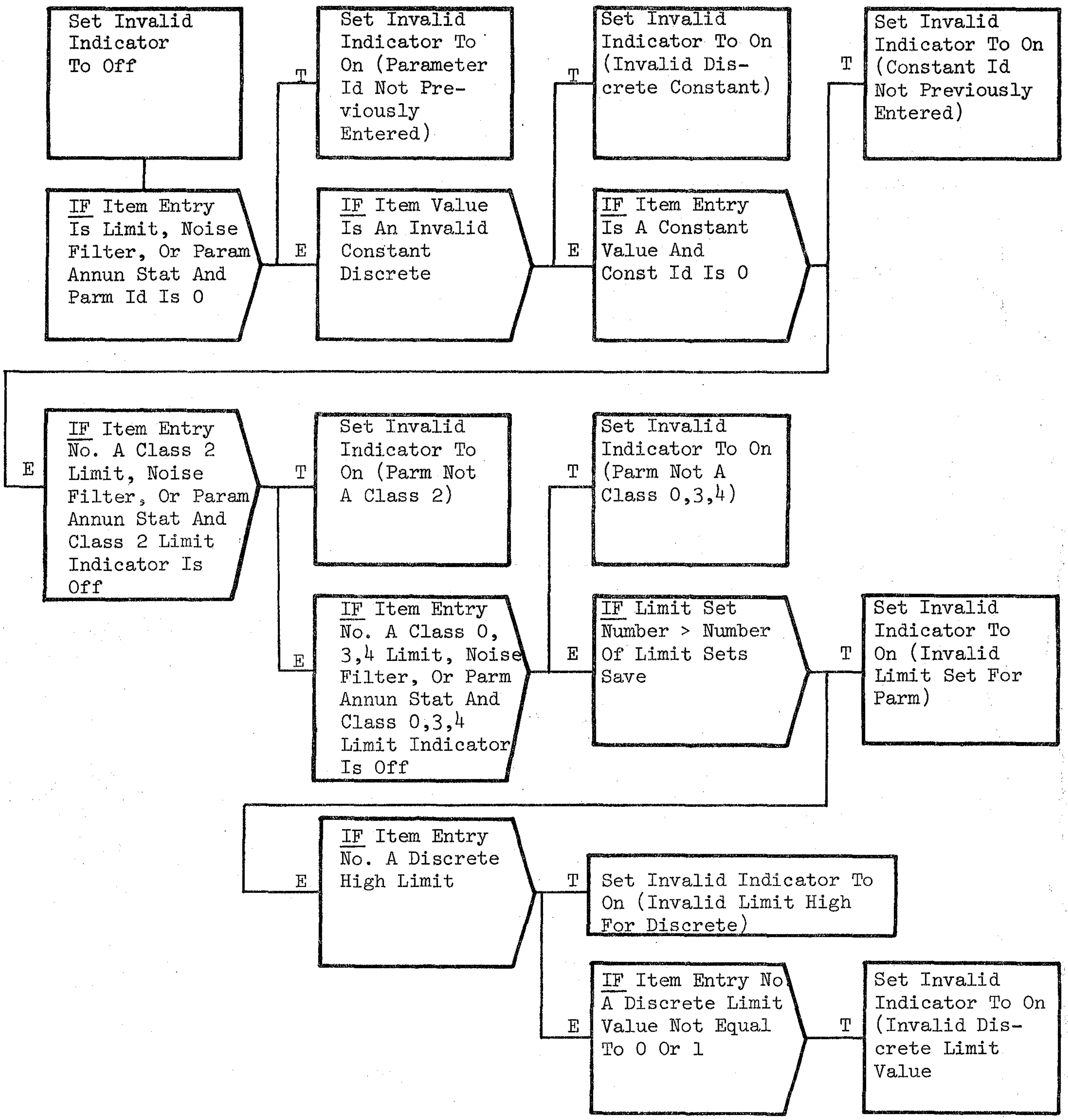

Figure 3.3.1.2-2. Item Entry Error Checking

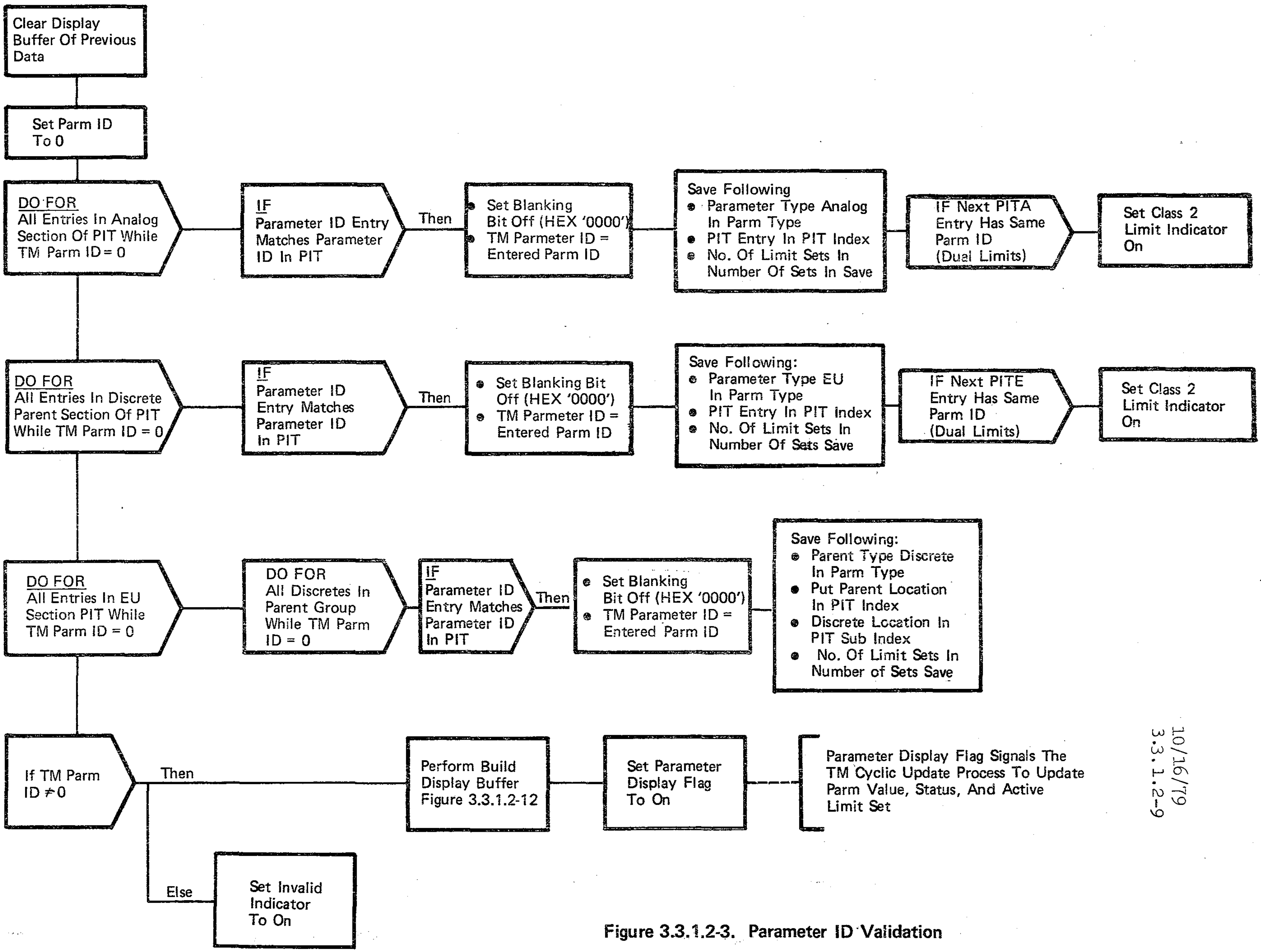

Figure 3.3.1.2-3. Parameter ID Validation

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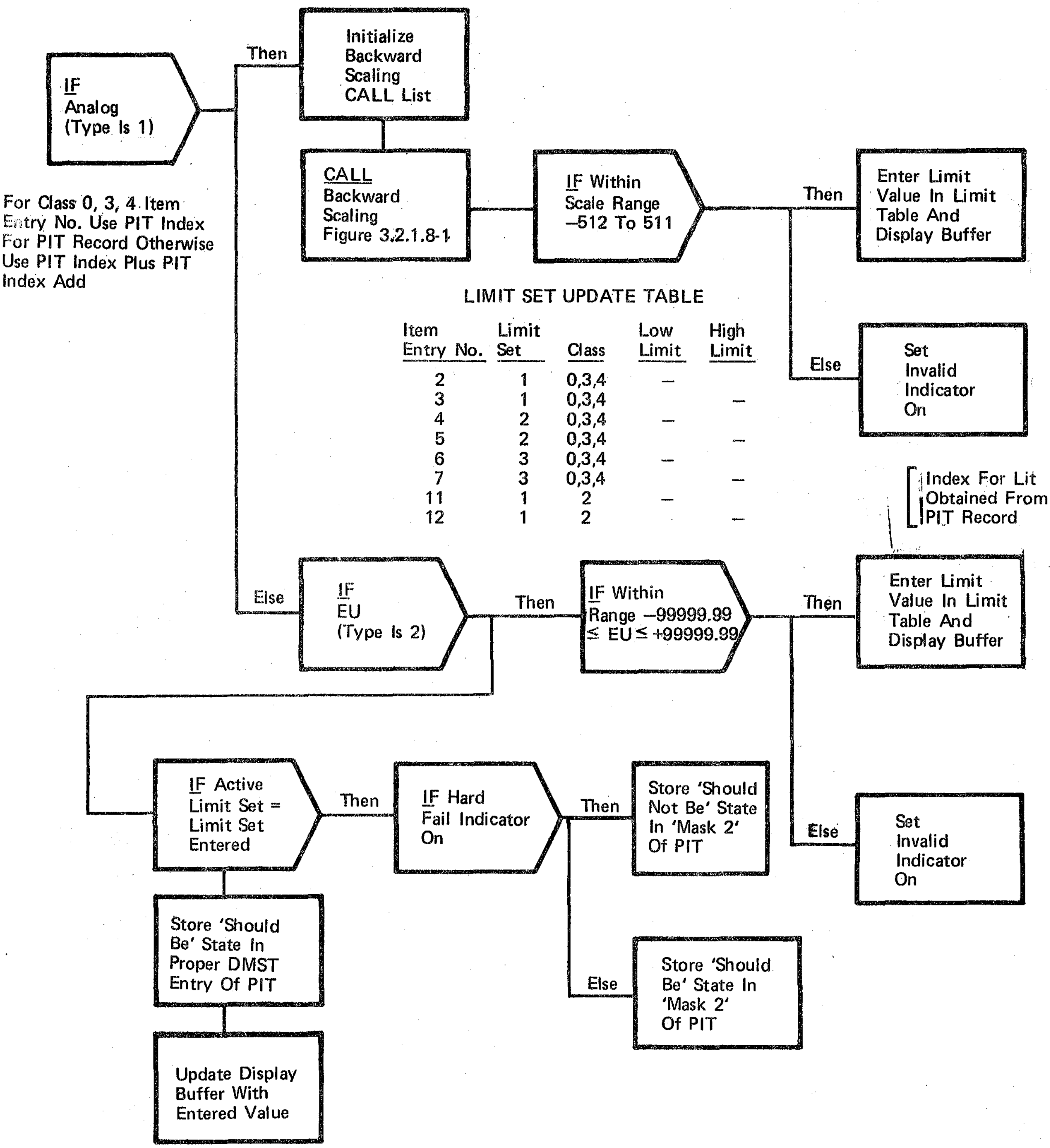

LIMIT SET UPDATE TABLE

Item Entry No.	Limit Set	Class	Low Limit	High Limit
2	1	0,3,4	–	
3	1	0,3,4		–
4	2	0,3,4	–	
5	2	0,3,4		–
6	3	0,3,4	–	
7	3	0,3,4		–
11	1	2	–	
12	1	2		–

Figure 3.3.1.2-4. Limit Change Check

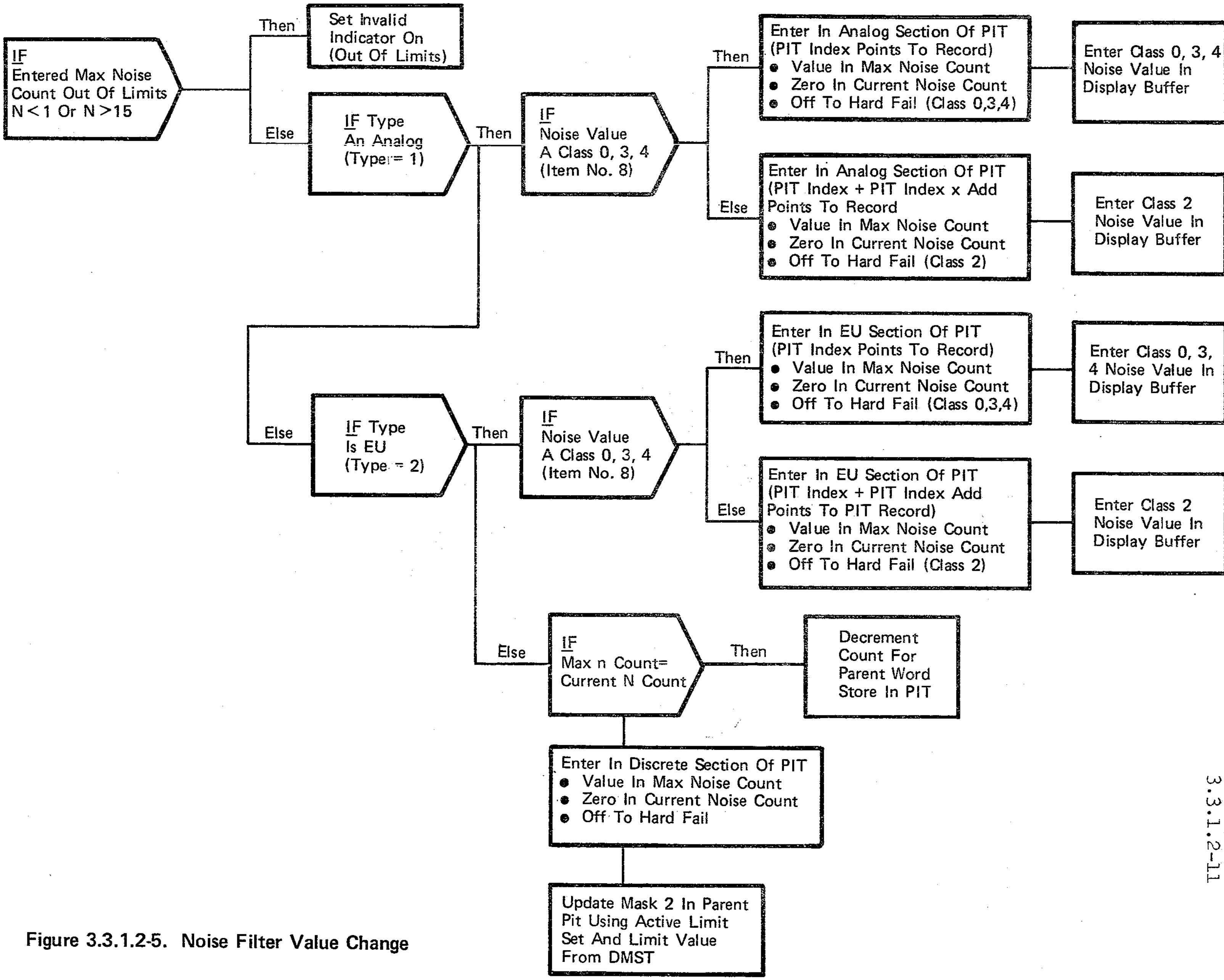

Figure 3.3.1.2-5. Noise Filter Value Change

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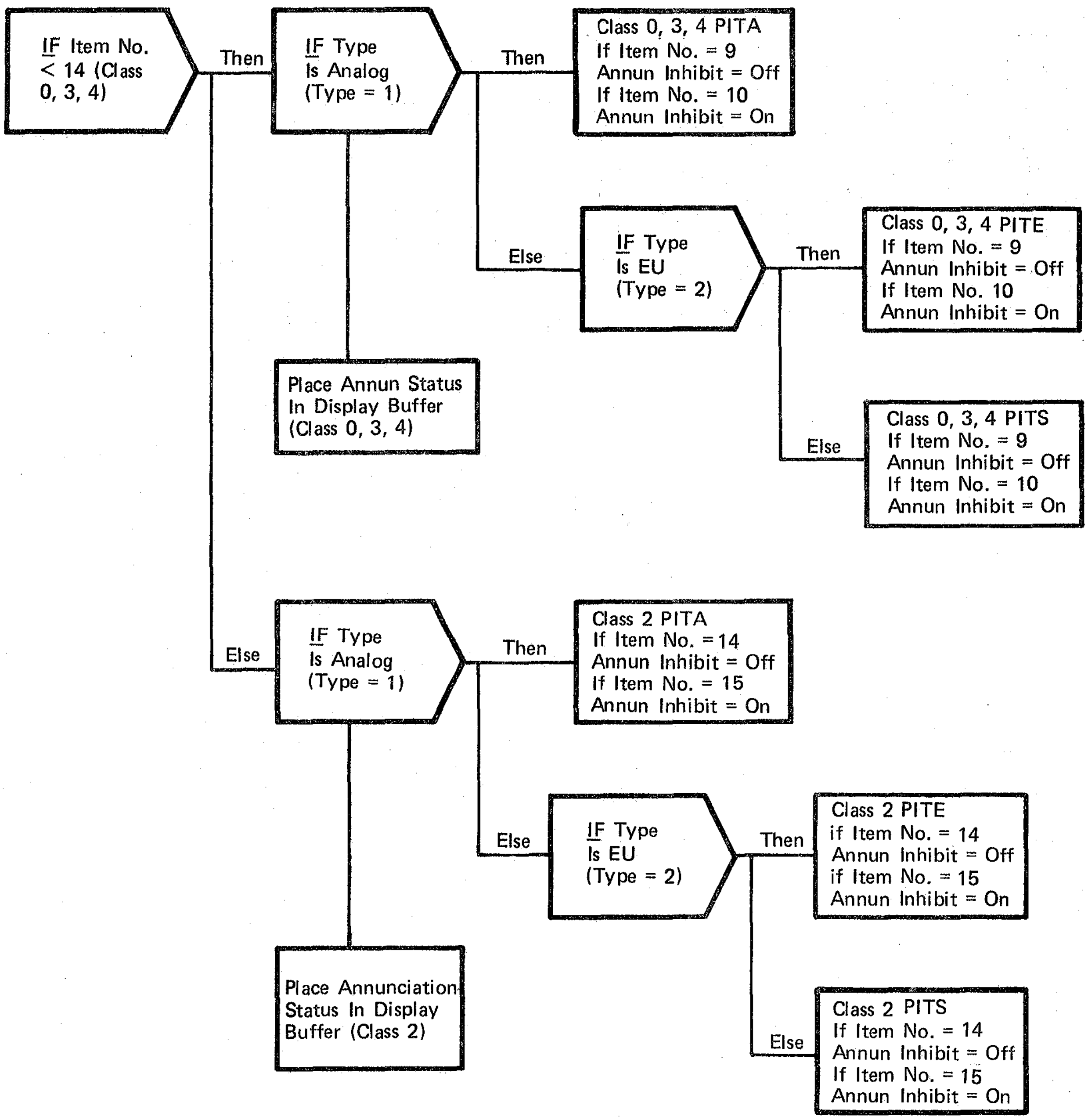

Figure 3.3.1.2-6. Parameter Annunciation Status

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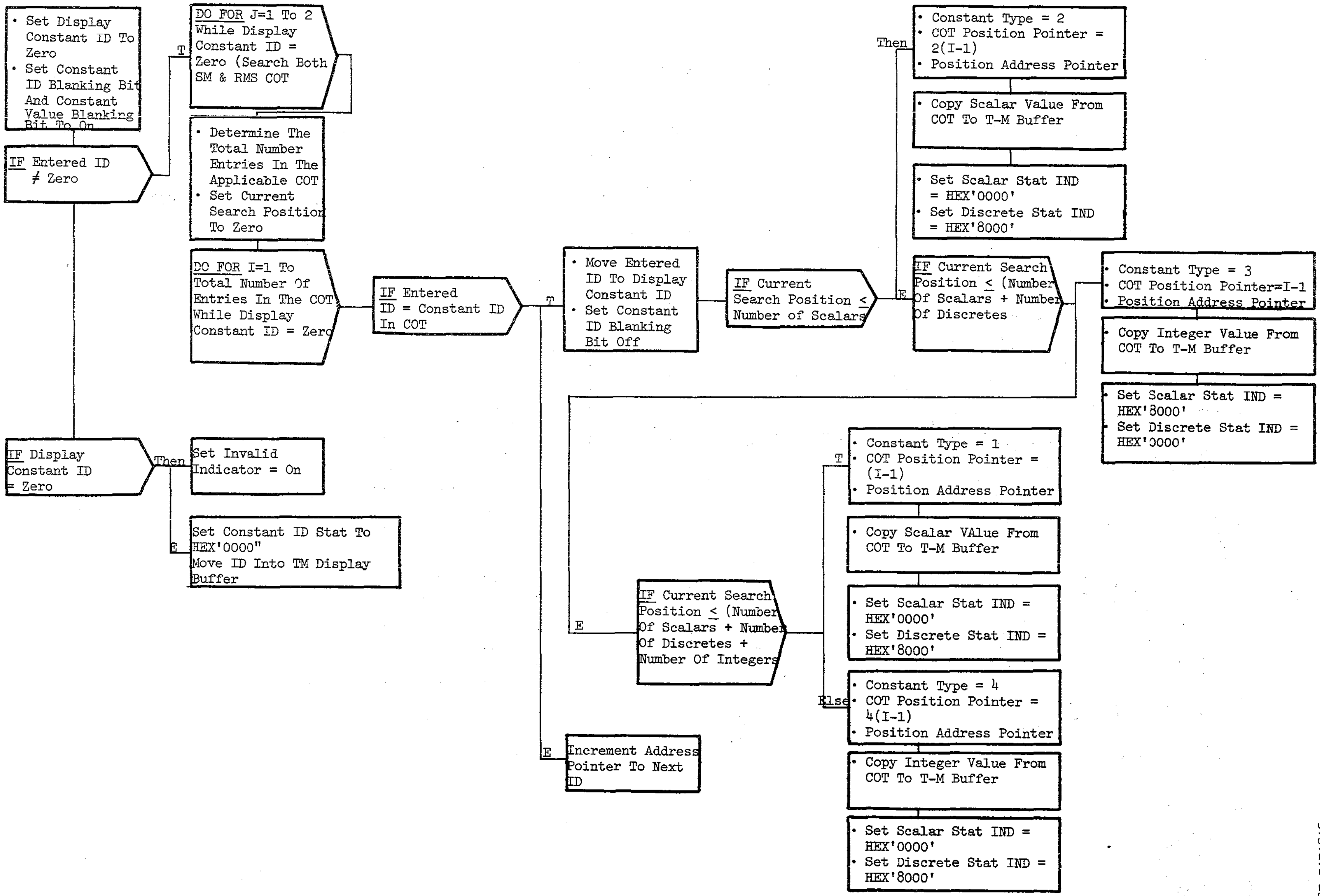

Figure 3.3.1.2-7 Constant ID Validation

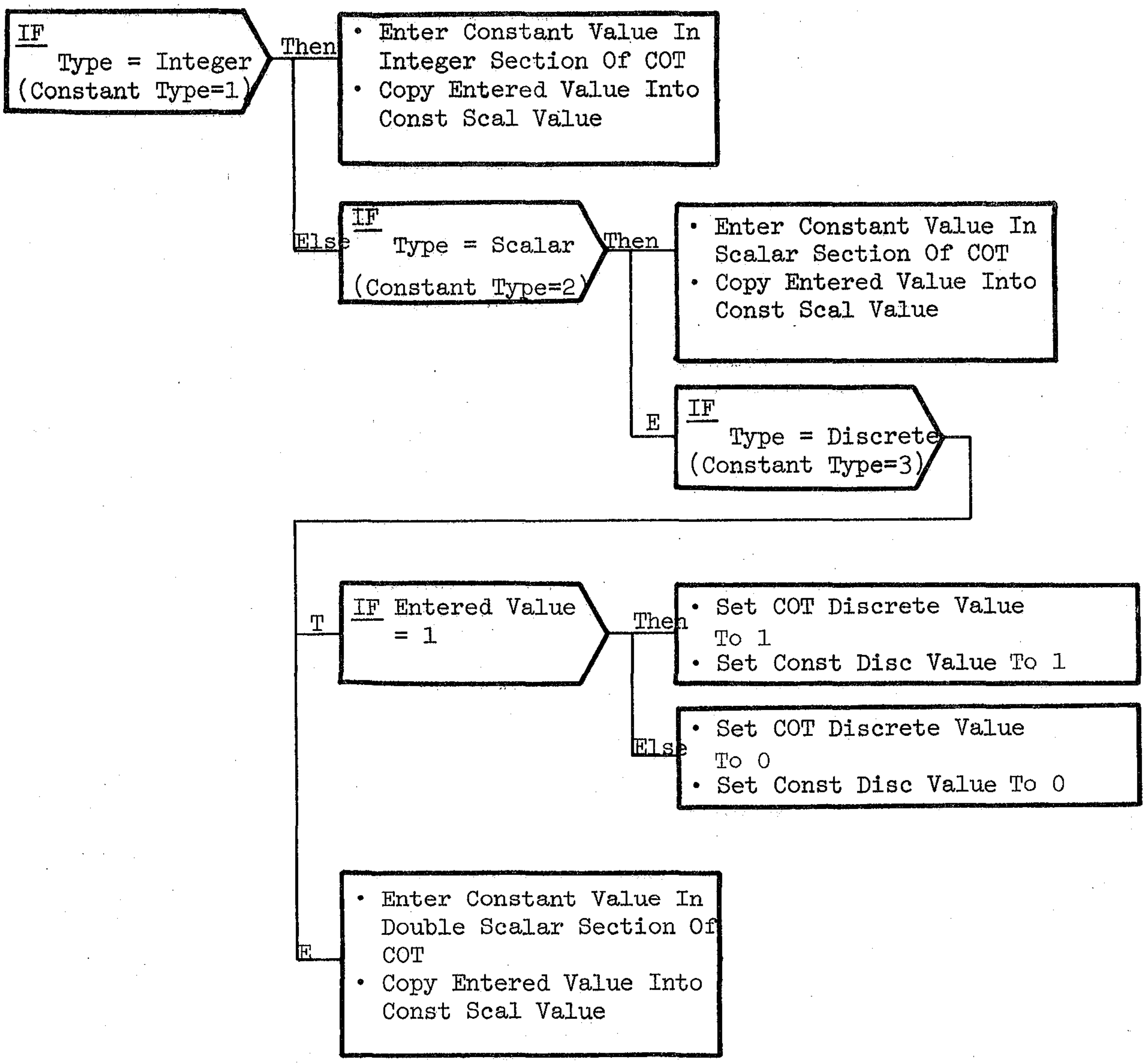

Figure 3.3.1.2-8 Constant Value Processing

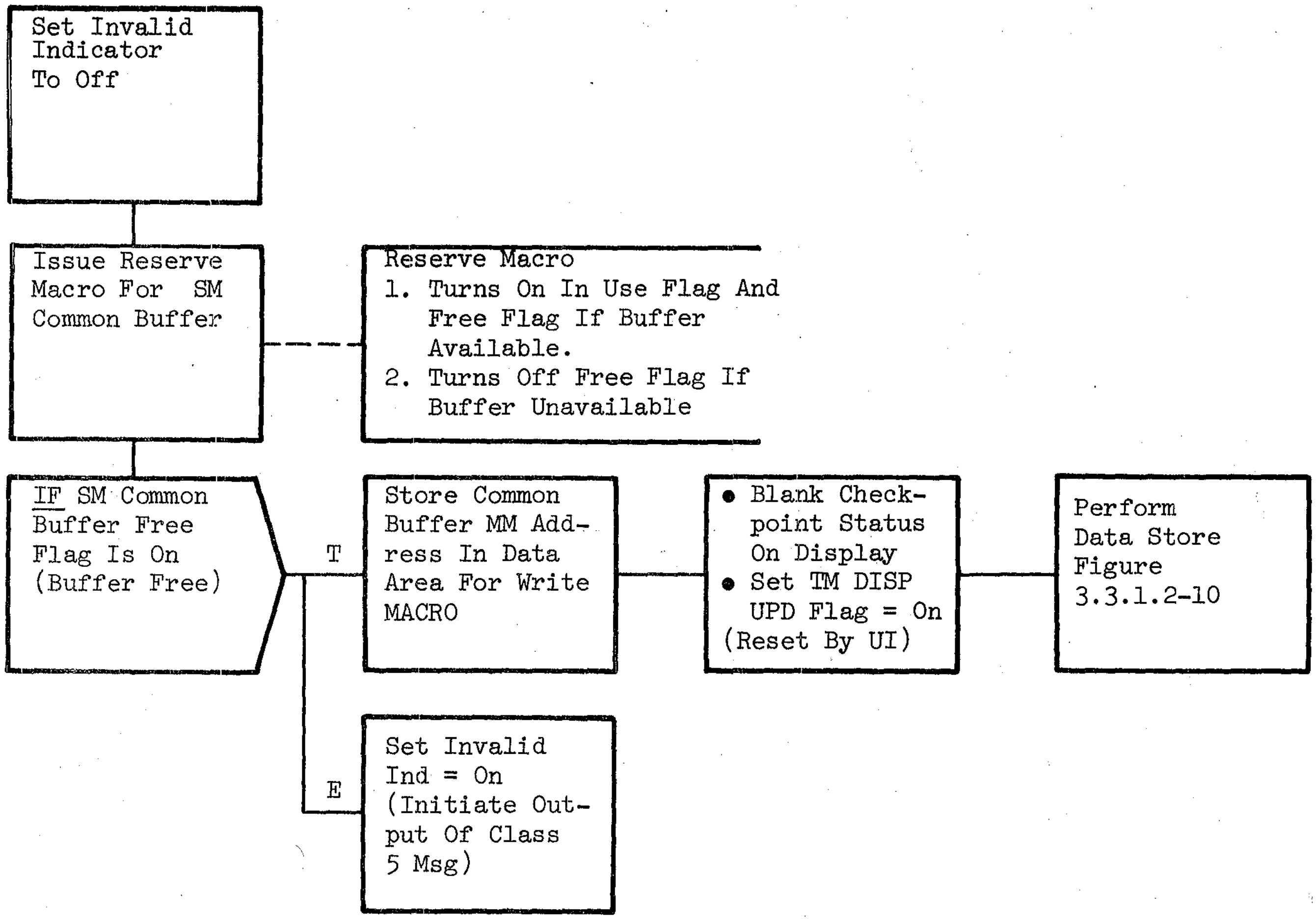

Figure 3.3.1.2-9. Checkpoint Execute

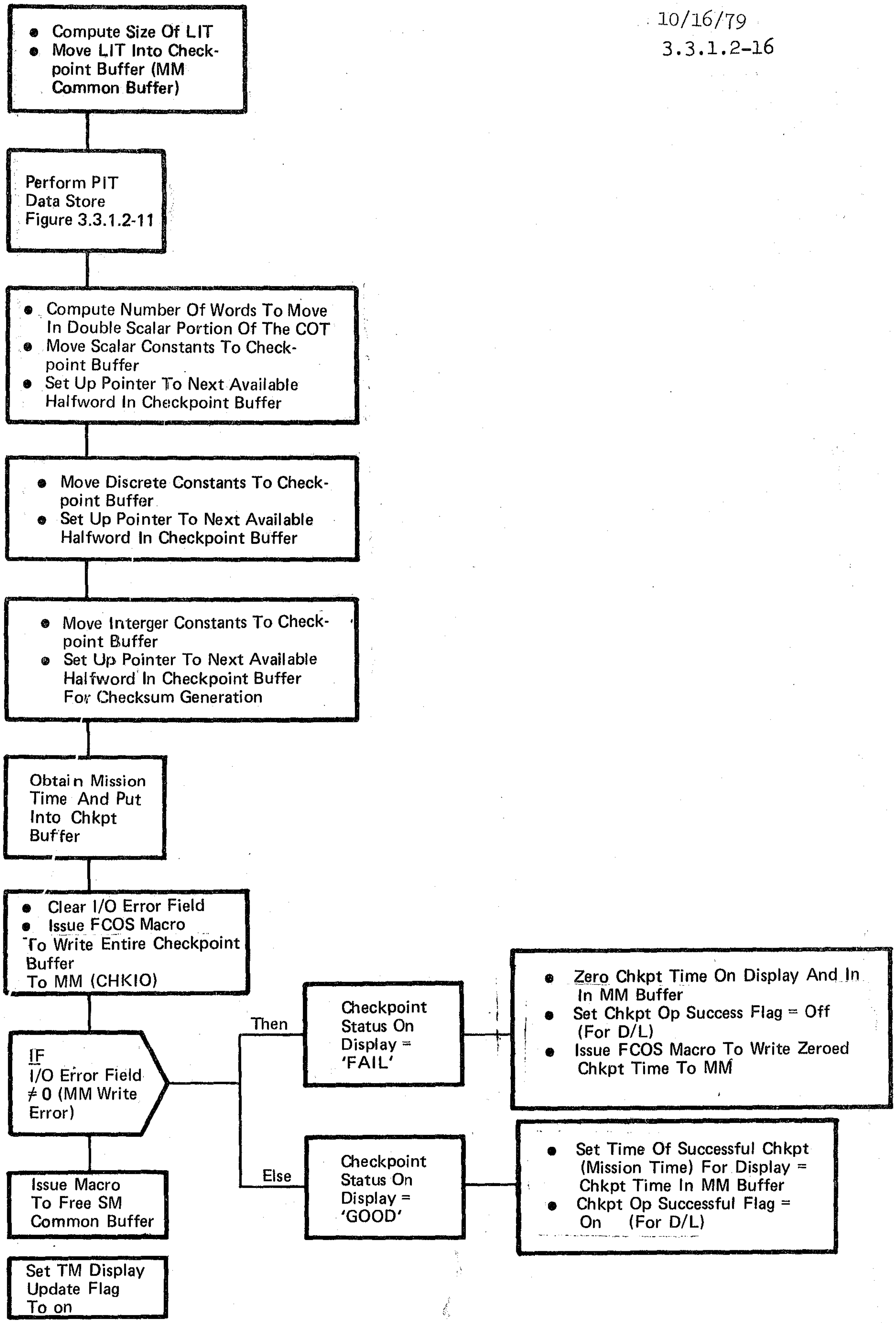

Figure 3.3.1.2-10. Data Store

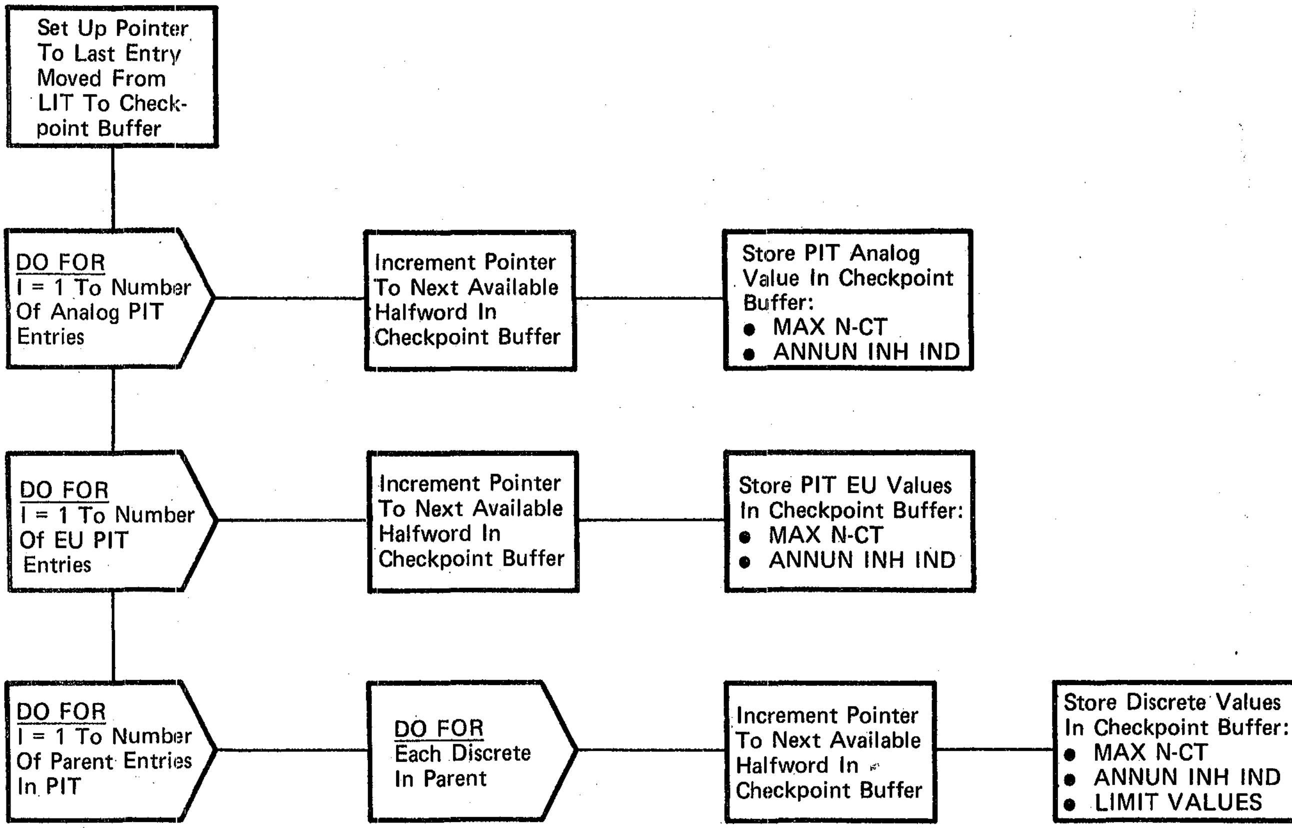

Figure 3.3.1.2-11. Pit Data Store

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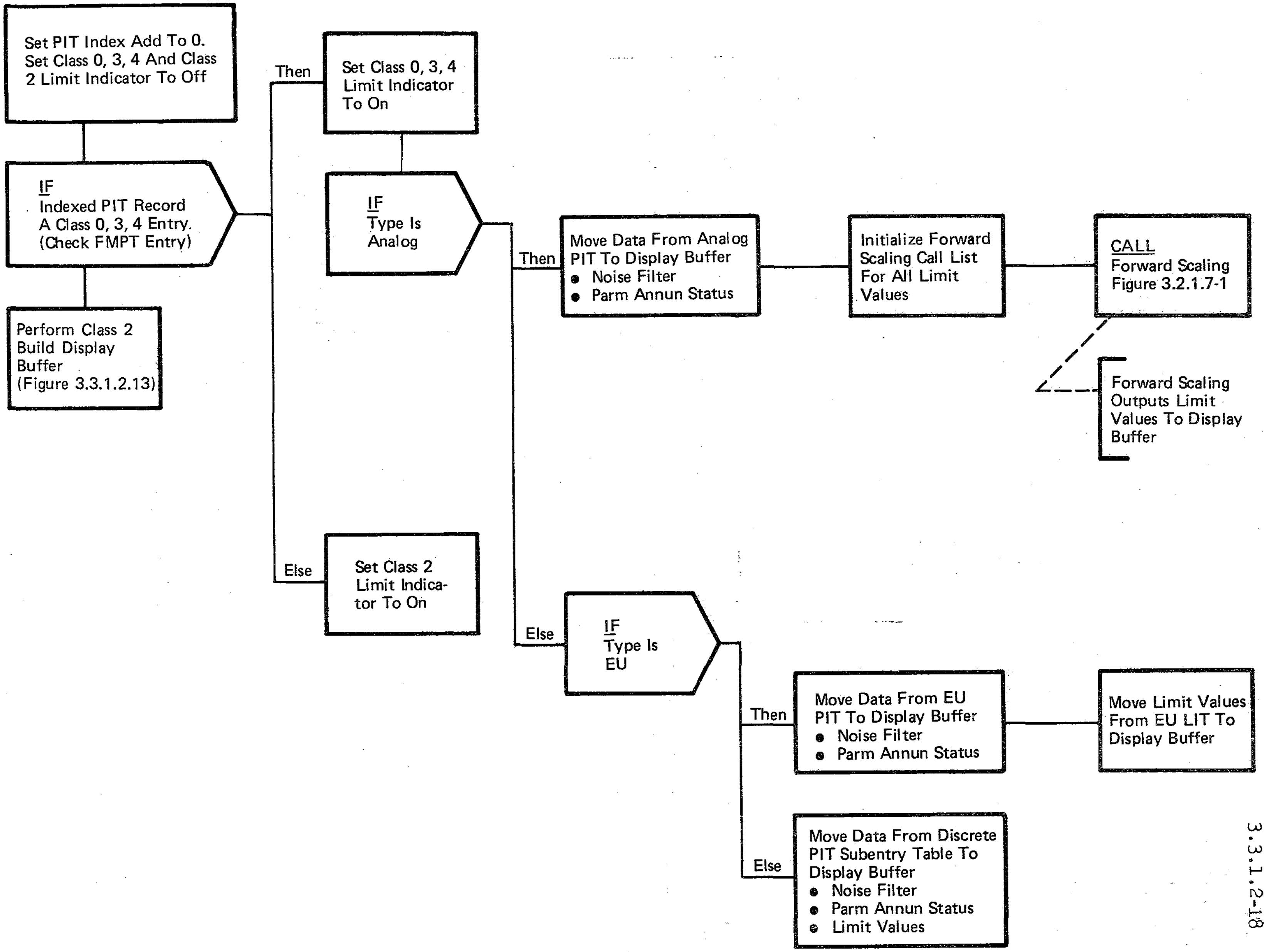

Figure 3.3.1.2-12. Build Display Buffer

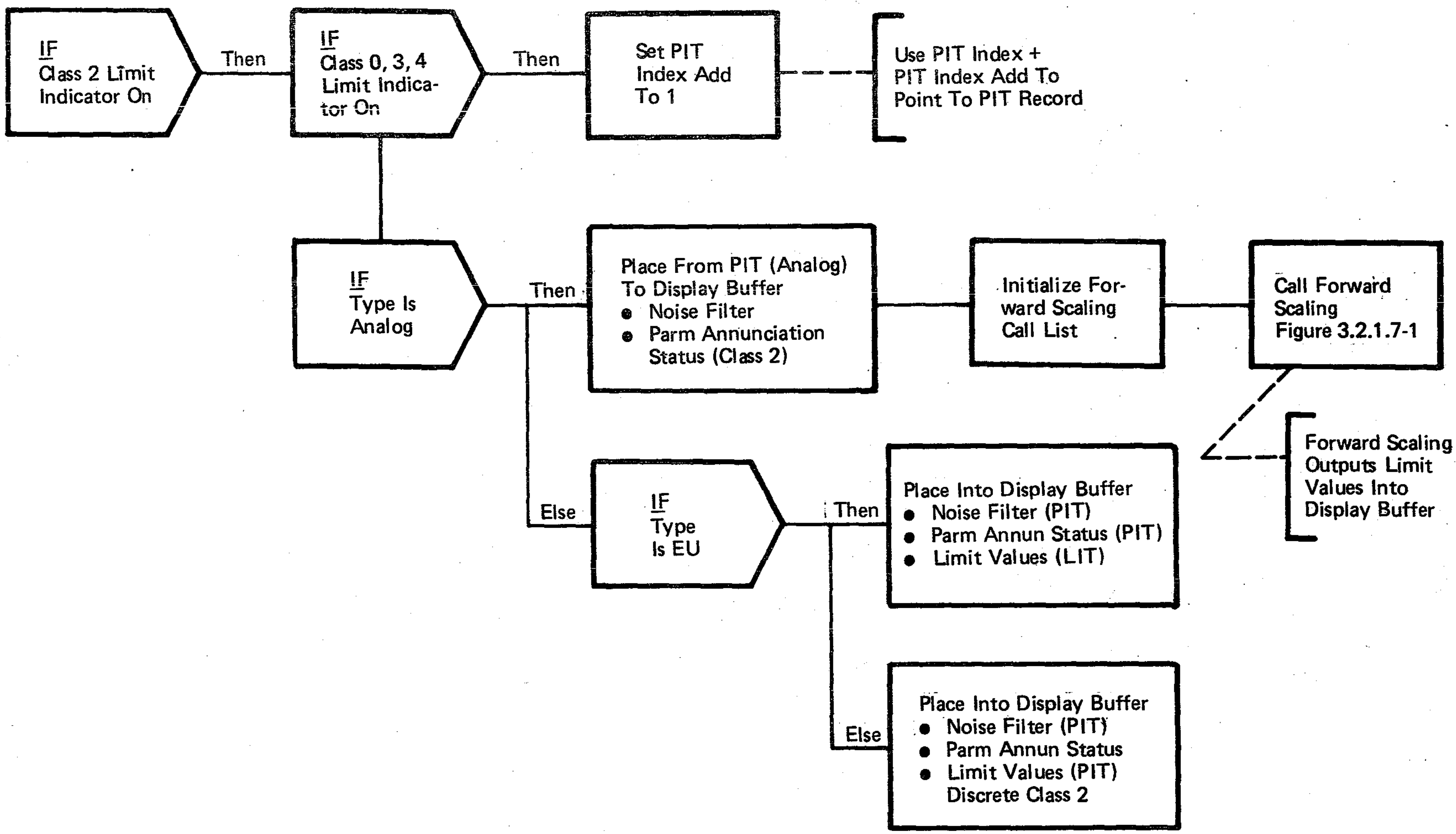

Figure 3.3.1.2-13. Class 2 Build Display Buffer

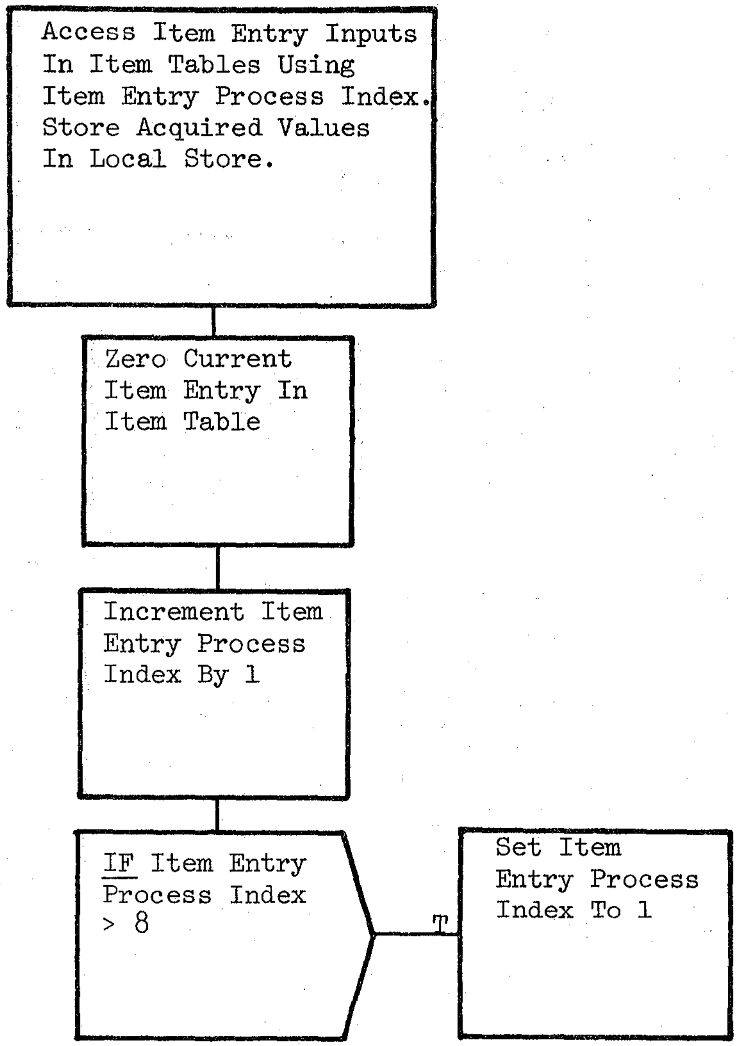

Figure 3.3.1.2-14. Item Processing

3.3.1.3 Table Maintenance Cyclic Parameter Update (STC_CYCL_UPDTE)

The Cyclic Parameter Update provides for the display buffer update once every two seconds.

a. Control Interface - The cyclic update module is scheduled by the Table Maintenance Specialist Function Control Segment at a rate of once every two seconds.

INVOCATION: SCHEDULE STC_CYCL_UPDTE AT PHASE_STC PRIORITY (PRIO_STC), REPEAT EVERY TIME_STC.

b. Inputs - Inputs to this module are specified in Table 3.3.1.3-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.1.3-1. The display buffer is updated as long as the parameter display flag is turned ON. This flag is initially turned OFF by the TM control unit and is turned ON by the TM module when the first parameter ID is entered by the crew. The class 0/3/4 Limit indicator is a flag in the TM display buffer and is set ON or OFF by the TM module. The active Limit set (1,2, or 3) is entered into the display buffer if the class 0/3/4 Limit indicator is ON.

The analog, EU, or discrete data is updated, depending on the parameter type.

The parameter type is an integer value in the display buffer. A value of 1 indicates an analog type, a 2 an EU type, and a 3 a discrete type. The data that is updated are the parameter value, status and active Limit set indicator.

d. Outputs - Outputs from this module are specified in Table 3.3.1.3-1.

e. Module References -

Process.	Section	Reference
Forward Scaling	3.2.1.7	CALL

f. Module Type and Attributes:

Type: Program

Attributes: N/A

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g. Template References:

D INCLUDE CSAPIT	Parameter Information Table (PIT)
D INCLUDE CSACDA	Current Data Array (CDA)
D INCLUDE TEMPLATE CST_TM_CMT	TM Communication COMPOOL
D INCLUDE TEMPLATE SFS_FOR_SCALE	Forward Scaling

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.3.1.3-1 Cyclic Parameter Update MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	Parameter Display Flag	A.2.11	I	STM	CSAV_CMT_PARM_DSPLY		
2.	Active Limit Set	A.2.1	I	STM	CSAS_PITA_ACT_LIM_SET CSAS_PITE_ACT_LIM_SET CSAS_PITS_ACT_LIM_SET		
3.	PIT INDEX	TM Display Buffer	I	STM	CSTS_CMT_PIT_INDEX		
4.	PIT SUBINDEX	TM Display Buffer	I	STM	CSTS_CMT_PIT_SUBINDX		
5.	Class 0/3/& Limit Indicator	TM Display Buffer	I	STM	CSTV_CLASS03&_LIM_IND		

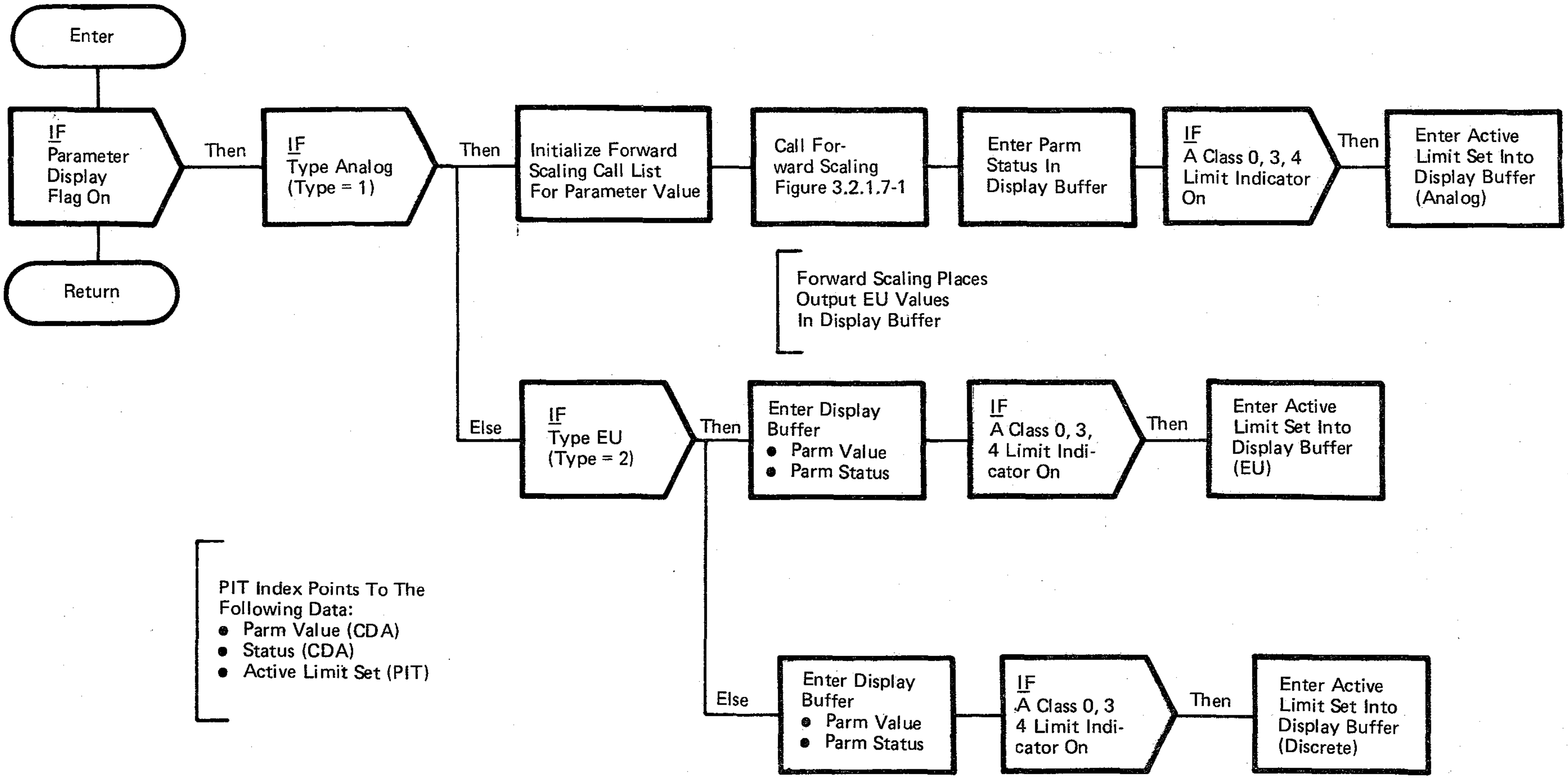

Figure 3.3.1.3-1. Cyclic Parameter Update

3.3.2 Subsystem Configuration Management

The Subsystem Configuration Management (SCM) function provides the capability to compare lists of specified parameters with predefined condigurations. SCM is a Specialist Function controlled via item entries from the SCM display.

3.3.2.1 SCM Specialist Function Control Segment (SCS_SPEC)

The Subsystem Configuration Management Specialist Function Control Segment acts as the interface between the crew and the SCM process and controls execution of the SCM processes.

a. Control Interface - The SCM Control Segment is SCHEDULE'd by the User Interface Sequence Request Processor (DMC_SEQ_REQ_PROC) upon user request.

   Invocation: SCHEDULE SCS_SPEC PRIORITY(PRIO_SCS)

b. Inputs - Inputs to this module are specified in Table 3.3.2.1-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.2.1-1. The SCM Specialist Function calls the SCM Initialization/Cleanup module to initialize the SPEC controlled display variables. The SCM Display is presented and the current SCM list ID is enabled. The system then waits for selection of a new OPS, new SPEC, RESUME, or an item entry. If there is an item entry, the SCM process is scheduled to perform the process associated with that item entry.

d. Outputs - Outputs from this module are specified in Table 3.3.2.1-1.

e. Module References

Process	Section	Reference
SCM Process	3.3.2.2	SCHEDULE
SCM Initialization	3.3.2.3	CALL

f. Module Type and Attributes

   Type: Program

   Attributes: N/A

g. Template References

D INCLUDE TEMPLATE CZ1_COMMON	Systems Services Common Compool
D INCLUDE TEMPLATE DIS_PLAY	Display presentation and Control
D INCLUDE TEMPLATE DNX_BMS	Application Moding and Sequences
D INCLUDE TEMPLATE CSC_CSM_CMT	SCM DISPLAY PARAMETERS
D INCLUDE DAG#RAM	Common grammar macro set
D INCLUDE DCG#RAM	SPEC Control Segment grammar macro set

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D INCLUDE DDG#RAM	Allows references to MCDS keyboard inputs
D INCLUDE ZPRIOTIM	Contains REPLACE names for baseline priorities, phasing, and rates of scheduled processes

h. Error Handling - None

i. Constraints and Assumptions

1. Item entries entered while the SCM Process is processing a previous entry are ignored.

2. There is no attempt to 'lock out' SPEC termination if the SCM Process is still active when SPEC termination is requested. Therefore, the 'SUCCESS/FAIL' indicator associated with SCM MM write would not be visible to the user since the SPEC display is overlayed at termination before the 'SUCCESS/FAIL' indicator can be updated.

TABLE 3.3.2.1-1 SCM Specialist Function Control Segment MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Item Entry	E	I	CRT			
2	Item Indicator	A.2.11, D.16	O	SCM	CSCV_CMT_ITEM_NO		
3	Limits/States	A.2.11, D.16	O	SCM	CSCV_CMT_LOW_LIMIT CSCV_CMT_HIGH_LIMIT		
4	List ID	A.2.11, D.16	O	SCM	CSCV_CMT_LIST_ID		
5	Parm ID	A.2.11, D.16	O	SCM	CSCV_CMT_PARM_ID		
6	Spec Table Pointer	A.2.11.2	O	SCM	TBL_WR_IDX		
7	Item Entry Table	A.2.11.2	O	SCM	SCM_ITEM_TBL		

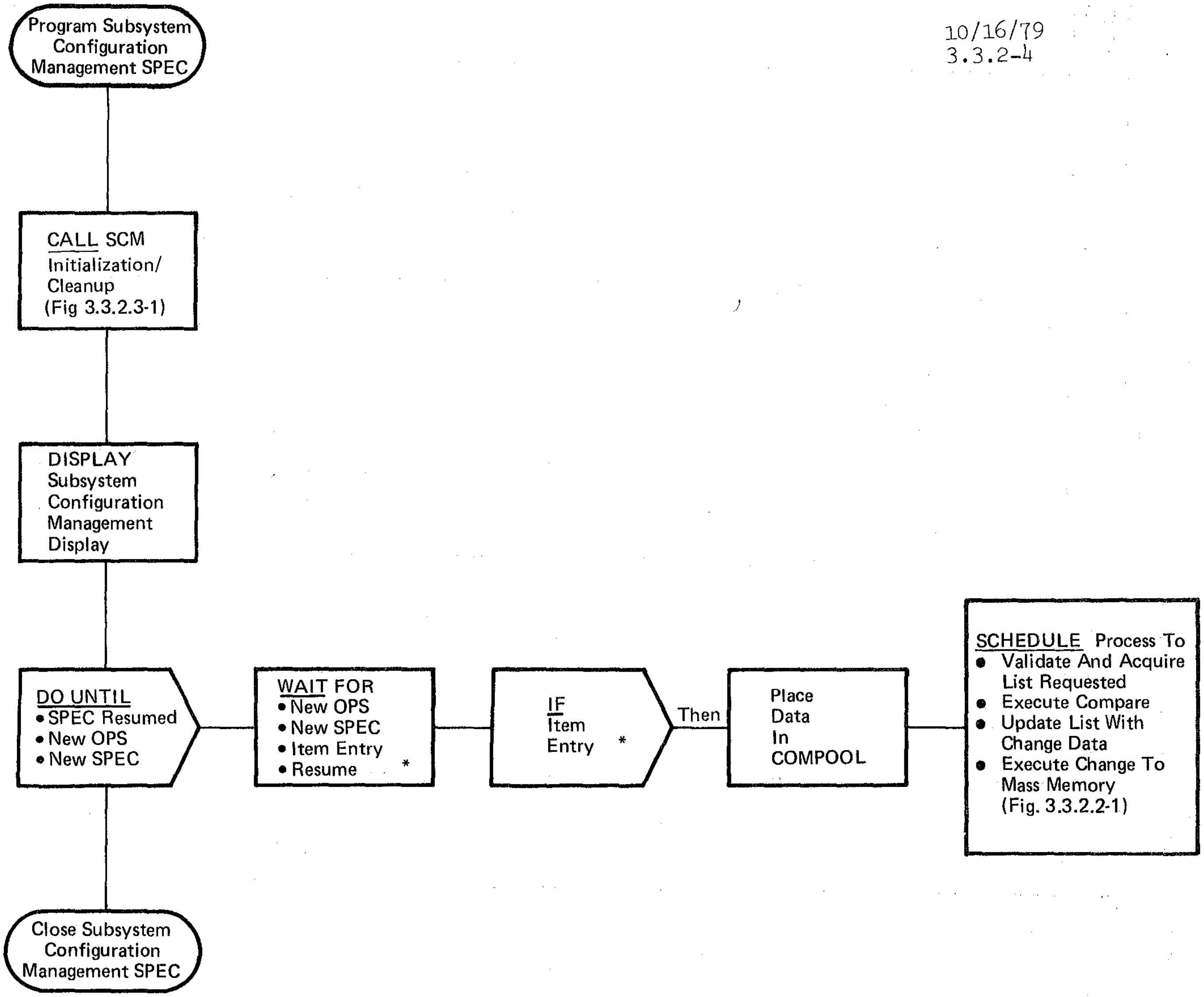

Figure 3.3.2.1-1. Subsystem Configuration Management Specialist Function Control Segment

3.3.2.2 Subsystem Configuration Management Process (SCM_SUB_CONFIG_MAN)

Subsystem Configuration Management (SCM) provides the capability to compare specified analog, EU, and discrete parameters with predefined configurations as defined in SCM lists. SCM is controlled by item entry from the SCM display.

a. Control Interface - The SCM module is SCHEDULE'd by the SCM Control Segment to process item entries.

INVOCATION: SCHEDULE SCM_SUB_CONFIG_MAN PRIORITY(PRIO_SCM)

b. Inputs - Inputs to this module are specified in Table 3.3.2.2-1.

c. Process Description - The control flows for this module are shown in Figures 3.3.2.2-1 through 3.3.2.2-17. The SCM module determines which process to perform based on the item entry. There are five processes as follows:

1. Select list to be used - When a valid list is selected it is read from Mass Memory if it is not already core resident and the new list ID is made available for display. If the list selected is invalid then an error message is enabled for display.

2. Execute List Compare - When a comparison is requested (regardless of whether a list is selected), the discrepancy message buffer and downlist buffer are cleared. The acquisition of the SCM data values by basic data acquisition and the Special Process data acquisition is independent of the SCM process. This data will reside in the CDA or SPINB and will be pointed to directly out of the SCM list. ICC data is requested by ICC Data Acquisition (Figure 3.3.2.2-4). If the ICC data is not acquired by some predetermined time those values are marked as invalid. The acquired values are compared with the predefined SCM list limits and discrepancies are noted and made available for display. Discrepancy messages are also generated for parameters with invalid status indicators. The parameter IDs of each parameter that generates a discrepancy message are added to the downlist buffer. Invalid status indicators, for values with I/O errors, and desired state, for discretes, are also made available for display at this time. The process is terminated when ten (10) discrepancies are found or the list is completed. If no discrepancies are found, a single "all good" message is enabled for display.

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3. Request display of a particular parameter and its limits - When a parameter ID is requested the current SCM list is searched. If the ID is found its limits are made available for display. If they are not found an error message is enabled for display.

4. Change limits - If the parameter ID has been previously entered the new limits are moved into the SCM list replacing the old. In the case of a discrete, the new desired state text is made available for display. If the parameter ID has not been entered, an error message is enabled for display.

5. Write current list to Mass Memory - The success/fail indicator is blanked and the list written to Mass Memory. The SCM software ensures that the Mass Memory initialization copy of the SCM list is not overwritten. When the write is complete, FCOS reads the data back into main memory, compares checksums of the write and read operation, then returns a status in the write status field of the FCOS write macro. This status field is interpreted by SCM and the success/fail indicator is set and made available for display.

d. Outputs - Outputs from this module are specified in Table 3.3.2.2-1.

e. Module References - DMA_MAC - A system software external procedure called when a class 5 error message is enabled by FMPT_CLASS5 macro.

f. Module Type and Attributes

Type: Program
Attributes: N/A

g. Template References -

D INCLUDE CSCSCMT - SCM TEXT DICTIONARY
D INCLUDE CSCSCAT - SCM ADDRESS TABLE (SCAT)
D INCLUDE TEMPLATE CSC_CMT_SCM - SCM DISPLAY PARAMETERS
D INCLUDE TEMPLATE CSZ_ICC_CMT - ICC INPUT BUFFERS AND FLAGS
D INCLUDE TEMPLATE CDL_ANNUN - SYSTEM SERVICES ANNUNCIATION COMPOL
D INCLUDE DM#MACS - SYSTEM SERVICES ERROR ANNUNCIATION MACRO REPLACE STATEMENTS
D INCLUDE TEMPLATE CZ2_COMMON_SCM ICC/UI FLAGS

h. Error Handling - None

i. <u>Constraints and Assumptions</u> -

1. Item entries made while the SCM program is busy with a previous item entry are ignored by the SCM control segment.

2. Any ICC data input errors caused all ICC parameters to be marked invalid.

TABLE 3.3.2.2-1 Subsystem Configuration Management MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Item Indicator	A.2.11, D.16	I	SCS	CSCV_CMT_ITEM_NO		
2	Parm ID	A.2.11, D.16	I	SCS	CSCV_CMT_PARM_ID		
3	Limits/States	A.2.11, D.16	I	SCS	CSCV_CMT_LOW_LIMIT CSCV_CMT_HIGH_LIMIT		
4	List ID	A.2.11, D.16	I	SCS	CSCV_CMT_LIST_ID		
5	SCM List	A.2.14	I	MMU	CSCS_LIST_ID		
6	Error Message Text	A.2.15	O	CRT	CSCD_SCM_TEXT		
7	Limits/States	A.2.14	I				
8-9	(deleted)						
10	Downlist PARMID	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(I)		
10A	PARMID 1	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(1)	V93U1951C	
10B	PARMID 2	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(2)	V93U1952C	
10C	PARMID 3	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(3)	V93U1953C	
10D	PARMID 4	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(4)	V93U1954C	
10E	PARMID 5	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(5)	V93U1955C	
10F	PARMID 6	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(6)	V93U1956C	
10G	PARMID 7	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(7)	V93U1957C	
10H	PARMID 8	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(8)	V93U1958C	
10I	PARMID 9	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(9)	V93U1959C	
10J	PARMID 10	A.2.11.2	O	DL	CSCV_CMT_DOWNLIST(10)	V93U1960C	
11	Discrepancy Message Line	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY_ERROR(I)		
11A	Discrepancy Message 1	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY_ ERROR(1)	V92U1961C	
11B	Discrepancy Message 2	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY_ ERROR(2)	V92U1962C	
11C	Discrepancy Message 3	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY ERROR(3)	V92U1963C	

TABLE

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
11D	Discrepancy Message 4	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY ERROR(4)	V92U1964C	
11E	Discrepancy Message 5	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY ERROR(5)	V92U1965C	
11F	Discrepancy Message 6	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY ERROR(6)	V92U1966C	
11G	Discrepancy Message 7	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY ERROR(7)	V92U1967C	
10H	Discrepancy Message 8	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY ERROR(8)	V92U1968C	
10I	Discrepancy Message 9	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY ERROR(9)	V92U1969C	
10J	Discrepancy Message 10	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY ERROR(10)	V92U1970C	
12	Display PARM Status	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY_STATUS(I)		
13	Display PARMID	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY_PARMID		
14	Display Should Be State	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY_STATE		
15	Item Table	E	L		SCM_ITEM_TABLE		
16	Item Type	E	L		SCM_ITEM_TYPE		
17	Error Indicator	E	L		SCM_CLASS5_ERROR	V92X0067X	
18	Number Discrepancies	E	L		SCM_NUM_DISCREP		
19	Display Low Limit	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY_LOW VAL		
20	Display High Limit	A.2.11.2	O	CRT	CSCV_CMT_DISPLAY_HIGH VAL		
21	(Deleted)						
22	Display Success/Fail	A.2.11.2	O	CRT	CSCB_CMT_DISPLAY_S/F		
23	FCOS Read/Write Macro Call List	E	O				
24	Write Status	E	I/O	Macro Call List			
25	MM Address	E	O	Macro Call List			

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TABLE 3.3.2.2-1 Subsystem Configuration Management (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
26	↑ to SCML Buffer	E	O	Macro Call List			
27	IFW Flag	E	O		ICC_CSCV_ICC_MSG		
28	ENABLE/INHIBIT FLAG	E	I	ICC Call List	ENABLE_SCM_DATA_MSG		
29	Parameter I/O Status	A.2.17, A.2.22 (SCMINB)	I	SCS			
30	Compare Error	E	L		SCM_COMPARE_ERROR		
31	SCML Should Be STATE	A.2.14	I	MMU	CSCS_DISC_STATE		
32	Discrepancy Text	A.2.15	I	MMU	CSCS_TEXT		
33	Desired State Text	A.2.14	I	MMU	CSCS_DISC_SWO CSCS_DISC_SW1		
34	Parameter A	A.2.14	I	MMU	CSCS_3POS_PARMIDA		
35	Parameter B	A.2.14	I	MMU	CSCS_3POS_PARMIDB		
36	Parameter A Value	A.2.10, A.2.17	I	SGA, SCM, SSD	CSCS_3POS_PARVALA		
37	Parameter B Value	A.2.10, A.2.17	I	SGA, SCM, SSD	CSCS_3POS_PARVALB		
38	PARM A Should Be STATE	A.2.14	I	MMU	CSCS_3POS_STATEA		
39	PARM B Should be STATE	A.2.14	I	MMU	CSCS_3POS_STATEB		
40	#_IN_DISCRETE_SECTION	A.2.14	I	MMU	CSCS_NUM_DISC		
41	#_IN_3POS_SECTION	A.2.14	I	MMU	CSCS_NUM_3POS		
42	#_IN_EU_SECTION	A.2.14	I	MMU	CSCS_NUM_EU		
43	E.U. VALUE	A.2.10, A.2.17	I	SGA, SSD	CSCS_EU_VALUE		
44	Found Flag	E	L		SCM_FOUND_FLAG		
45	SCML_PARMID	A.2.14	I	MMU	CSCS_EU_PARMID		
46	SCML_SAVE	E	L		SCM_SAVE		
47	Section INDICATOR	E	L		SCM_SECTION		
48	A_FLAG	E	L		SCM_AFLAG		
49	3POS_ERROR	E	L		SCM_3POS_ERROR		
50	SCM ICC Event Flag	E	I	ICC Router	CSCV_SCM_ICC_EVENT		

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TABLE 3.3.2.2-1 Subsystem Configuration Management (Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
51	Item Entry Table	A.2.11.2	I	SCS	SCM_ITEM_TBL		
52	Process Table Pointer	A.2.11.2	I	SCS	TBL_RD_IDX		
53	SM Common Buffer	A.2.25	O	MM	CDHV_BLOCKS		
54	Common Buffer In Use Flag	A.2.25	I/O	Various Processes Using MM Common Buffer	CDHB_COM_BUF_INUSE		
55	Common Buffer In Use Flag for SCM	E	L		SCM_COM_BUF_FREE		

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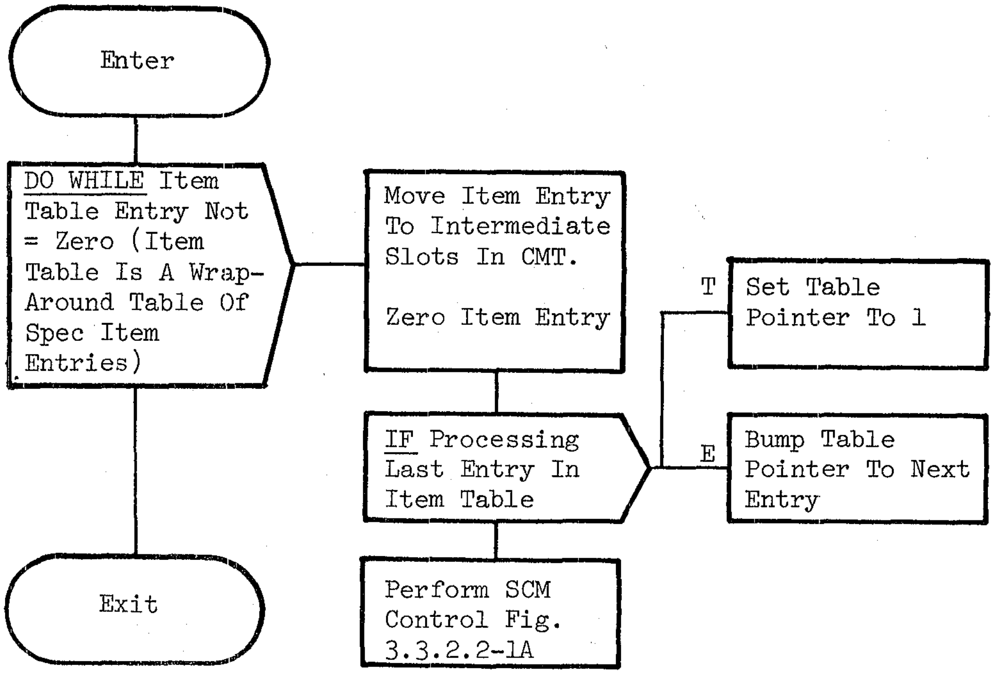

Figure 3.3.2.2-1 . SCM

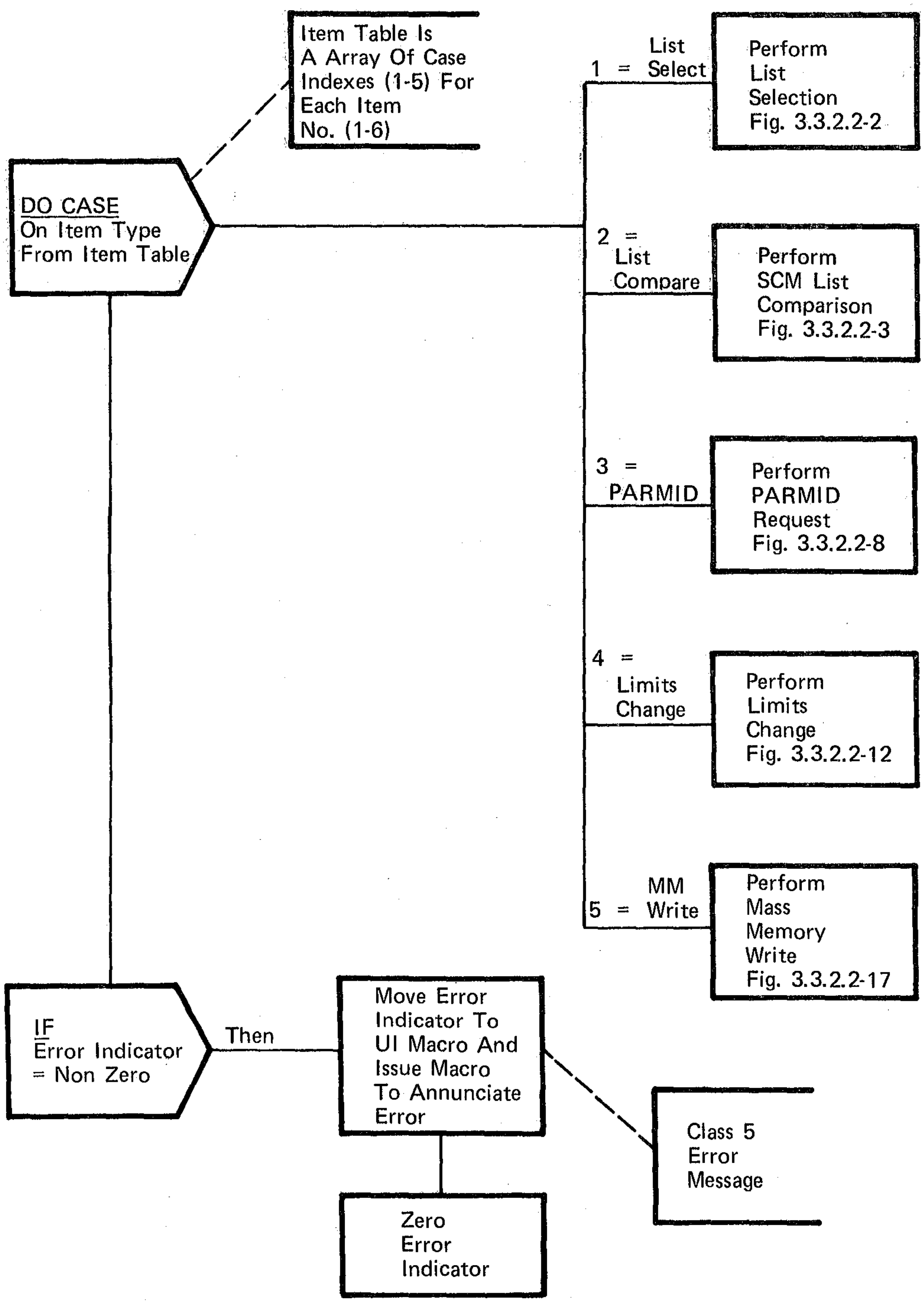

Figure 3.3.2.2-1A SCM Control

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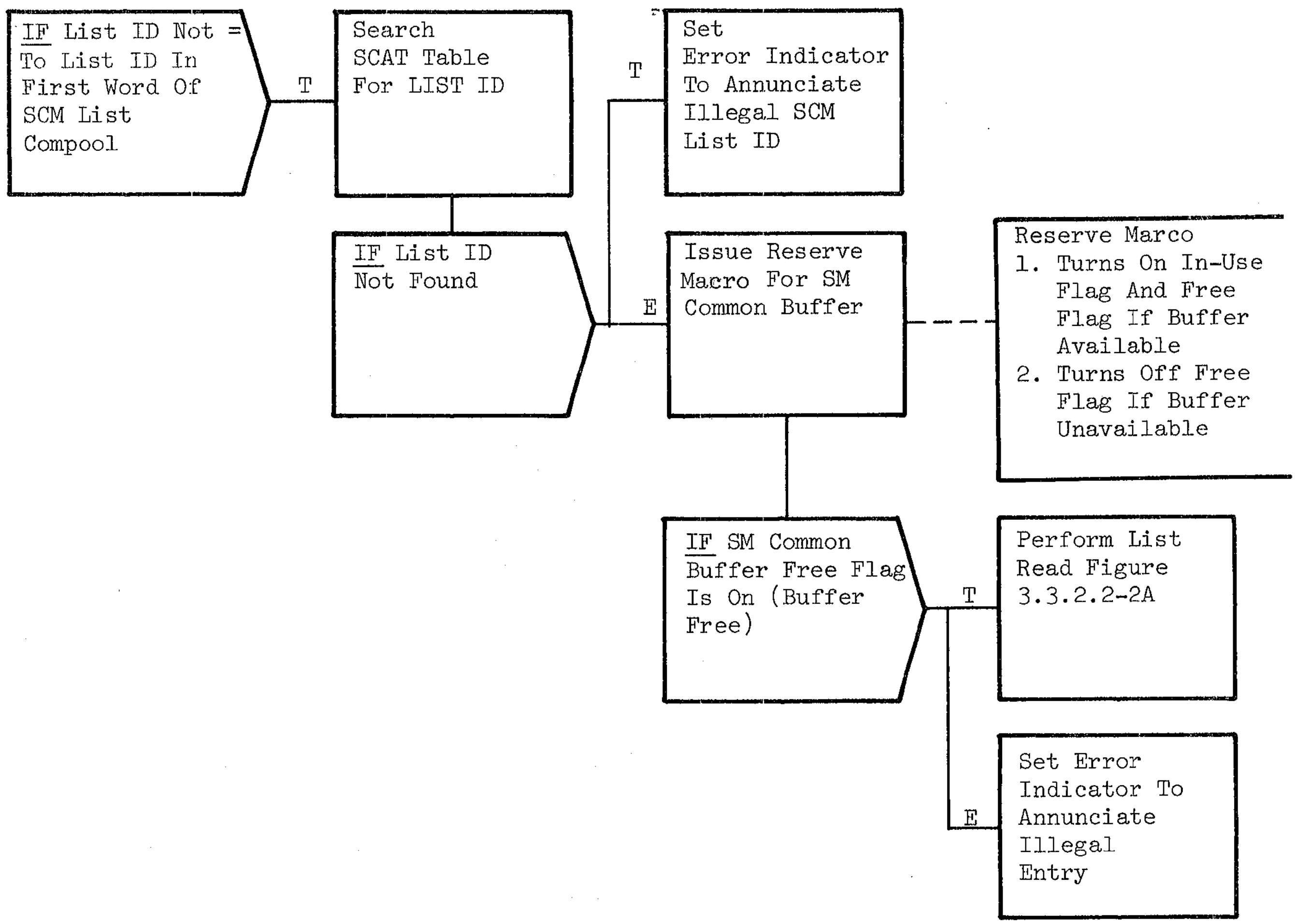

Figure 3.3.2.2-2. List Selection

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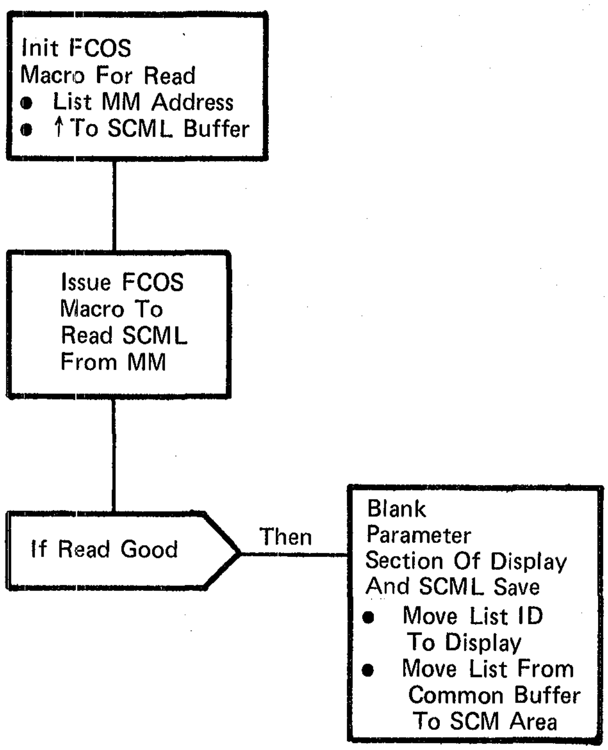

Figure 3.3.2.2-2A List Read

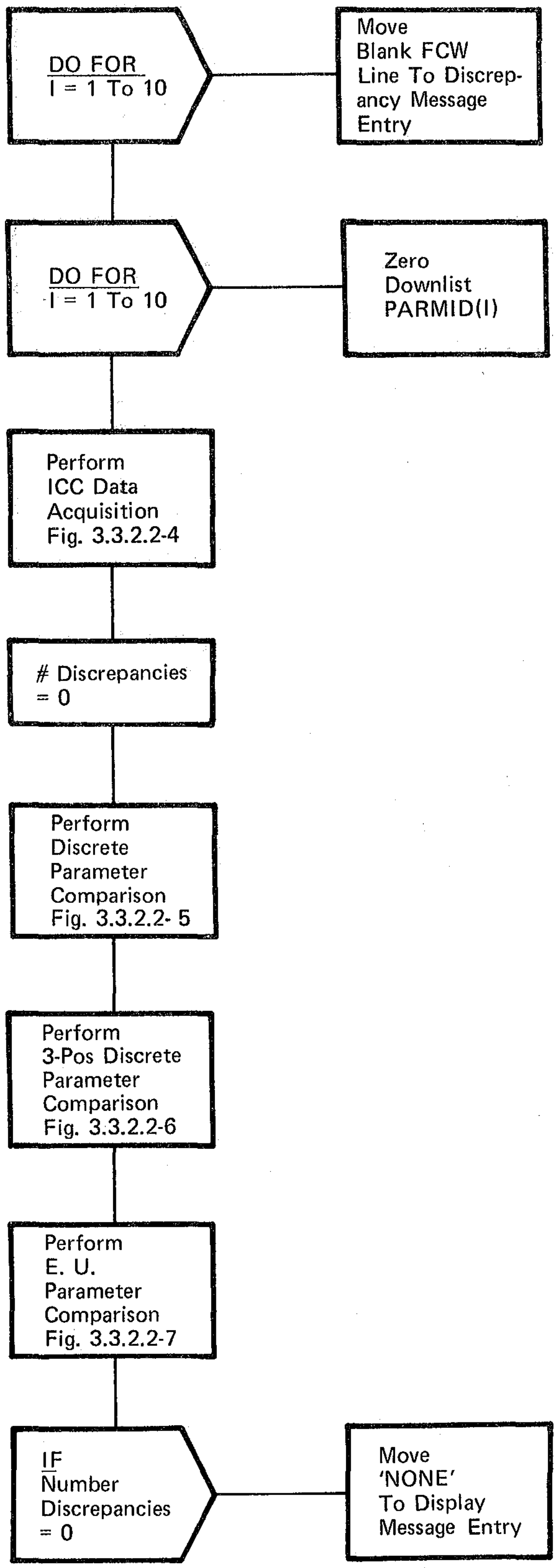

Figure 3.3.2.2-3. LIST Comparison

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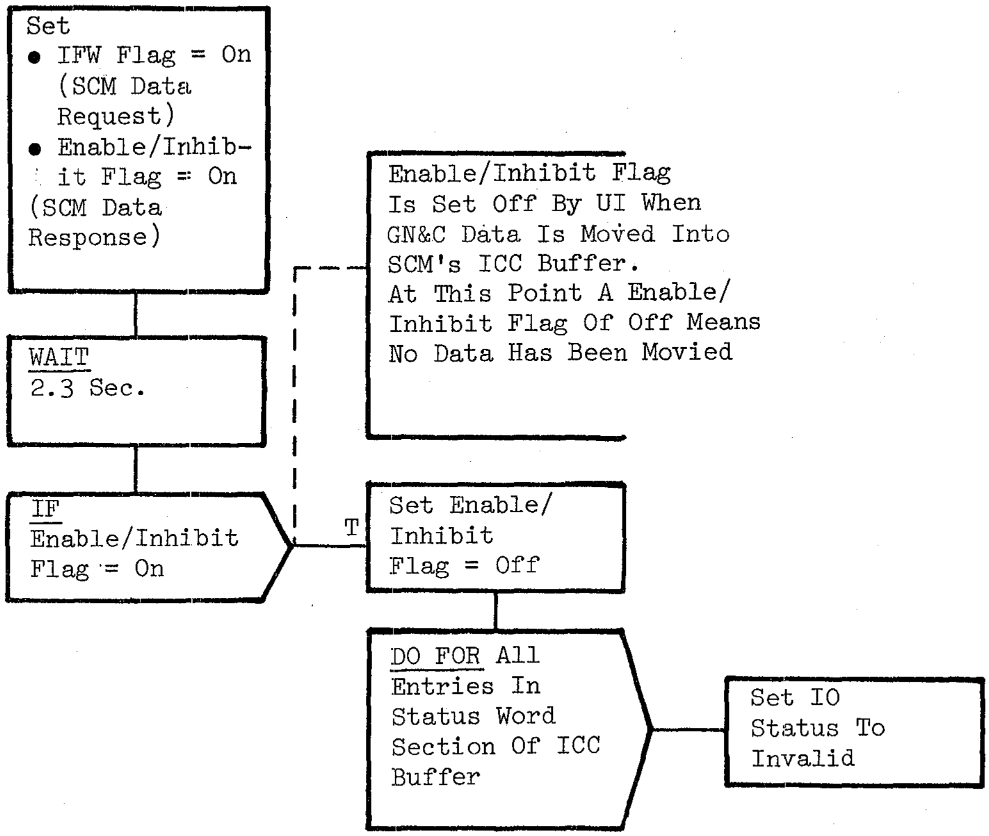

Figure 3.3.2.2-4. ICC Data Acquisition

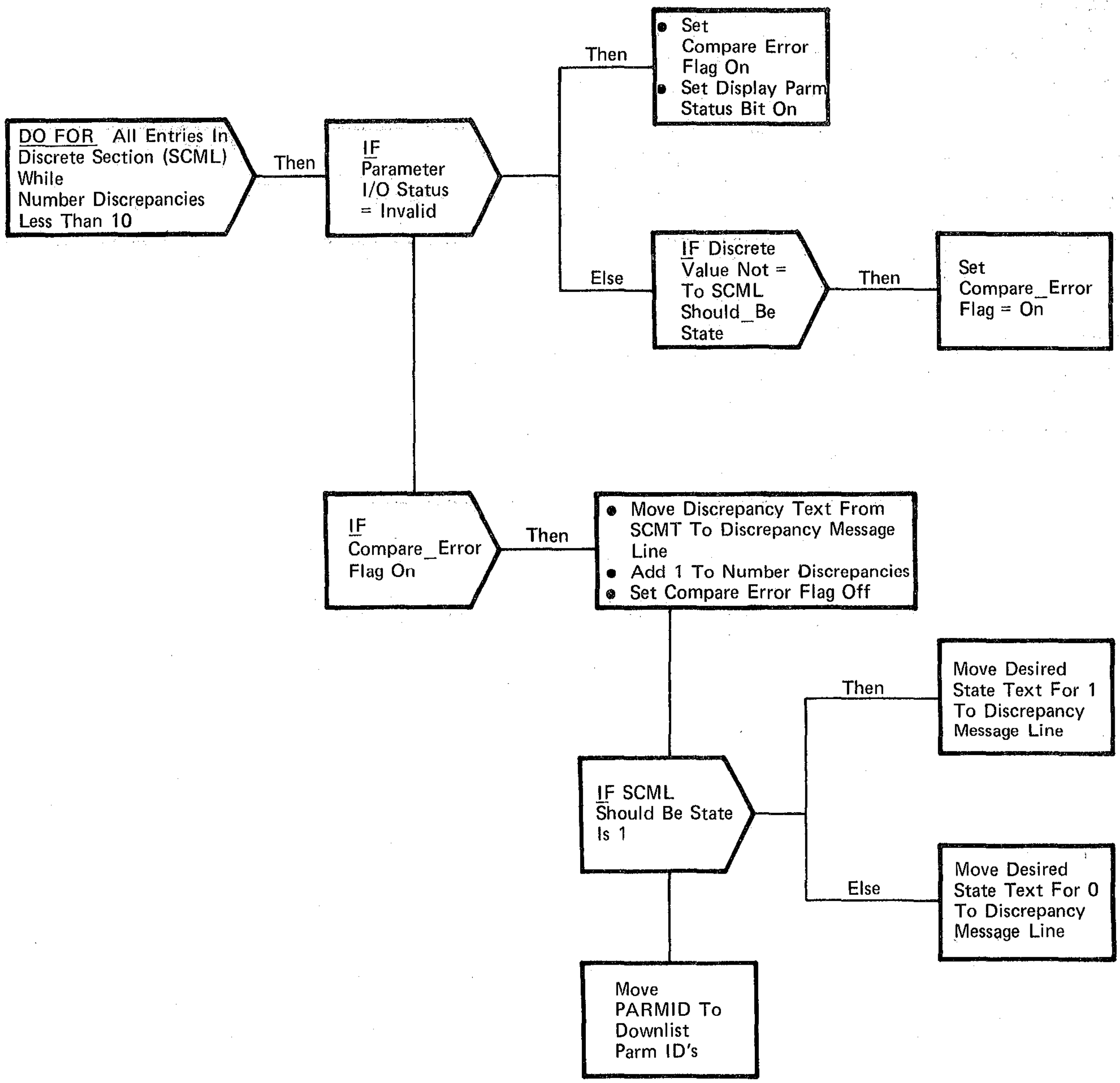

Figure 3.3.2.2-5. Discrete Parameter Comparison

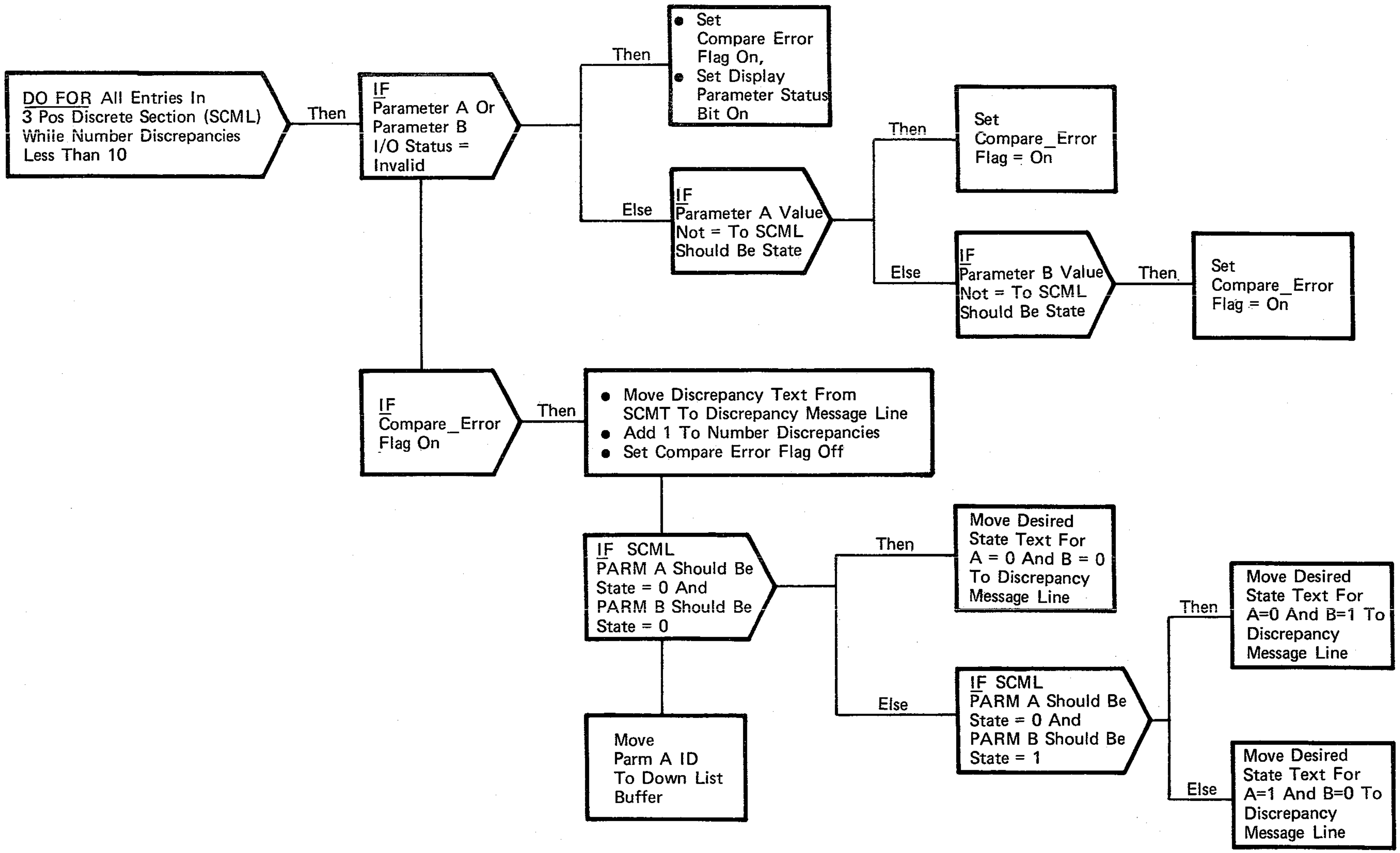

Figure 3.3.2.2-6. 3 Pos. Discrete Parameter Comparison

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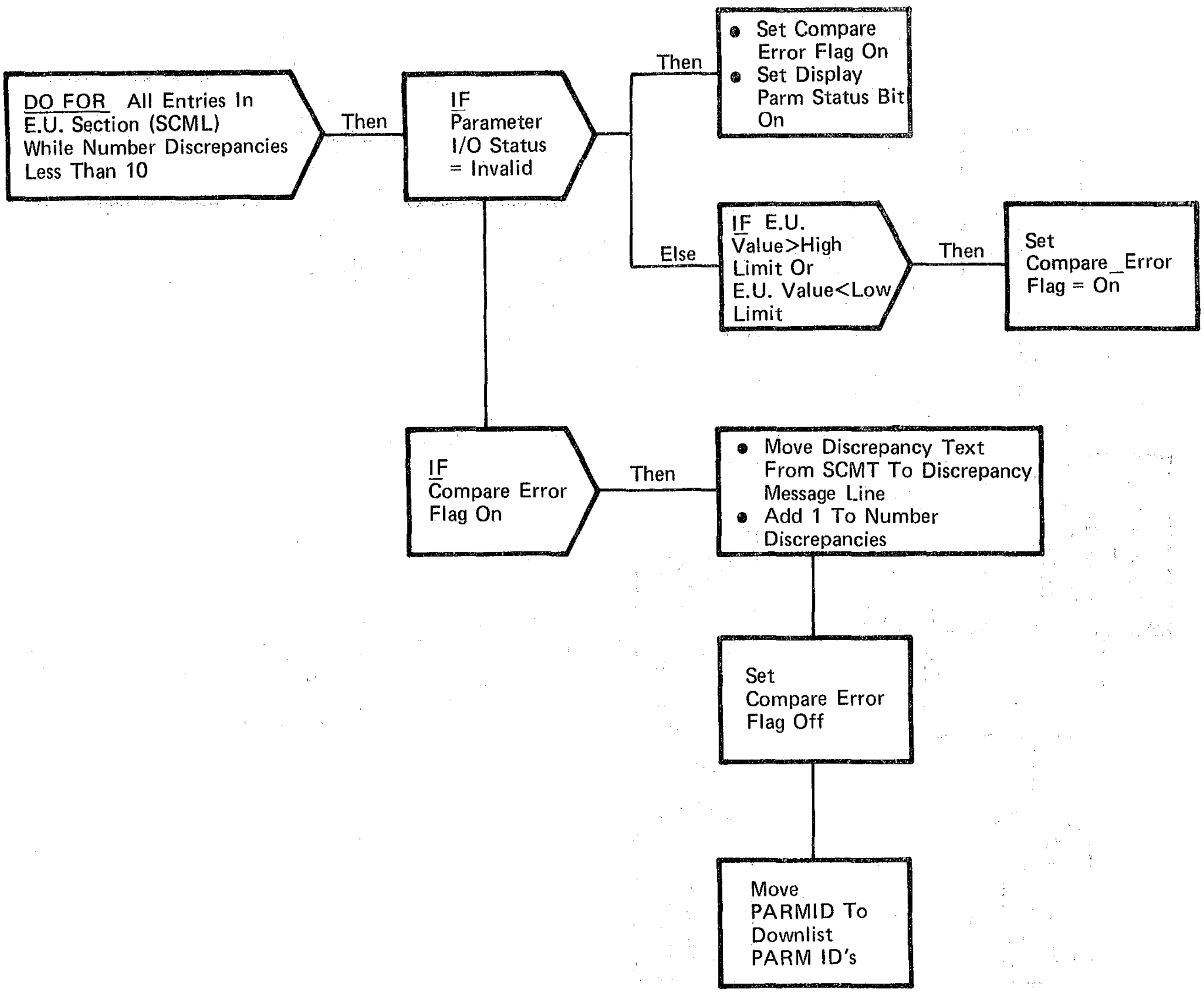

Figure 3.3.2.2-7. E.U. Parameter Comparison

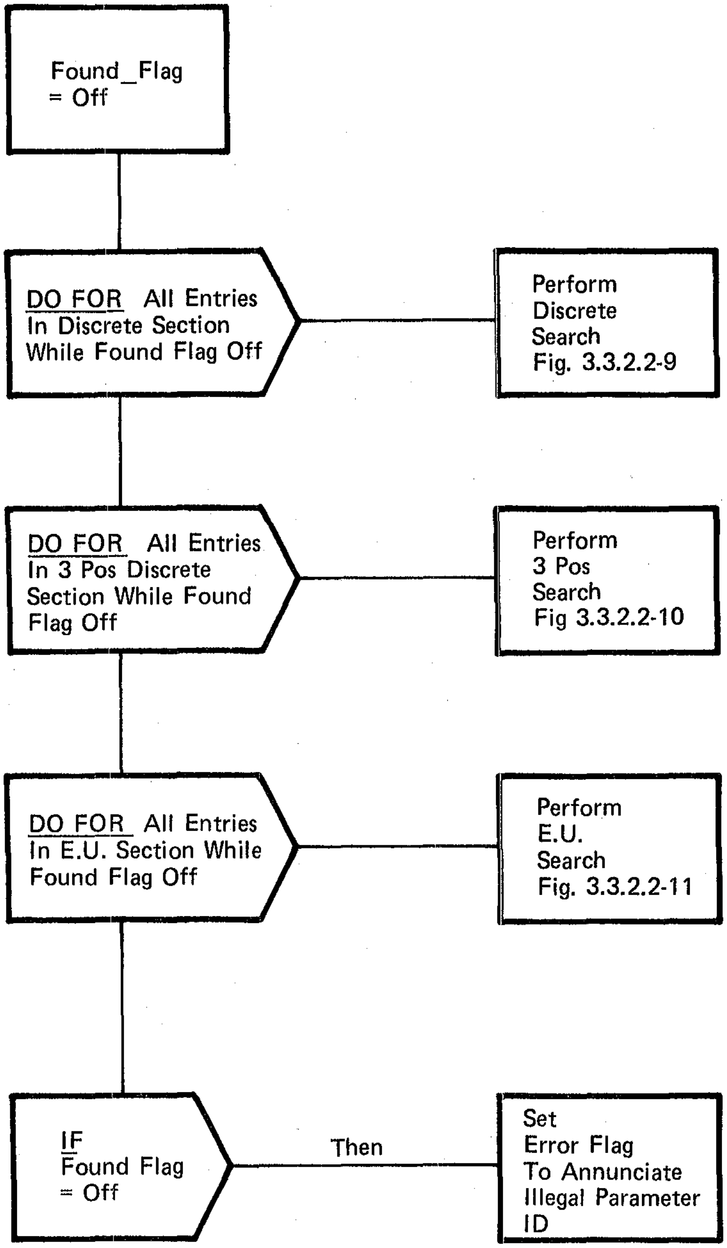

Figure 3.3.2.2-8. PARMID Request

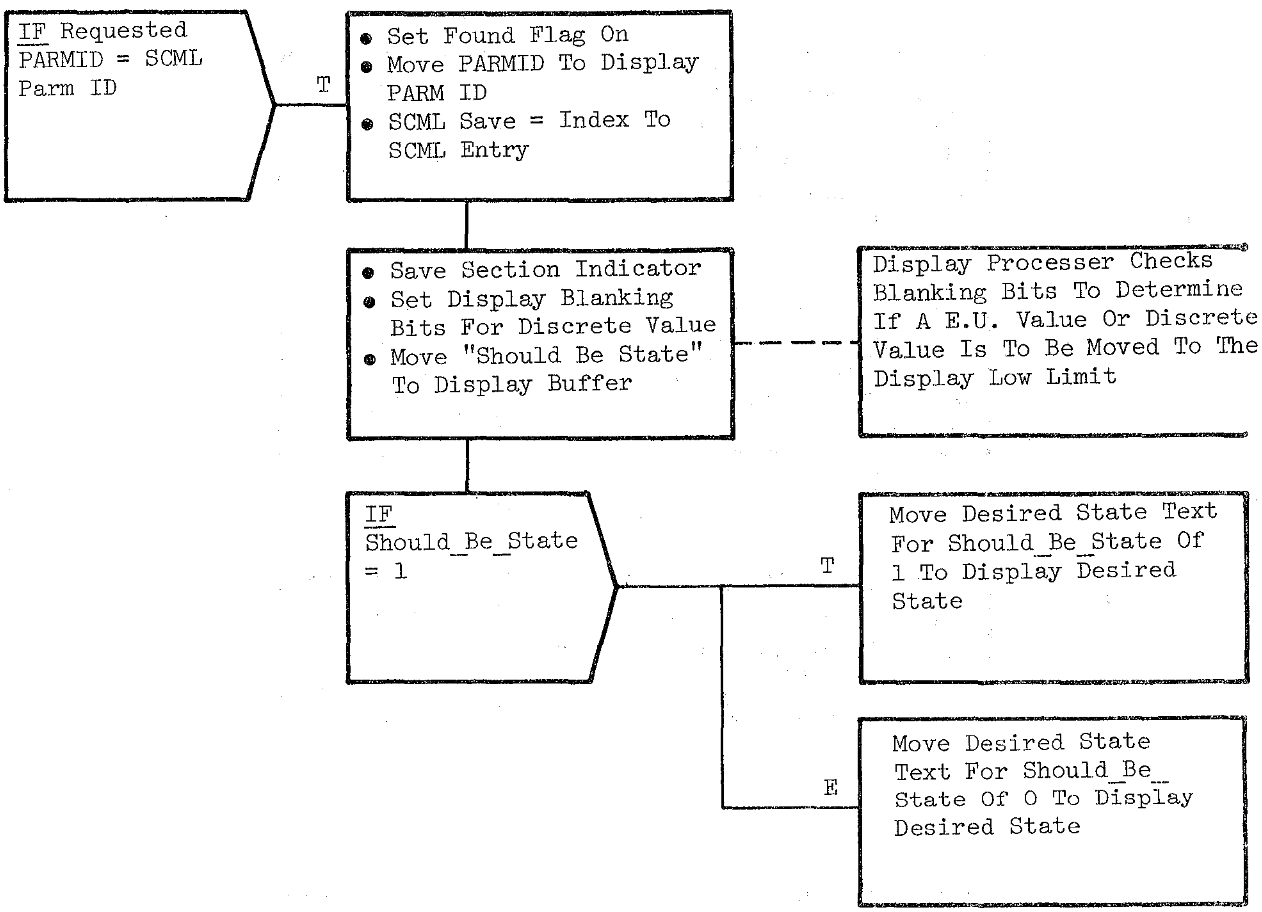

Figure 3.3.2.2-9. Discrete Search

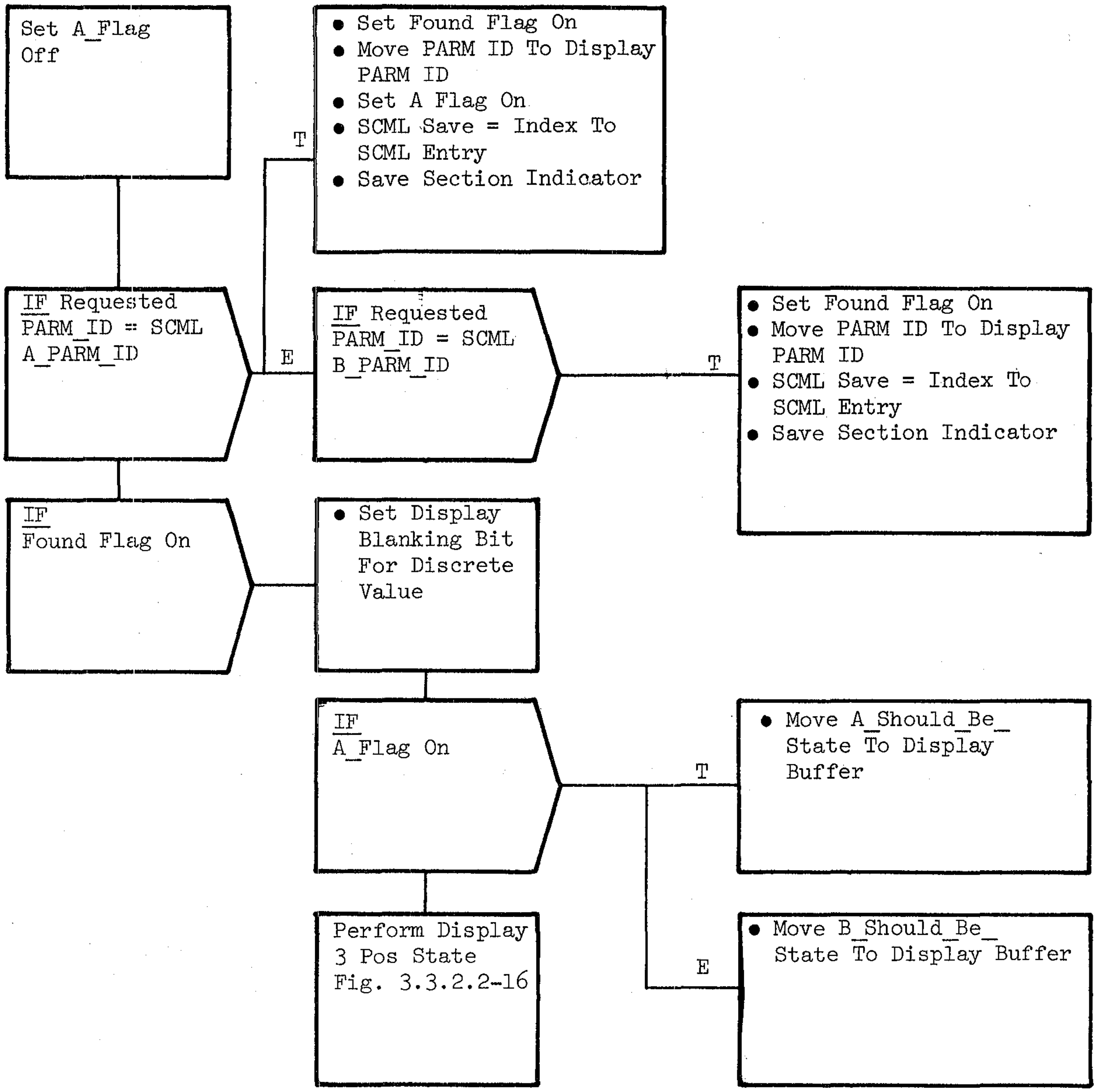

Figure 3.3.2.2-10 . 3-Pos Search

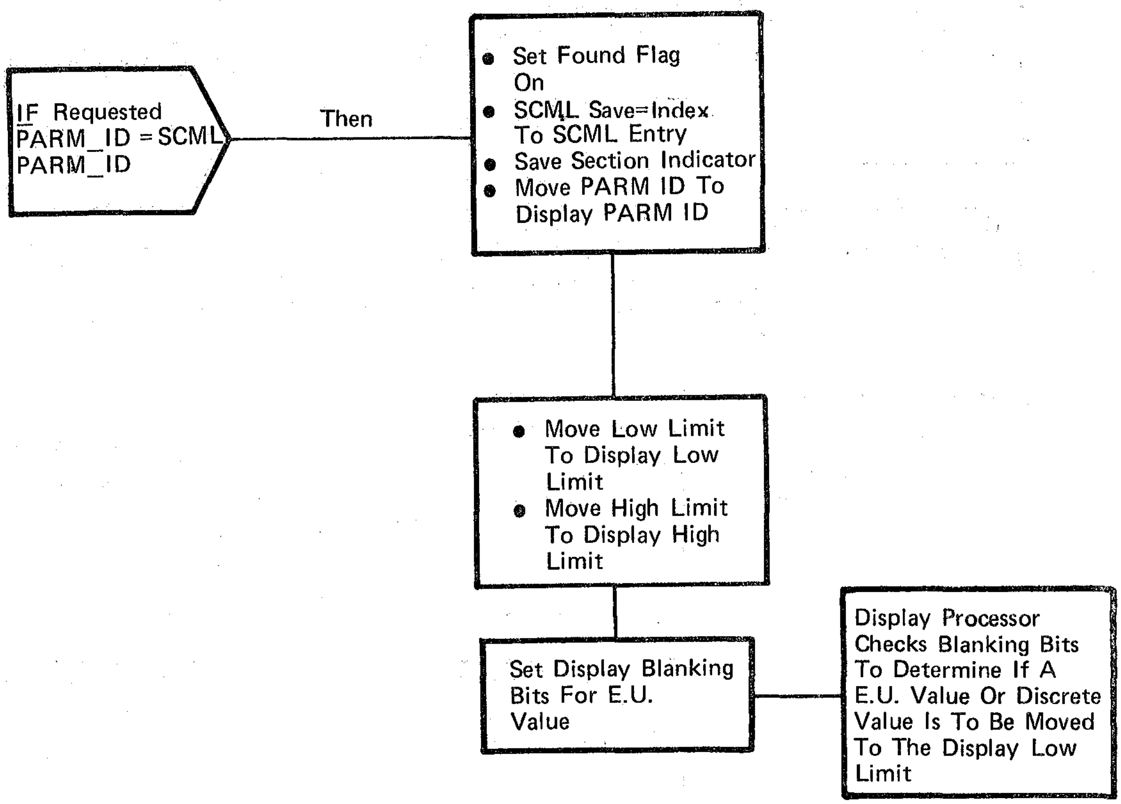

Figure 3.3.2.2-11. E.U. Search

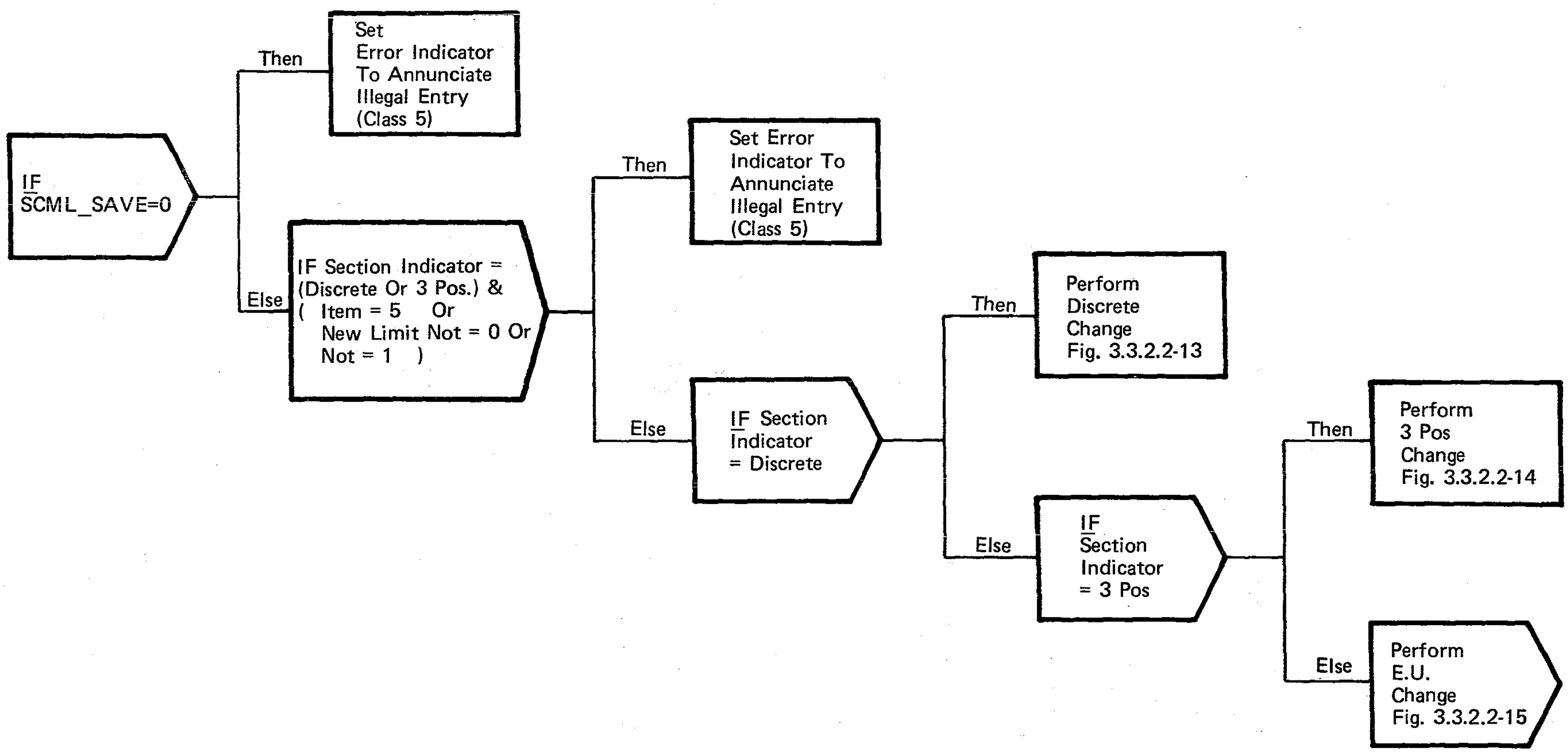

Figure 3.3.2.2-12. Limits Change

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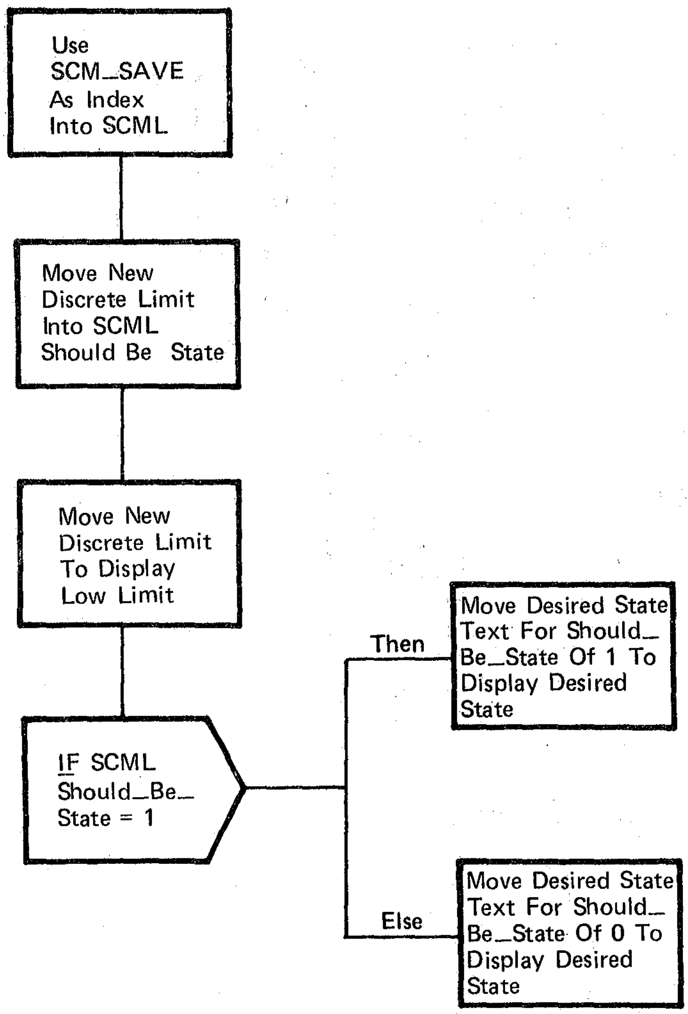

Figure 3.3.2.2-13. Discrete Change

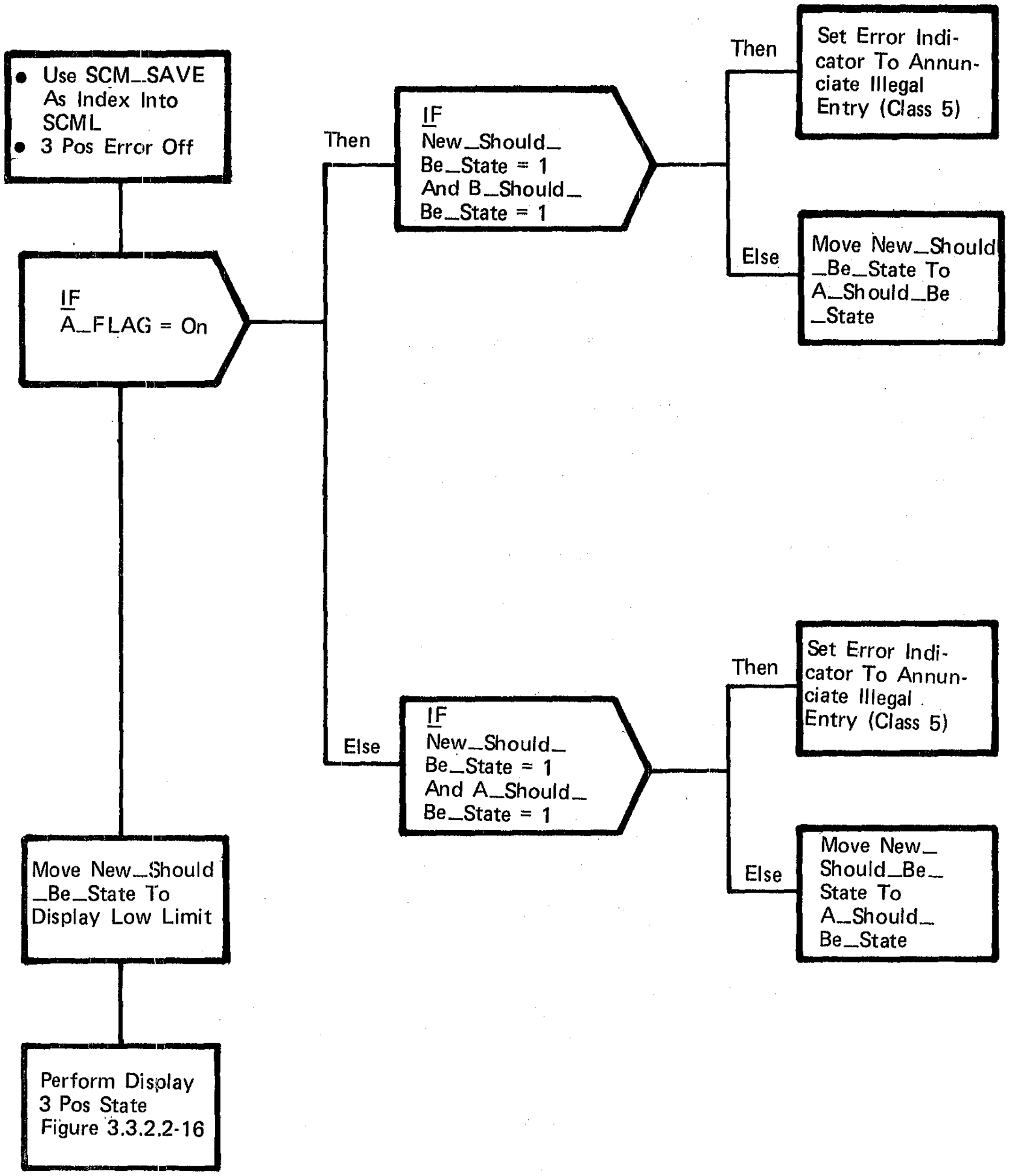

Figure 3.3.2.2-14. 3-Pos Change

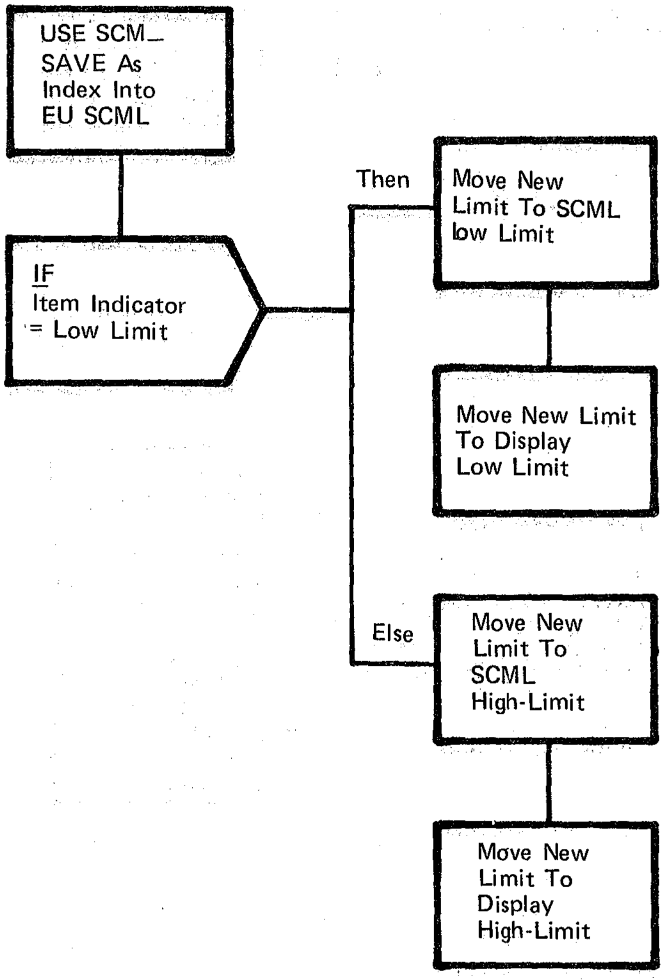

Figure 3.3.2.2-15. EU Change

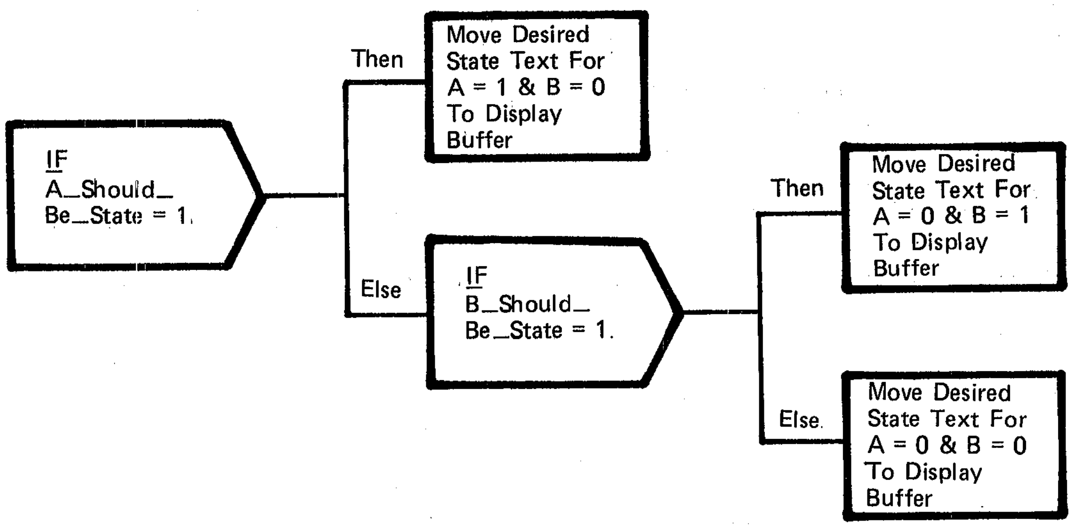

Figure 3.3.2.2-16. Display 3-Pos State

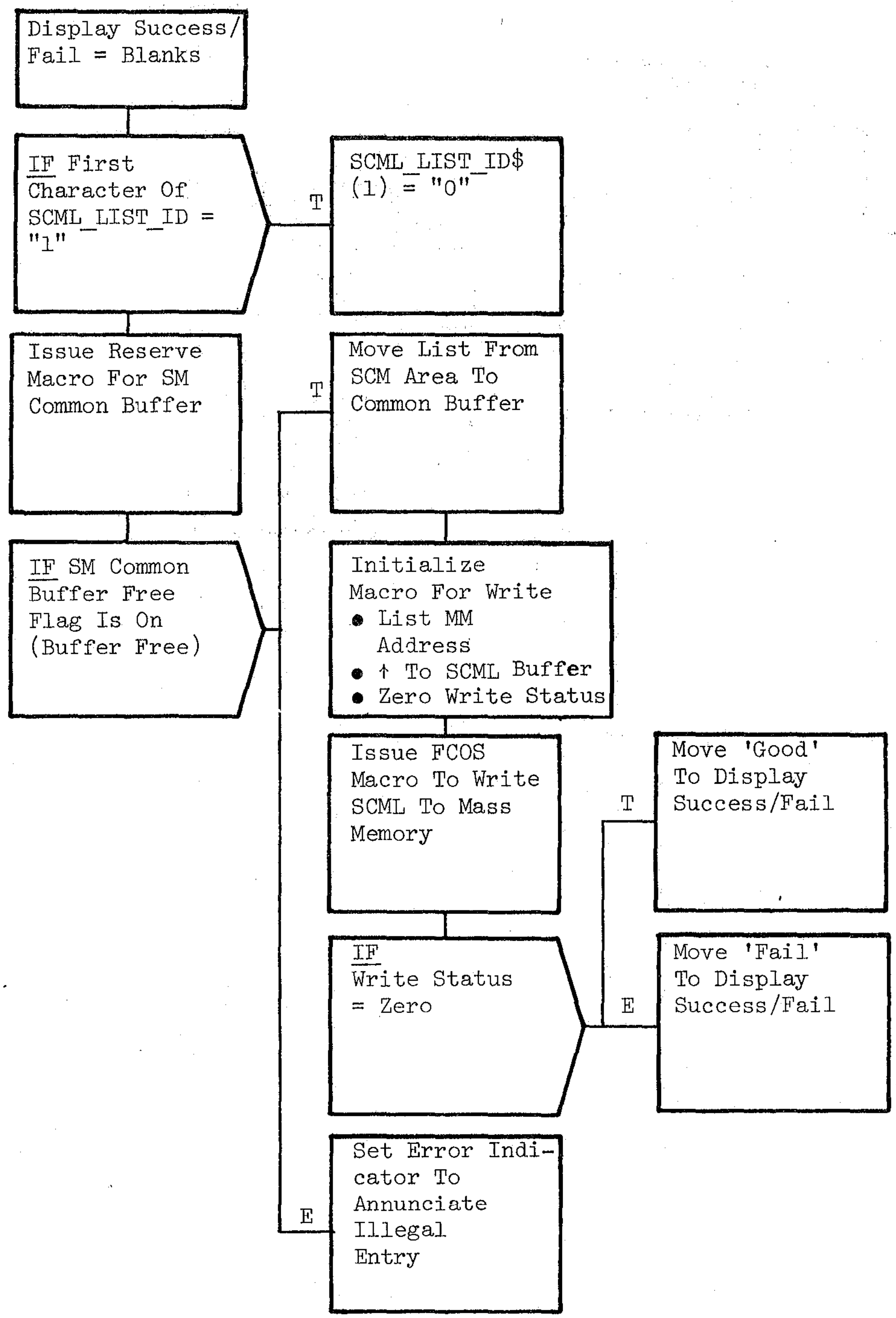

Figure 3.3.2.2-17. Mass Memory Write

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3.3.2.3 SCM Initialization/Cleanup (SCI_CLNUP)

Subsystem Configuration Management (SCM) Initialization/Cleanup provides the necessary initialization of variable data for the SCM Display.

a. Control Interface - The SCM Initialization module is CALL'ed by the SCM Specialist Function Control Segment.
   INVOCATION: CALL SCI_CLNUP

b. Inputs - Inputs to this module are specified in Table 3.3.2.3-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.2.3-1. The Initialization module blanks the variable data in the SCM display. This data includes the item entries, mass memory, write success indicator, and the discrepancy message text buffer. The list ID is not blanked and is enabled whenever the display is up.

d. Outputs - Outputs from this module are specified in Table 3.3.2.3-1.

e. Module References - None

f. Module Type and Attributes

   Type: External Procedure

   Attributes: Default (serially reusable with no protective mechanism).

g. Template References
   D INCLUDE TEMPLATE CSC_SCM_CMT   SCM DISPLAY PARAMETERS

h. Error Handling - None

i. Constraints and Assumptions - None

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TABLE 3.3.2.3-1 Initialization/Cleanup Process MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Display variable data	E	I/O	CRT			
2	Discrepancy message buffer	A.2.11		CRT	CSCV_CMT_MESS_LINE (I)		

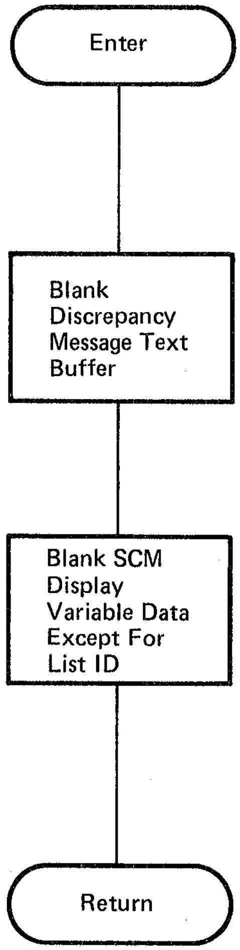

Figure 3.3.2.3-1. SCM Initialization/Cleanup

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3.3.3 Communication Instrumentation

The Communication Instrumentation Specialist Function provides the capability to load telemetry formats into both the 128 KBPS and 64 KBPS programmable PCM Master Unit output RAMs.

3.3.3.1 Communication Instrumentation Specialist Function Control Segment (SLS_SPEC)

The Communication Instrumentation (CI) Specialist Function Control Segment presents the CI Display and controls execution of the Telemetry Format Load (TFL) process. The control segment acts as the interface between the crew and the TFL process.

a. Control Interface - The CI Control Segment is SCHEDULE'd by the User Interface Sequence Request Processor (DMC_SEQ_REQ_PROC) upon user request.

   Invocation: Schedule SLS_SPEC PRIORITY (PRIO_SLS)

b. Inputs - Inputs to this module are specified in Table 3.3.3.1-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.3.1-1 through 3.3.3.1-3. The CI Specialist Function initializes flags, indicators and SPEC controlled display variables. When CI Initialization is completed, the GTS Cyclic Update Processor is scheduled to acquire the PCM BITE and update the display with the current downlink formatter selected. The CI display is then presented and the system waits for selection of a new OPS, a new SPEC, RESUME or an item entry. If the TFL active flag is off (TFL module inactive) for an item entry, the CI specialist function sets the TFL active flag to ON and enters the format ID into the TFL Compool. The TFL module is scheduled and it performs the task of validating the entered format ID. When an item number 1 or 2 is entered with an item execute, then the 128 KBPS fixed and programmable formatters are respectively selected. When item 4 is entered with an item execute, the TFL module is scheduled for the purpose of acquiring, executing, and verifying the format load. The TFL active flag is always turned off by the TFL module just before it terminates. When the control segment is terminated, the GTS cyclic update process is cancelled and the TFL termination flag is turned on to signal the TFL process to terminate its processing after completing any I/O operations.

d. Outputs - Outputs from this module are specified in Table 3.3.3.1-1.

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e. Module References - Process

Process	Section	Reference
GTS Cyclic Update	3.3.3.3	SCHEDULE
TFL Process	3.3.3.4	SCHEDULE
Display	A system software external procedure called when the DISPLAY GRAMMAR macro is invoked.	
DNX_BMS	A system software external procedure called when various moding and sequencing grammar macros are invoked.	

f. Module Type and Attributes

Type: Program
Attributes: N/A

g. Template References -

D INCLUDE TEMPLATE CZ1_COMMON	Systems Services Common Compool
D INCLUDE TEMPLATE DIS_PLAY	Systems Services Display Presentation and Control/Routine
D INCLUDE TEMPLATE DNX_BMS	Systems Services Application Moding and Sequencer routine
D INCLUDE TEMPLATE CVL_TFL_COMPOOL	TFL Display Compool
D INCLUDE DAG#RAM	Common grammar macro set
D INCLUDE DCG#RAM	Spec Control Segment grammar macro set
D INCLUDE DDG#RAM	Allows references to MCDS Keyboard inputs
D INCLUDE ZPRIOTIM	Contains REPLACE names for baseline priorities phasing, and rates of scheduled processes
D INCLUDE IOMACS	I/O macros for FCOS
D INCLUDE PMUMACS	PMU Read/Write Control

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D INCLUDE TEMPLATE VCY_CYC_UPD   Cyclic Update process

D INCLUDE TEMPLATE VTL_TFL_MODULE   TFL Process

h. Error Handling - None

i. Constraints and Assumptions - Specialist function termination is such that the control segment signals the TFL process to terminate as soon as possible. However, the user does not get a 'FAIL' indication on the TFL display since the display will be overlayed before the TFL process can indicate a fail.

TABLE 3.3.3.1-1 Communication Instrumentation Specialist Function MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Item Entry	E	I/O	CRT/VTF			
2	Current 128 KBPS Formatter	A.2.11 (TFL COMPOOL)	O	CRT, VTF	CVLV_CUR_128_FMT		
3	Format ID	A.2.11 (TFL COMPOOL)	O	VTF	CVZV_FORMAT_ID		
4	TFL Invalid Format ID Flag	A.2.11 (TFL COMPOOL)	O	CRT, VTF	CVLB_ITEM_ERROR		
5	TFL Termination Flag	A.2.11 (TFL COMPOOL)	O	VTF	CVZB_OPS_TRANS		
6	Selected Format ID	A.2.11 (TFL COMPOOL)	O	CRT	CVZV_V_FMT_SELECT		
7	Execute the Format Load	A.2.11 (TFL COMPOOL)	O	CRT			
8	Current TFL Load Status	A.2.11 (TFL COMPOOL)	O	CRT	CVLV_TFL_STATUS		
9	TFL Active Flag	A.2.11 (TFL COMPOOL)	O	VTF	CVZB_V_EVENT_1		

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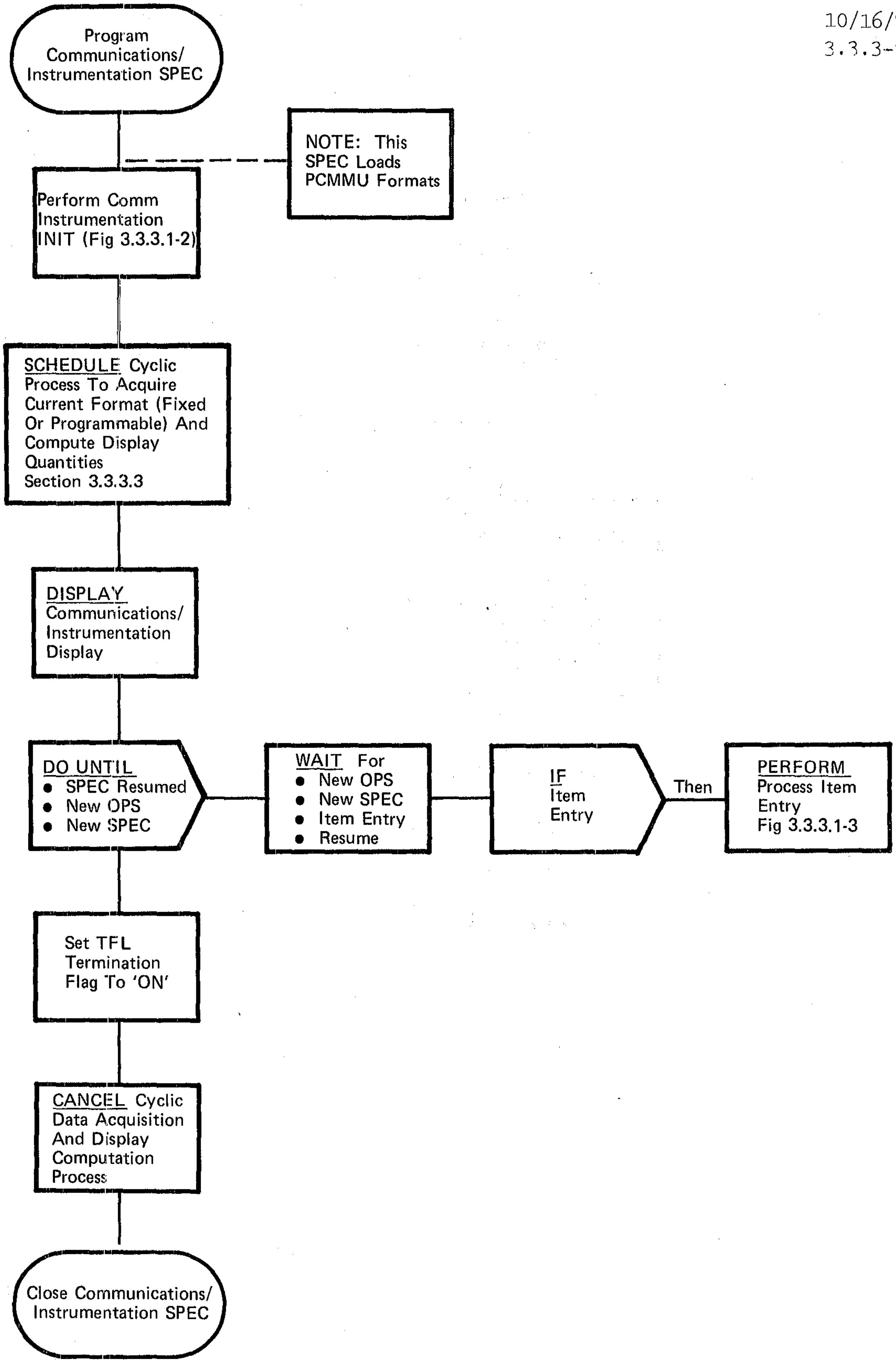


Figure 3.3.3.1-1. Communications/Instrumentation Specialist Function Control Segment

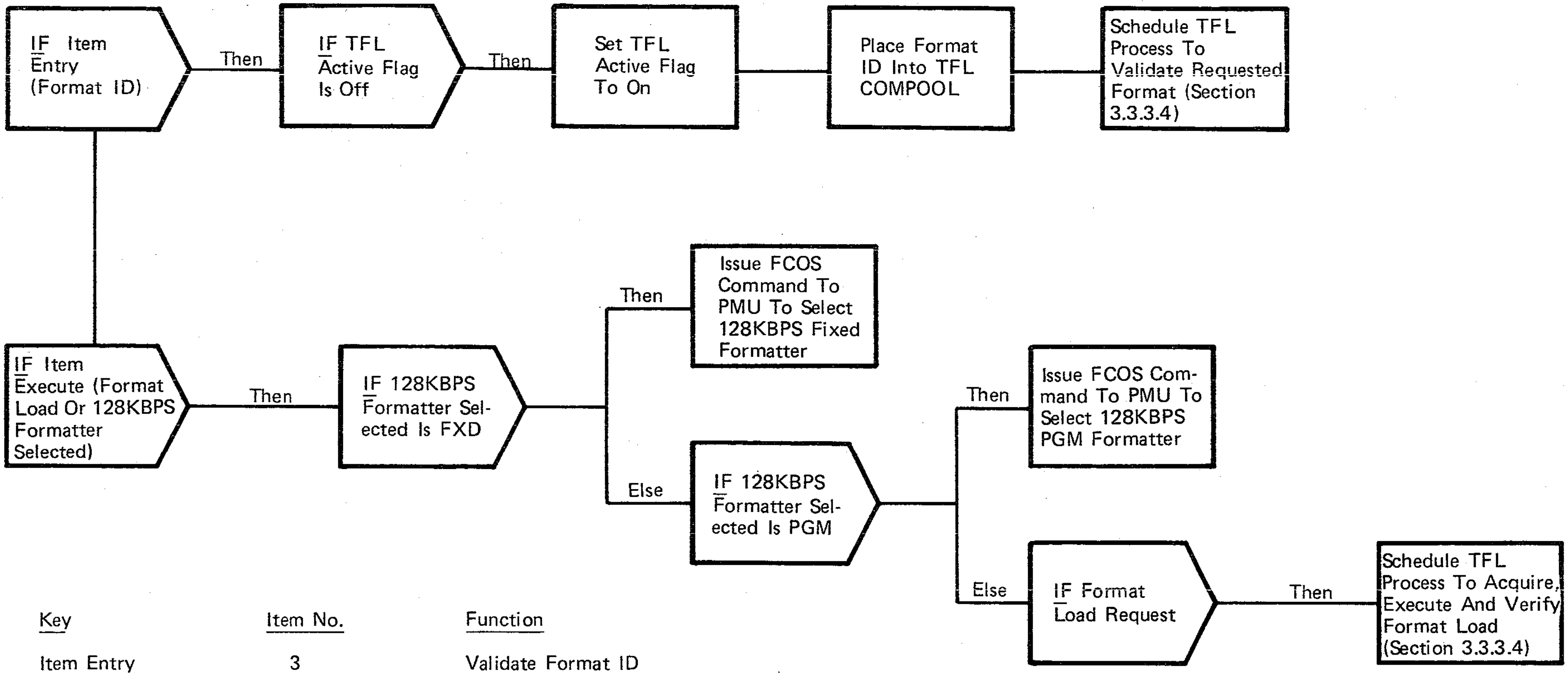
Set Invalid
Format I/O
Flag In VCO
To Off

Clear TFL Display

- Selected Format ID
- Current TFL Load Status Set To Zeroes
- Current Formag ID's In Use Set To 0.

Set TFL
Termination
Flag To Off

Figure 3.3.3.1-2. Comm Instrumentation Init



Key	Item No.	Function
Item Entry	3	Validate Format ID
Item Execute	1	Select FXD Formatter (128KBPS)
	2	Select PGM Formatter (128KBPS)
	4	Execute Format Load

Figure 3.3.3.1-3. Process Item Entry

3.3.3.3 GTS Cyclic Update Processor (VCY_CYC_UPD)

This module is scheduled cyclically by the control segment to acquire the PCM Master Unit BITE and update the display with the current downlink formatter selected. This module is described in the Vehicle Checkout (VCO) DDS, Section 3.3.1.1.

3.3.3.4 Telemetry Format Load Process Module (VTF_TFL_MODULE)

The Telemetry Format Load (TFL) module verifies the user selected downlink format ID, reads the verified selected downlink format from mass memory, transfers the format to the proper random access memory (RAM) in the PCM Master Unit; and verifies that the format was correctly loaded. This module is described in the VCO DDS, Section 3.3.5.

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3.3.4 Antenna Management Item Processor (SAM_ITEM)

The Antenna Management (AM) Item Processor serves as the link between the Antenna Management display and the cyclic Antenna Management module (see Section 3.2.1.22).

a. Control Interface - The AM Item Processor is CALL'ed by Orbit/Doors (OPS2) Control Segment when an item entry is made to the Antenna Management display.

   Invocation: CALL SAM_ITEM(Keyboard Index)

b. Inputs - Inputs to this module are specified in Table 3.3.4-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.4-1. The AM Item Processor takes an item entry from the AM display as input. This item entry is used as an index into the item type array to determine the case number for that type of item entry. The possible item types are Radar Range Estimate, Radar Self Test Initiate, Ku-Band Gimbal Motor Override, Ku-Band TDRS Select, S-Band TDRS Select, Auto S-Band Antenna Select, and S-Band Site Select.

   For each item type, the AM Item Processor sets the corresponding item variable to the appropriate item code. This item code is obtained by using the input item entry as an index into the item code array. The item codes are initialized in such a way that when an item code is moved into an item variable the item variable is correctly set to indicate the input item entry to the display, to downlist, and to the cyclic Antenna Management Processor.

d. Outputs - Outputs from this module are specified in Table 3.3.4-1.

e. Module References - None

f. Module Type and Attributes

   Type: External Procedure
   Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

D INCLUDE TEMPLATE CSM_AM_CMT	Antenna Management Display Parameters
D INCLUDE TEMPLATE CZ1_COMMON	Systems Services Common COMPOOL

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.3.4-1 Antenna Management Item Processor

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	AM Item Processor CALL LIST	E	I	SM2			
2	Display Index	E	I	CALL LIST	D_IND		
3	Item Entry	E	I	CRT	ITEM_NO		
4	Item Type	E	L		SAM_ITEM_TYPE		
5	Item Code	E	L		SAM_ITEM_CODE		
6	Ku-Band TDRS Select Item	A.2.11	O	SSM, CRT, DL	CSMB_KUBAND_TDRS_SEL		
7	Ku-Band TDRS Select Auto	A.2.11	O	SSM, CRT, DL	CSMB_KUBAND_TDRS_SEL$1	V93X5600X	
8	Ku-Band TDRS Select East	A.2.11	O	SSM, CRT, DL	CSMB_KUBAND_TDRS_SEL$2	V93X5604X	
9	Ku-Band TDRS Select West	A.2.11	O	SSM, CRT, DL	CSMB_KUBAND_TDRS_SEL$3	V93X5602X	
10	S-Band TDRS Select Item	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_TDRS_SEL		
11	S-Band TDRS Select Auto	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_TDRS_SEL$1	V93X5610X	
12	S-Band TDRS Select East	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_TDRS_SEL$2	V93X5614X	
13	S-Band TDRS Select West	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_TDRS_SEL$3	V93X5612X	
14	Auto S-Band Select Item	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_AUTO_SEL		
15	Auto S-Band Select Enabled	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_AUTO_SEL$1	V93X5625X	
16	Auto S-Band Select Inhibited	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_AUTO_SEL$2	V93X5626X	
17	S-Band Site Select Item	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_SITE_SEL		
18	S-Band Site Select Auto	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_SITE_SEL$1	V93X5620X	
19	S-Band Site Select Next	A.2.11	O	SSM, CRT, DL	CSMB_SBAND_SITE_SEL$2	V93X5622X	
20	Radar Range Estimate Item	A.2.11	O	SSM, CRT, DL	CSMB_RADAR_RANGE_EST		
21	Radar Range Estimate Auto	A.2.11	O	SSM, CRT, DL	CSMB_RADAR_RANGE_EST$1	V93X5642X	
22	Radar Range Estimate Min	A.2.11	O	SSM, CRT, DL	CSMB_RADAR_RANGE_EST$2	V93X5641X	

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TABLE 3.3.4-1A Antenna Management Item Processor MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
23	Radar Self Test Initiate Command	A.2.11	O	SSM, DL	CSMB_RADAR_SELF_TEST_INIT	V74K2636J	
24	Motor Shut Off Override Command	A.2.11	O	SSM, DL	CSMB_MOTOR_SHUTOFF_OVRD_CMD	V74K2642J	
25	Radar Self Test Initiate Item	E	I	CRT		V93X5645X	
26	Ku-band Gimbal Motor Override Item	E	I	CRT		V93X5628X	

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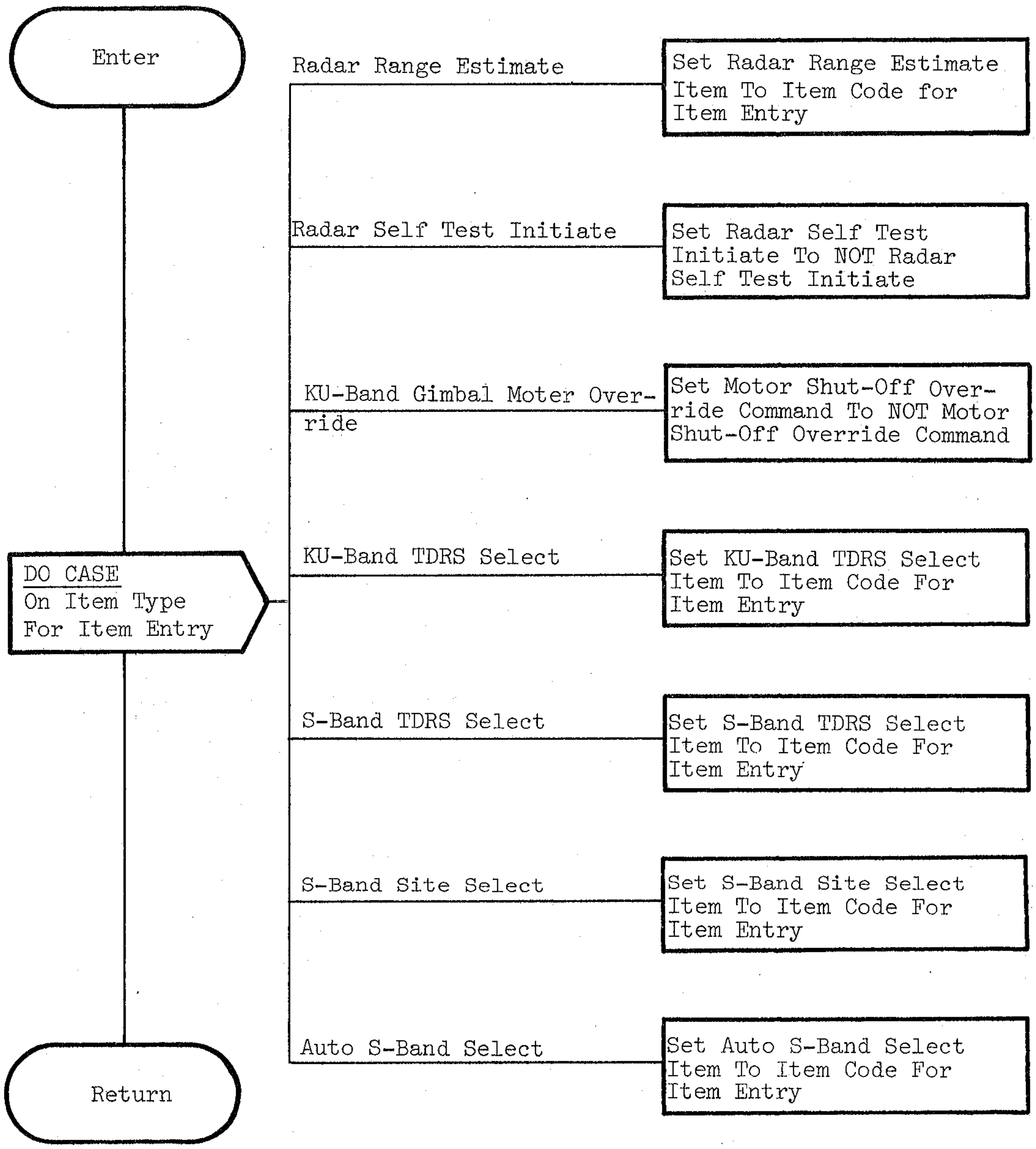

Figure 3.3.4-1. Antenna Management Item Processor

3.3.5 Payload Bay Doors Item Processor (SBD_ITEM)

The Payload Bay Doors (PBD) Item Processor serves as the link between the Payload Bay Door display and the cyclic Payload Bay Door module (section 3.2.1.20).

a. Control Interface - The PBD Item Processor is CALL'ed by the Orbit/ Doors (OPS2) Control Segment when an item entry is made to the PBD display.

   INVOCATION: CALL SBD_ITEM(DISPLAY INDICATOR)

b. Inputs - Inputs to this module are specified in Table 3.3.5-1.

c. Process Description — The control flow for this module is shown in Figure 3.3.5-1. The PBD Item Processor takes item entries made on the PBD display, does validity checking on these entries and either sets appropriate item(s) for later use by the cyclic PBD module or enables an error message for output.

   Four item entry types are processed. If a power on/off item entry is entered, the power on/off item is set on and the other power item is set off. The 'POWER ON/OFF FLAG' is then set on to alert the cyclic PBD module (SSB) that power on/off commands need to be set on or off. The auto mode item entry is only valid if the PBD control switch or the PBD Stop Item is in the "stop" position. Its entry results in reversing the setting of the auto mode item and setting the manual mode items off. All manual mode item entries are valid if either the PBD control switch or the PBD STOP ITEM is in the "stop" position or any manual mode items are set on. Their entry results in setting the requested manual mode item on and setting the auto mode item off. All bypass switch item entries are valid when the Switch Bypass item is on. When the Switch Bypass item is off, the only valid entry is the Switch Bypass Item itself, which will result in setting the Switch Bypass item and the Stop item to on. If the Switch Bypass item is on, a Switch Bypass item entry will result in setting all bypass switch items off. Valid entry of either the Open, Stop, or Close item (bypass switch items) will result in setting the requested item on, and setting the other remaining two items off. The power off item is set on and all other auto or manual items are set off during Mode 202 initialization. If an invalid entry is made, the FMPT_CLASS5 macro is issued. This macro sets a bit in the Fault Message Parameters Table (FMPT) to alert a cyclic User Interface (UI) program that annunciation is to be performed.

d. Outputs - Outputs from this module are specified in Table 3.3.4-1.

e. Module References - None

f. Module Type and Attributes

   Type: External Procedure
   Attributes: Default (Serially reusable with no protective mechanism).

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g. Template References -

D INCLUDE TEMPLATE CDL_ANNUN	Systems Services Annunciation Compool
D INCLUDE TEMPLATE CZ1_COMMON	Systems Services Common Compool
D INCLUDE TEMPLATE CSB_PBD_CMT	Payload Bay Doors Display Parameters
D INCLUDE TEMPLATE DMA_MAC	Systems Services Annunciation Routine
D INCLUDE DDG#RAM	Allow References to MCDS Keyboard Inputs
D INCLUDE DMA#MACS	Systems Services Error Annunciation Macro Replace Statements

h. Error Handling - None

i. Constraints and Assumptions - None

TABLE 3.3.5-1 Payload Bay Doors Item Processor

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1.	Display Indicator	E	I	CALL LIST	D_IND		
2.	Item Entry Number	E	I	CRT	ITEM_NO		
3.	Power On Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_POWER_ON_OFF_ITEM$(1)	V93X5830X	
4.	Power Off Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_POWER_ON_OFF_ITEM$(2)	V93X5831X	
5.	Auto Mode Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_AUTO_MODE_ITEM	V93X5800X	
6.	Centerline Latch Group 5-8 Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(4)	V93X5801X	
7.	Centerline Latch Group 9-12 Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(5)	V93X5802X	
8.	Centerline Latch Group 1-4 Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(6)	V93X5803X	
9.	Centerline Latch Group 13-16 Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(7)	V93X5804X	
10.	Right FWD BKHD Latch Group Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(8)	V93X5810X	
11.	Right AFT BKHD Latch Group Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(9)	V93X5811X	
12.	Right Door Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(10)	V93X5812X	
13.	Left FWD BKHD Latch	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(11)	V93X5819X	
14.	Left AFT BKHD Latch Group Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(12)	V93X5820X	
15.	Left Door Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_MANUAL_MODE_ITEMS$(13)	V93X5821X	
16.	Power On/Off Flag	A.2.11,D.37	O	SSB	CSBB_POWER_ON_OFF_FLAG		
17.	Control Switch Position Indicator	A.2.11,D.17	I	SSB	CSBB_CONTROL_SWITCH_POS_INDIC		
18.	Switch Bypass Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_SWITCH_BYPASS_ITEM	V93X5814X	
19.	PBD OPEN Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_PBD_OPEN_ITEM	V93X5815X	
20.	PBD STOP Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_PBD_STOP_ITEM	V93X5816X	
21.	PBD CLOSE Item	A.2.11,D.13	O	SSB,CRT,DL	CSBB_PBD_CLOSE_ITEM	V93X5817X	

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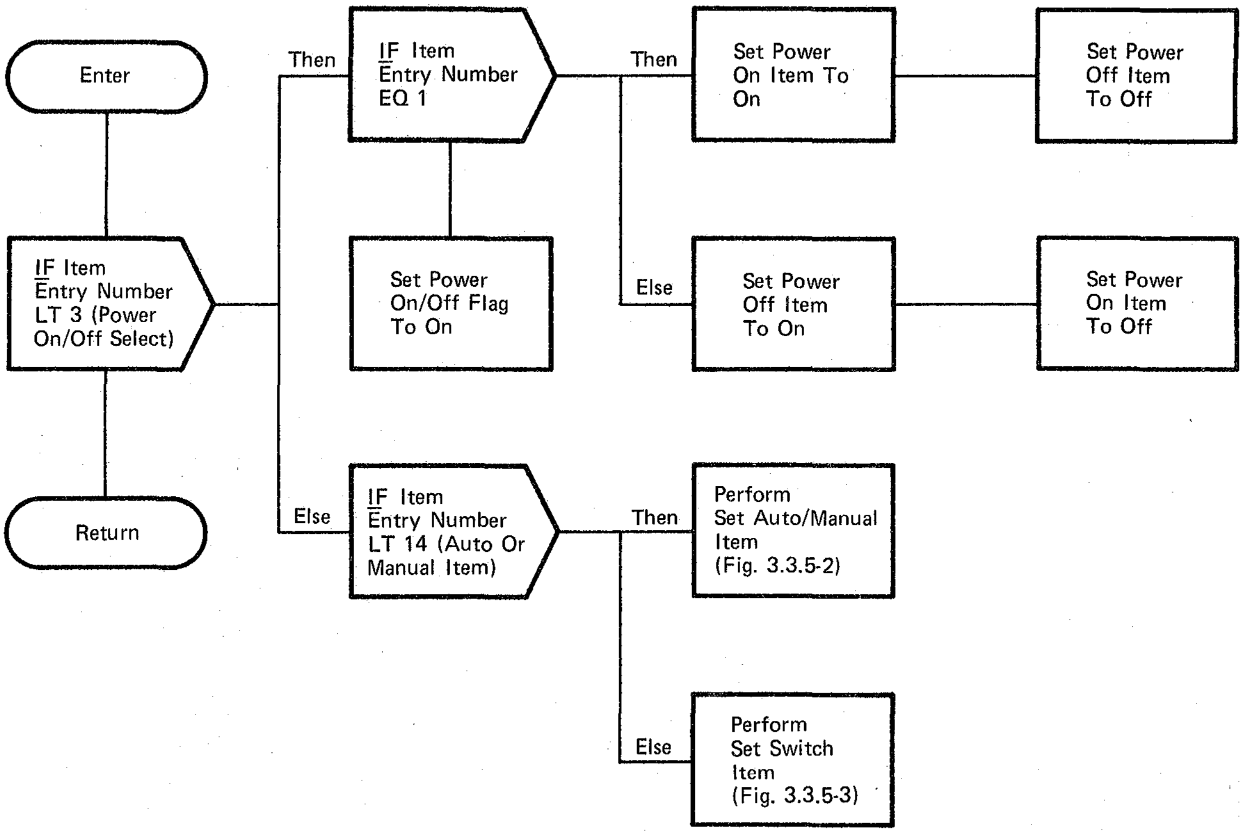

Figure 3.3.5-1. Payload Bay Door Item Processor

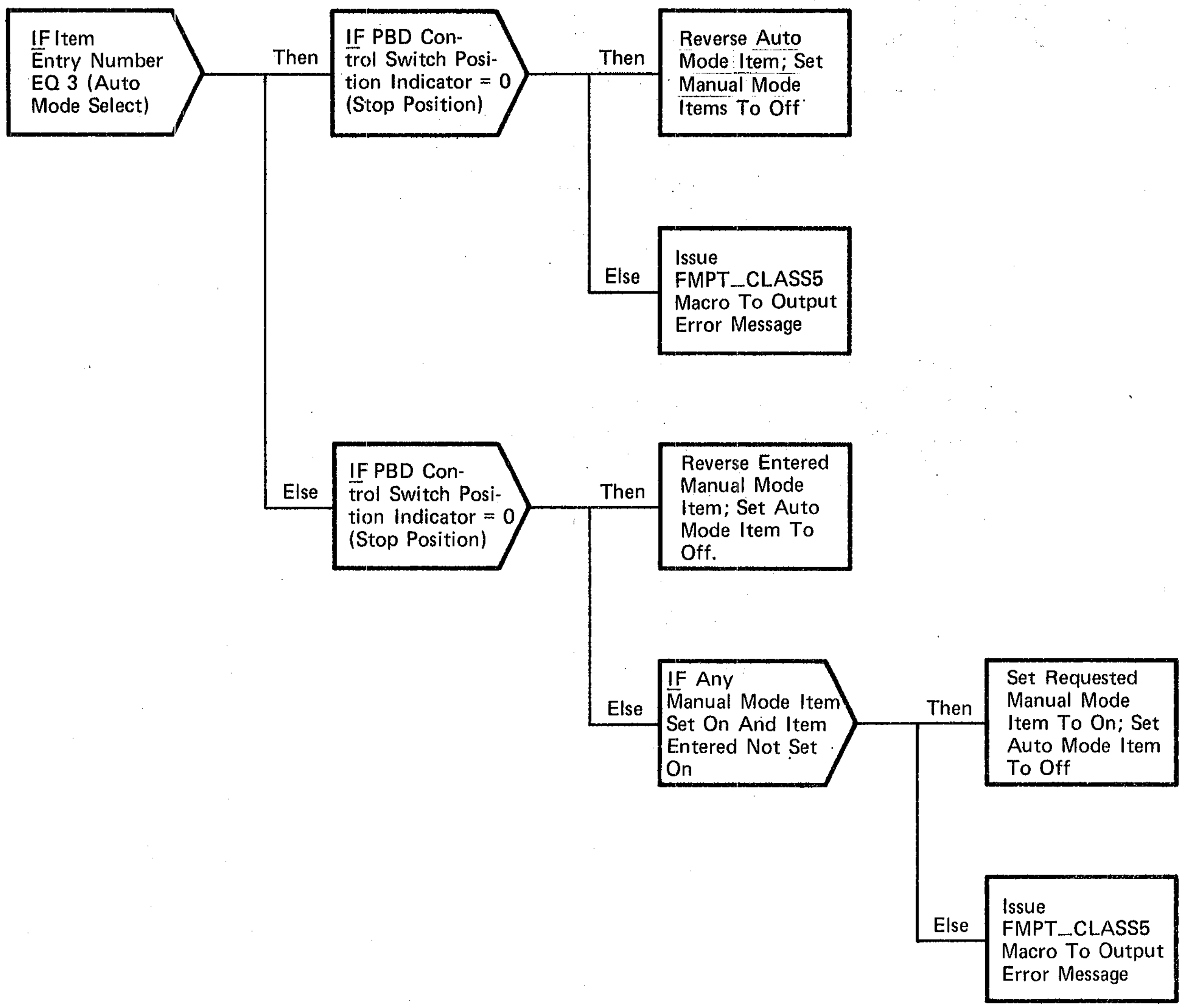

Figure 3.3.5-2. Set AUTO/MANUAL Item

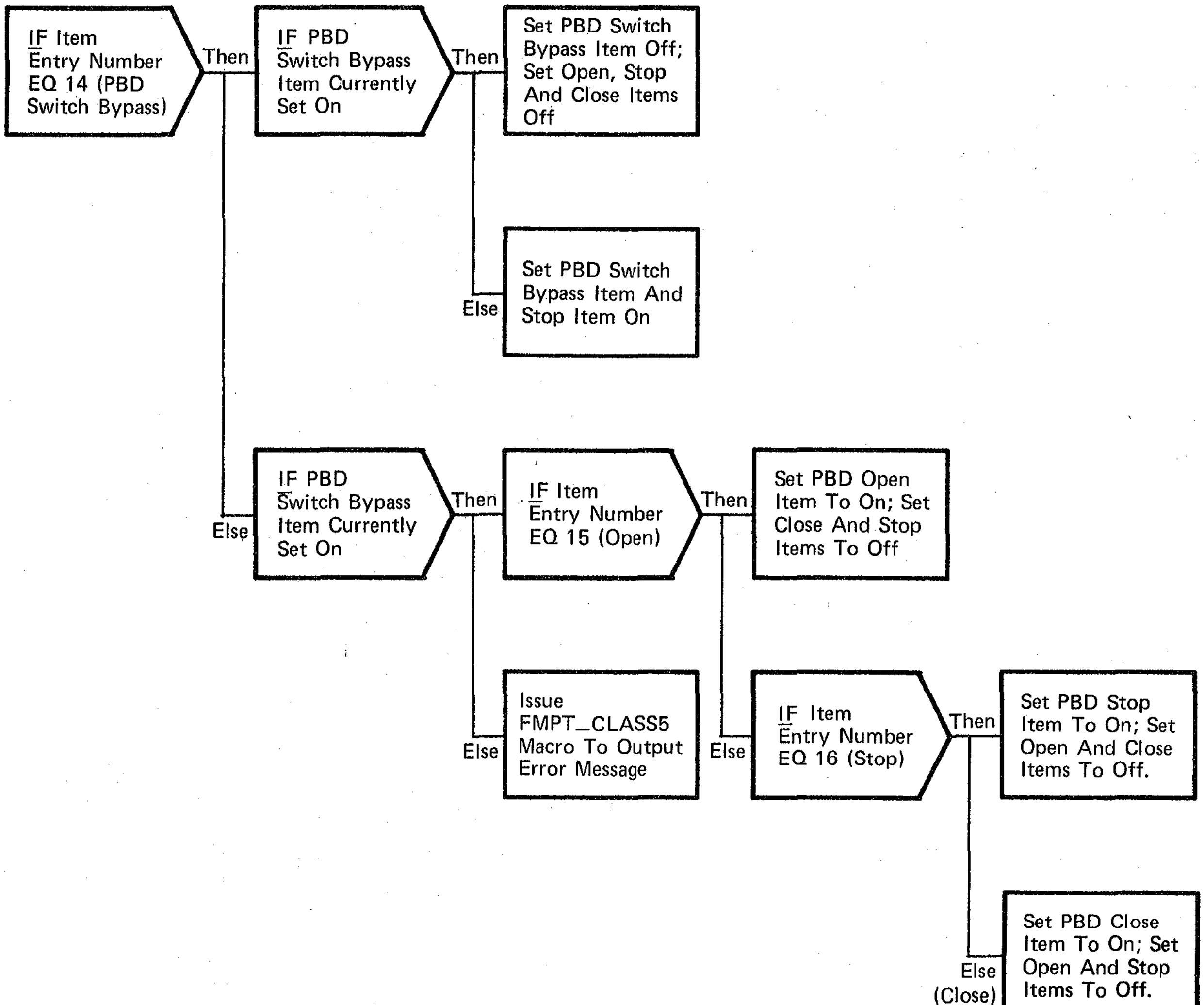

Figure 3.3.5-3. Set SWITCH Item

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3.3.6 Payload Control

The Payload Control function provides up to four Specialist Functions, and associated displays, to control payload operations. Both discrete and analog commands to the payload and pallet MDM's are supported.

3.3.6.1 Payload Control Specialist Function Control Segment (SP1_SPEC, SP2_SPEC, SP3_SPEC, SP4_SPEC)

The Payload Control Specialist Function Control Segment controls execution of the Payload Control Process. There are four Payload Control Specialist Function Control Segments each having the same functional processing as described below.

a. Control Interface - The Payload Control Specialist Function Control Segment is SCHEDULE'd by the User Interface Sequence Request Proprocessor upon user request.

```
Invocation:  SCHEDULE SP1_SPEC PRIORITY(PRIO_SP1);
             SCHEDULE SP2_SPEC PRIORITY(PRIO_SP2);
             SCHEDULE SP3_SPEC PRIORITY(PRIO_SP3);
             SCHEDULE SP4_SPEC PRIORITY(PRIO_SP4);
```

b. Inputs - Inputs to this module are specified in Table 3.3.6.1-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.6.1-1. The Payload Control Specialist Function Control Segment calls the Payload Control Initialization/Cleanup module to initialize flags, indicators and SPEC controlled display variables. It then presents the Payload Control Process Display and waits for selection of a new OPS, new SPEC, RESUME or an item entry. If an item entry is made the Payload Control module is called to process the request.

d. Outputs - Outputs from this module are specified in Table 3.3.6.1-1.

e. Module References - Process

Process	Section	Reference
Payload Control Process	3.3.6.2	CALL
Payload Control Initialization/Cleanup	3.3.6.3	CALL

f. Module Type and Attributes

Type: Program

Attributes: N/A

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g. Template References

D INCLUDE TEMPLATE CZ1_COMMON	System Services Common Compool
D INCLUDE TEMPLATE DIS_PLAY	UI Display Presentation & Control External Procedure
D INCLUDE TEMPLATE DNX_BMS	UI Application Moding & Sequencing External Procedure
D INCLUDE TEMPLATE SPC_ITEM	Payload Control Process
D INCLUDE TEMPLATE SI1_CLNUP	Payload Control Initialization/Cleanup
D INCLUDE DAG#RAM	Common grammar macro set
D INCLUDE DCG#RAM	SPEC Control Segment grammar macro set
D INCLUDE DDG#RAM	Allows references to MCDS keyboard inputs

h. Error Handling - None

i. Constraints and Assumptions - Payload Control Spec item numbers must be consecutive.

TABLE 3.3.6.1-1 Payload Control Specialist Function Control Segment

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Item entry	E	I	CRT	KEY		
2	Item No.	E	O	SPC	SP1_ITEM_NO SP2_ITEM_NO SP3_ITEM_NO SP4_ITEM_NO		
3	Disp.	E	C	SI1	SP1_DISP SP2_DISP SP3_DISP SP4_DISP		
4.	Scalar Data Item	E	O	SPC	SP1_ITEM_S SP2_ITEM_S SP3_ITEM_S SP4_ITEM_S		
5.	UI Scalar value	E	I	UI	ITEM_S		
6.	DEU #	E	O	SPC	SP1_DEU SP2_DEU SP3_DEU SP4_DEU		
7.	UI DEU #	E	I	UI	D_DEU_NUMBER		

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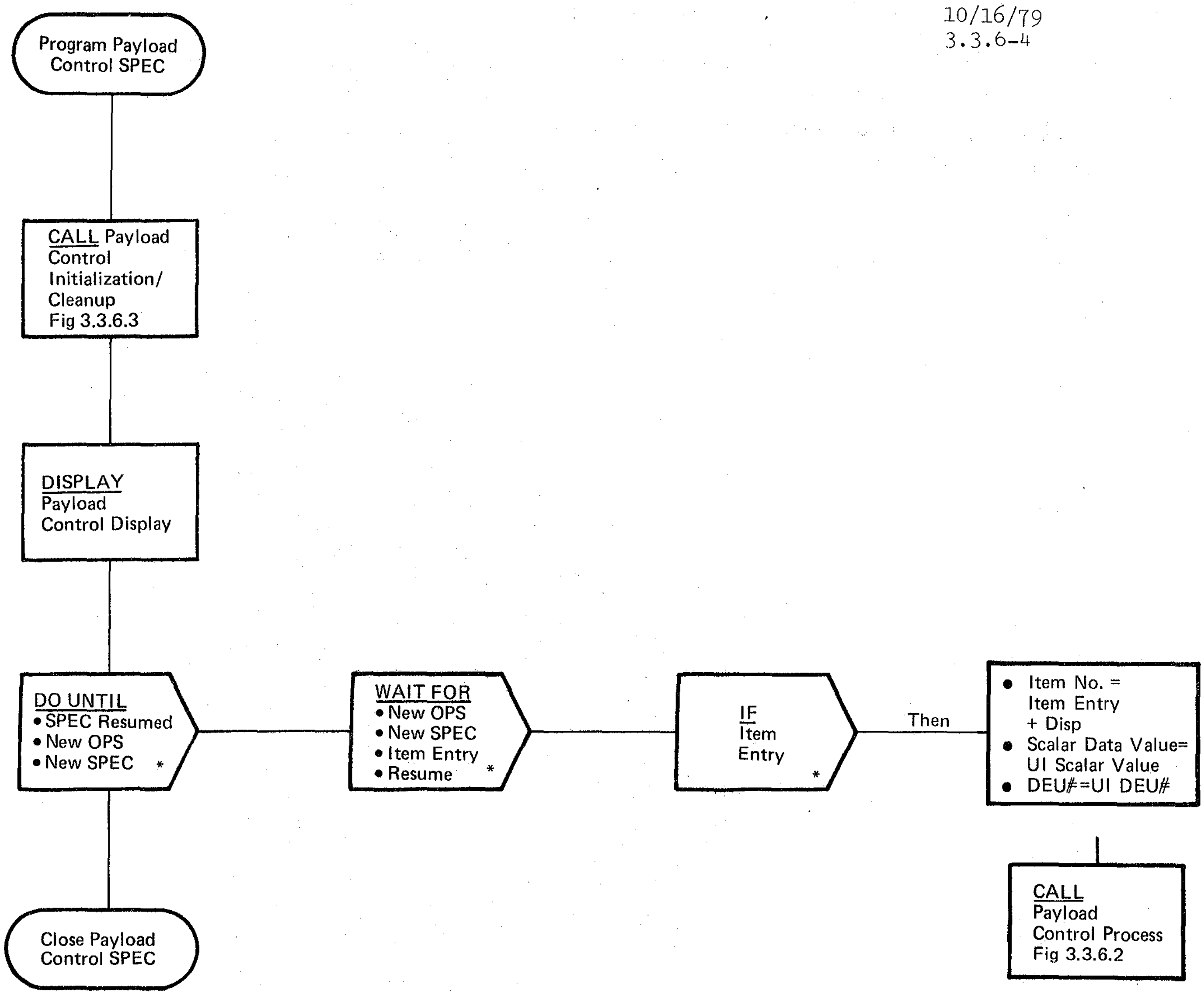

Figure 3.3.6.1-1. Payload Control Specialist Function Control Segment

3.3.6.2 Payload Control Process (SPC_ITEM)

The Payload Control Process outputs the selected analog or discrete command to either the payload MDM or pallet MDM (PL MDM).

a. Control Interface - Payload Control is CALL'd by the Payload Control Specialist Function as a result of a valid item entry.

   Invocation: CALL SPC_ITEM (Item No, Data Item, DEU no);

b. Inputs - Inputs to this module are specified in Table 3.3.6.2-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.6.2-1 through 3.3.6.2-3. When the item entered represents a discrete command, the associated device address, reset mask and set mask are used to build appropriate commands. First, bits within the channel indicated are commanded OFF with a RESET command utilizing the reset mask. Then, the set mask is used to command ON bits within the selected channel. In order to make the current status of selected device available for display and/or downlist, the status of the MDM is read via MDM BITE test 4. This status is then set in the proper channel status mask.

   When the item entry represents an analog command, the associated device address and scaling coefficients are isolated. The Backward Scaling module is called to convert the entered value to analog PCM count and a command is issued to output that analog. Values that are offscale are not output and result in a Class 5 error message being output.

d. Outputs - Outputs from this module are specified in Table 3.3.6.2-1.

e. Module References -

Process	Section	Reference
Backward Scaling	3.2.1.8	CALL(Call List)

f. Module Type and Attributes

   Type: External Procedure

   Attributes: Exclusive

g. Template References

D INCLUDE TEMPLATE	CDL_ANNUN	System Services Annunciation Compool
D INCLUDE TEMPLATE	SBS_BACK_SCALE	Backward Scaling
D INCLUDE CSAPLC		Payload Control Tables (GXT,DIT,CST,ANIT)
D INCLUDE TCSMACS		Contains TCS I/O Macro Skeleton
D INCLUDE IOMACS		Contains I/O Macro flags

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D INCLUDE SMSTAT	Status field Replace Statements
D INCLUDE DMA#MACS	Contains Replace Statements for CALL TO DMA_MAC
D INCLUDE TEMPLATE DMA_MAC	System Service Annunciation Macro Interface External Procedure

h. Error Handling - None

i. Constraints and Assumptions -

- All analog outputs are 1st order only.
- Payload Control Spec item numbers must be consecutive.

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TABLE 3.3.6.2-1 Payload Control Process MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Device address	A.2.24, A.2.21	O	PL MDM	CSPS_CST_MDM$(3 to 16) CSPS_ANIT_MDM$(3 to 16)		
2	Reset mask	A.2.20	O	PL MDM	CSPS_DIT_RESET		
3	Set mask	A.2.20	O	PL MDM	CSPS_DIT_SET		
4	Channel status word	A.2.24	O	CRT,DL	CSPS_CST_CHAN		
5	Scale coefficients	A.2.21	O	SBS	CSPS_ANIT_A0 CSPS_ANIT_A1		
6	Offscale Status Indicators	E	L		SPC_OFFSCALE_IND		
7	Analog value	A.2.21	O		CSPS_ANIT_PCM_COUNT		
8	Backward Scaling Call List	E.3.2.1.8	O		SPC_COEF_PTR SPC_EU_VAL SPC_OFFSCALE SPC_PCM_VAL		
9	Item No.	E	I	SP1-SP4	SPC_ITEM_NO		
10	GXT Index	A.2.19	I		CSPS_GXT		
11	Transaction Status Word for Bite Test 4	E	L		SPC_BT4_TSW		
12	I/O Status Word	A.2.24	O		CSPS_CST_IO		
13	Command word fields	E	O		SPC_TCS_DISC_SET SPC_TCS_DISC_RESET SPC_TCS_MDM_BT4 SPC_TCS_ANA		
14	FCOS Data Words	E	L		SPC_DISC_RESET.DLOC SPC_DISC_SET.DLOC SPC_ANA.DLOC		
15	TCS-IO Device ID	E	O	PL MDM	SPC_DISC_RESET.DDEV SPC_DISC_SET.DDEV SPC_MDM_BT4.DDEV SPC_ANA.DDEV		
16	TCSPF1	E	I	FCOS	TCSPF1_DEVID		
17	TCSPF2	E	I	FCOS	TCSPF1_DEVID		
18	Pallet MDM1	E	I	FCOS	TCSPF1_DEVID		
19	Pallet MDM2	E	I	FCOS	TCSPF2_DEVID		

TABLE 3.3.6.2-1 Payload Control Process MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
20	EU Value	A.2.21	O	CRT	CSPS_ANIT_EU		
21	Data Item	E	I	CRT	SPC_EU_DATA_ITEM		
22	Device ID	A.2.24, A.2.21	I		CSPS_ANIT_MDM$(1 to 2) CSPS_CST_MDM$(1 to 2)		
23	Response Word	E	I	FCOS	SPC_BT4_RESPONSE		
24	DEU no	E	I	SP1-SP4	SPC_DEU		
25	Set Word	E	O	FCOS	SPC_SET_OUT		
26	Reset Word	E	O	FCOS	SPC_RESET_OUT		
27	Analog Word	E	O	FCOS	SPC_PCM_VAL		
28	Class 5 error msg	FMPT	O	CRT	CDLK_V92X0060X	V92X0060X	

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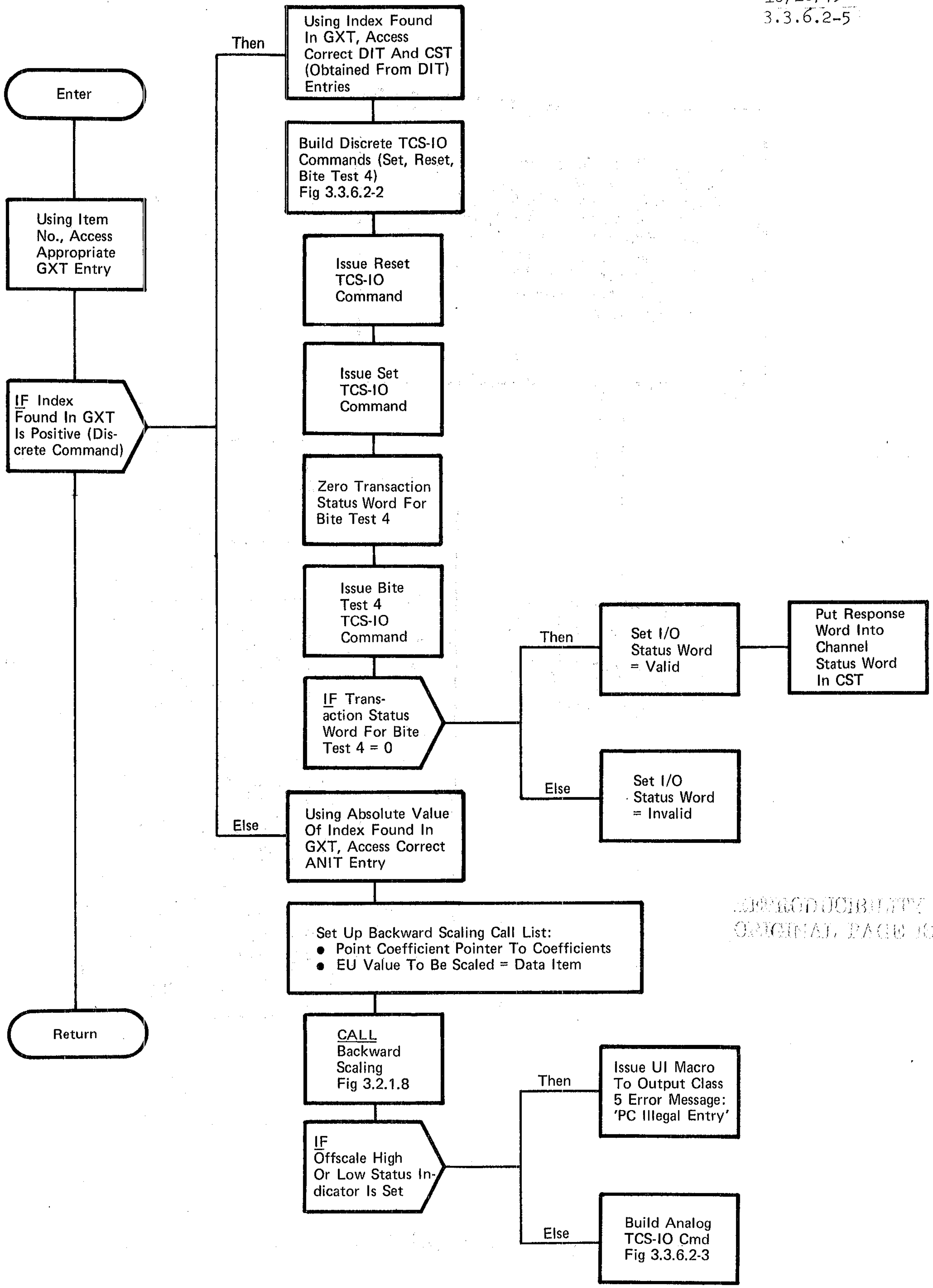

Figure 3.3.6.2-1. Payload Control Process

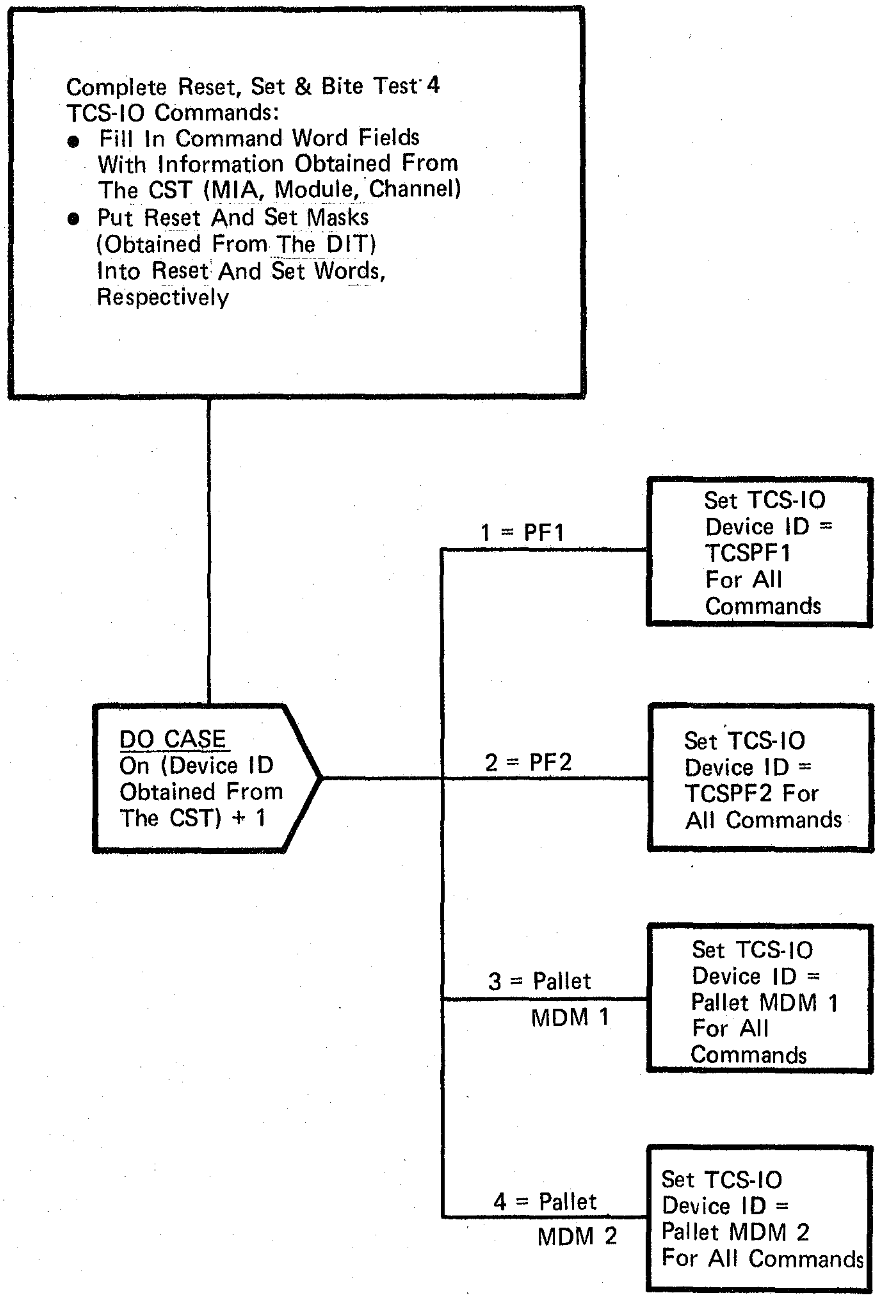

Figure 3.3.6.2-2. Build Discrete TCS-IO Commands

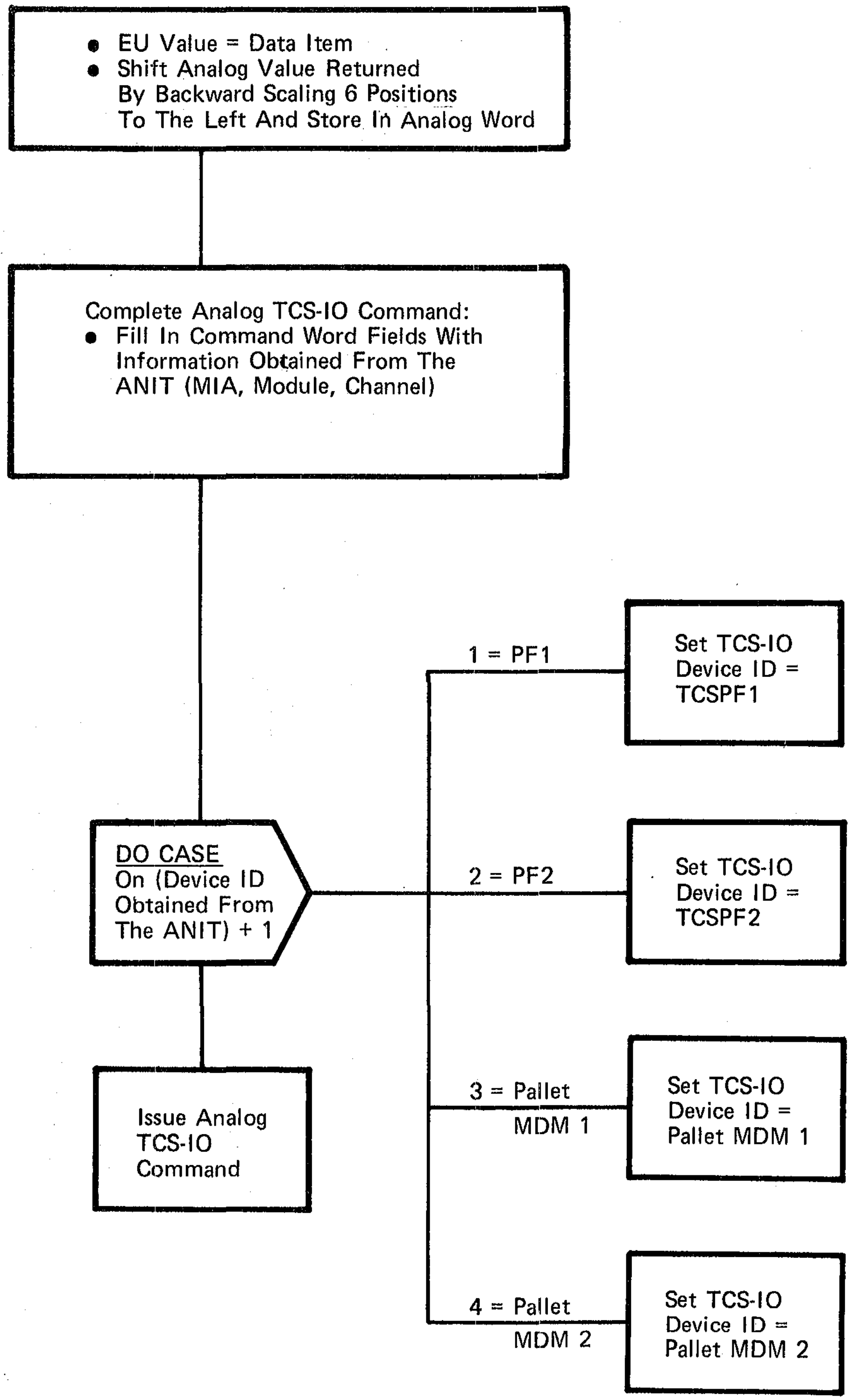

Figure 3.3.6.2-3. Build Analog TCS-IO Command

3.3.6.3 Payload Control Initialization/Cleanup (SI1_CLNUP)

The Payload Control Initialization module initializes all channel status words.

a. Control Interface - Payload Control Initialization is CALL'ed by the Payload Control Specialist Function Control Segment.
Invocation: CALL SI1_CLNUP (Disp);

b. Inputs - Inputs to this module are specified in Table 3.3.6.3-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.6.3-1. MDM BITE TEST 4 is used to determine the true state of all applicable PL MDM (payload and pallet) discrete channels. These states are placed into the correct channel status words.

d. Outputs - Outputs from this module are specified in Table 3.3.6.3-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure

Attributes: Exclusive

g. Template References

D INCLUDE CSAPLC	Payload Control Tables (GXT,DIT,CST,ANIT)
D INCLUDE TCSMACS	Contains TCS I/O Macro Skeleton
D INCLUDE IOMACS	Contains I/O Macro Flags
D INCLUDE SMSTAT	Status field replace statements

h. Error Handling - None

i. Constraints and Assumptions

- Payload Control Spec item numbers must be consecutive.

TABLE 3.3.6.3-1. Payload Control Initialization/Cleanup MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Channel status words	A.24	O	CRT	CSPS_CST_CHAN		
2	Command Word Fields	E	O	FCOS	SI1_TCS_BT4		
3	Device ID	A.2.24 A.2.21	I		CSPS_CST_MDM$(1 to 2)		
4	TCS-IO Device ID	E	O	FCOS	SI1_BT4.DDEV		
5	TCSPF1	E	I	FCOS	TCSPF1_DEVID		
6	TCSPF2	E	I	FCOS	TCSPF2_DEVID		
7	Pallet MDM1	E	I	FCOS	TCSPF1_DEVID		
8	Pallet MDM2	E	I	FCOS	TCSPF2_DEVID		
9	Transaction Status Word	E	I		SI1_TSW		
10	I/O Status Word	A.2.24	O	CRT	CSPS_CST_IO		
11	DISP	E	I	SP1,SP2 SP3,SP4	SI1_DISP		
12	Range	E	L		SI1_RANGE		
13	GXT Index	A.2.19	I		CSPS_GXT		
14	Response Word	E	L		SI1_BT4_RESPONSE		

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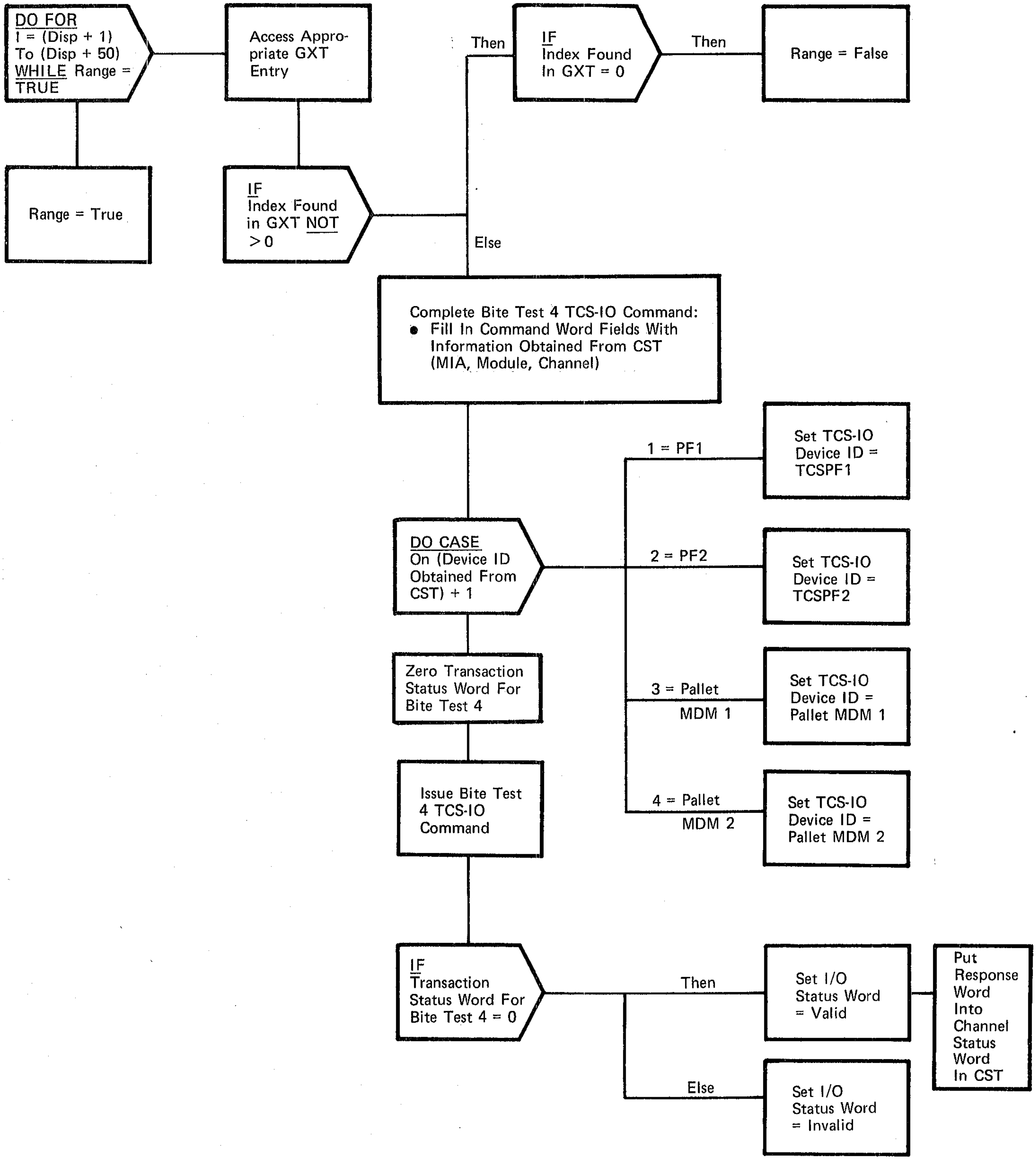

Figure 3.3.6.3-1. Payload Control Init/Cleanup

3.3.7 Mass Memory Patch

The Mass Memory Patch function in SM OPS 2 provides the capability to modify mass memory via the Mass Memory Read/Write SPEC or Uplink (Capability 2) for load blocks of 2048 half words or less.

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3.3.7.1 Mass Memory READ/WRITE SPEC Control Segment (VMM_MM_SPEC)

The MM READ/WRITE (MM R/W) SPEC provides the user the ability to patch the mass memories through keyboard inputs at the MCDS. A load block is read into core from mass memory and portions of the load block (up to 39 words) may be displayed. The changes may then be merged with the actual data and the load block written out to the mass memory. The checksum is also displayed, providing the user greater assurance of accuracy. Other displayed values keep the user informed of the status of his request as well as any violations of allowable procedures.

a. Control Interface - The MM R/W SPEC function will be activated by User Interface upon a user request for the SPEC. This SPEC is valid only in the SM 2 OPS Sequence.

b. Inputs - See Table 3.3.7.1-1.

c. Process Description (Figure 3.3.7.1-1) - Once activated, following initialization of necessary flags, variables, and buffers, the MM R/W Display will be presented. The program will be in the "WAIT" state until an ITEM is entered. Receipt of Item entries will result in the CALLing of the MM Item Processor (Section 3.3.7.2).

   Upon SPEC termination (by user request), if the MM Message Processor is active, a WAIT is issued until it becomes inactive, whereupon control is returned to the CALLing routine.

d. Outputs - See Table 3.3.7.1-1.

e. Module References - VMP_ITEM_PROC: MM R/W SPEC Item Processor

f. Module Type and Attributes

   Type: Program
   Attributes: N/A

g. Template References

D INCLUDE TEMPLATE CZ1_COMMON	System Services Common Compool
D INCLUDE TEMPLATE DIS_PLAY	UI Display Presentation and Control and External Procedures
D INCLUDE TEMPLATE DNX_BMS	UI Application Moding and Sequencing External Procedure
D INCLUDE TEMPLATE VMP_ITEM_PROC	MM R/W Spec Item Processor
D INCLUDE TEMPLATE CDF_MM_UTILITY	MM Utility Compool Containing Buffer 1
D INCLUDE DAG#RAM	UI Common Grammar Macro Set
D INCLUDE DBG#RAM	OPS Control Segment Grammar Macro Set
D INCLUDE DCG#RAM	Spec Control Segment Grammar Macro Set
D INCLUDE DDG#RAM	Allows references to MCDs keyboard input

h. Error Handling - None

i. Constraints and Assumptions - If MM I/O is in progress when an attempt is made to terminate the SPEC, the user may experience a slight delay between the time the request to terminate is made and the time of the actual termination of the SPEC.

TABLE 3.3.7.1-1 MM R/W SPEC Control Segment

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Keyboard Function Types	E	I	CRT	KEY		
2	MM Msg Proc Event	E	I	HAL	DMP_MM_MSG_PROC		
3	Patch Entered Bits	Appendix D, VCO DDS	O	DMP, VMP	CDHB_PATCH_ENTERED_BITS		
4	Ready Bits	Appendix D, VCO DDS	O	VMP, DMP	CDHV_READY_BITS		
5	Patch Input Buffer	Appendix D, VCO DDS	O	VMP, DMP	CDHV_PTACH_REQUEST		
6	MM R/W SPEC Display Variables	Appendix D, VCO DDS	O	VMP, DMP	CDHV_ACTUAL_STAT CDHV_DESIRED_STAT CDHV_DISP_STAT CDHV_DISP_VIOL CDHV_FSWID_STAT CDHV_PHASE_STAT CDHV_LDBLK_STAT CDHV_OFFST_STAT CDHV_NUM_STAT CDHV_PATCHID_STAT CDHV_ESC_STAT CDHV_VER_STAT CDHV_CS_STAT CDHB_MM_SELECT		

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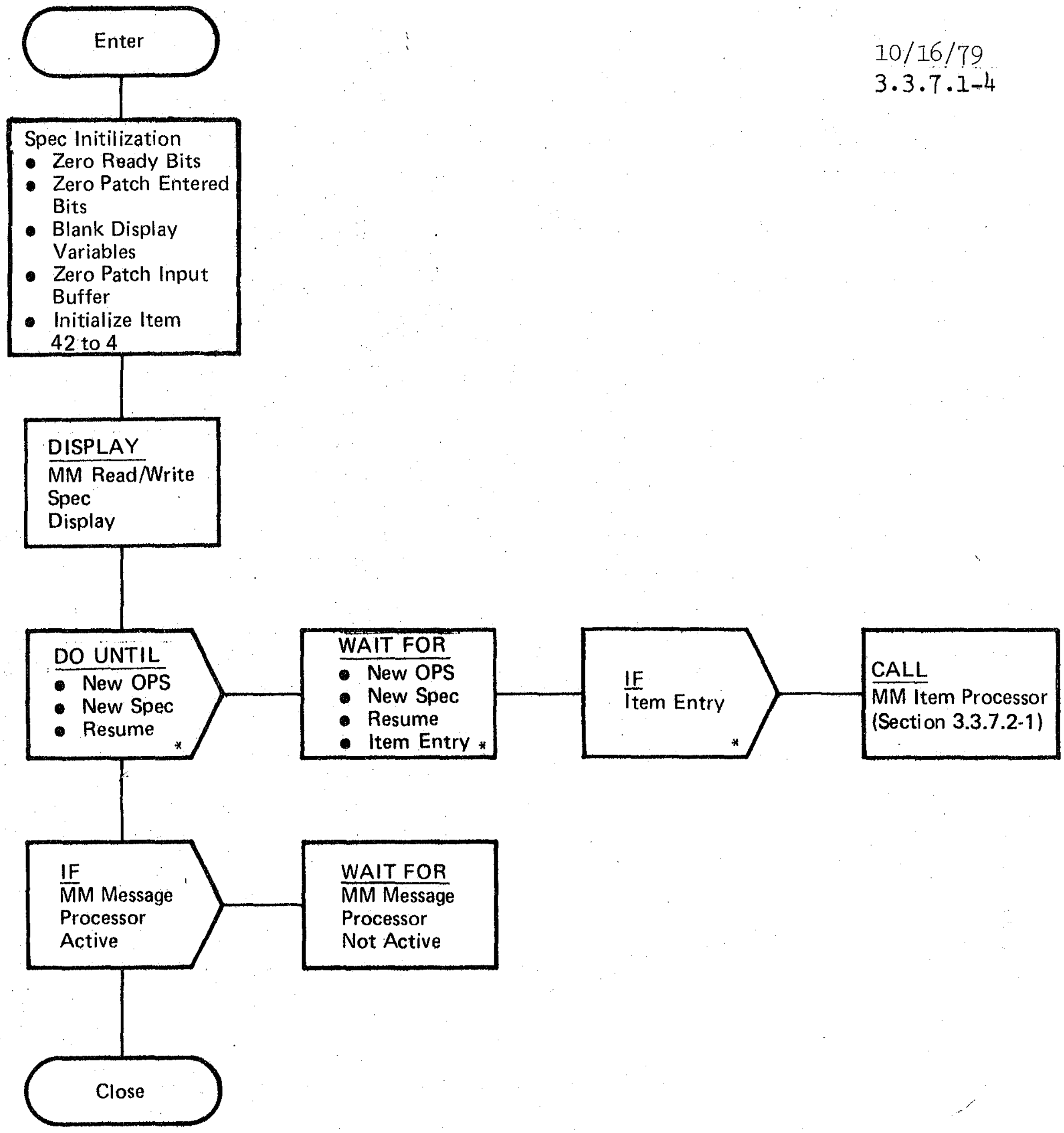

Figure 3.3.7.1-1. MM Read/Write SPEC Control Segment

3.3.7.2 Mass Memory R/W SPEC Item Processor (VMP_ITEM_PROC)

This module is called by the Mass Memory R/W SPEC Control Segment to translate keyboard item inputs into the appropriate software action such as setting the proper fields in the control words for the MM Message Processor and enabling the display of the item entries. This module is described in the Vehicle Checkout (VCO) DDS, Section 3.2.7.1.

3.3.7.3 Mass Memory Message Processor (DMP_MM_MSG_PROC)

The Mass Memory Message Processor processes requests from the ground or on-board (via the MCDS MM Spec function). It decodes the messages from the ground or MCDS and performs Mass Memory Read LOAD BLOCK, Merge Patch Data, and Write LOAD BLOCK operations. As such, the processor provides a mass memory load and dump capability. This module is described in the Vehicle Checkout (VCO), DDS, Section 3.7.2.2.

3.3.8 Remote Manipulator System

The Remote Manipulator System (RMS) software provides inflight payload handling to support deployment, retrieval, and stowage of payloads. The RMS software monitors and controls the motion of the mechanical arm(s) by:

1. Selecting and initializing the control modes
2. Computing arm commands
3. Determining operational arm status
4. Providing RMS caution and warning signals
5. Performing fault detection, and
6. Allowing mission tailoring through the use of I-LOAD and mission/payload-dependent parameters.

All parameters in the MCIU Input/Output (I/O) data blocks (compools) are available for Downlist (DL). Therefore, these items shall not show DL as a destination in the module data lists since they are all available for DL.

3.3.8.1 Remote Manipulator System (RMS) Specialist Function Control Segment (RMC_SPEC)

The RMS Specialist Function Control Segment (RMC) activates RMS processing and presents the RMS SPEC display (094) on the orbiter CRT.

a. Control Interface - The RMS Control Segment is SCHEDULE'd by the User Interface (UI) Program Sequence Request Processor (DMC). Control is given to RMC whenever any of the following keyboard actions occur:

- SPEC 094 is entered
- SPEC 094 is resumed
- ITEM entry/execute via SPEC 094 is received
- New OPS is selected
- New SPEC is selected

Invocation: SCHEDULE RMC_SPEC PRIORITY (PRIO_RMC)

b. Inputs - Inputs to this module are specified in Table 3.3.8.1-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.8.1-1. Selection of the RMS Specialist Function causes RMC to check if the RMS Executive (REX) is active. If it is, RMC presents the RMS SPEC display and waits for keyboard input. If REX is not active, the RMS initialization flag is set, the FCOS Timer Initiated I/O is scheduled, REX is SCHEDULE'd (using the priority, frequency and phase offset specified for REX in SAM 10), and the RMS SPEC display is presented. Once SHCEDULE'd, REX continues to execute until a new OPS is selected (REX will continue cycling even when the RMS SPEC is deselected and RMC is rendered inactive).

While active, RMC monitors for valid keyboard input. When an item entry is received, pertinent keyboard data (the item number and the item data) is stored for the item entry processor (RUD), the item flag is set (causing REX to CALL RUD), and RMC WAITs for TIME_REX (.08) seconds. This WAIT insures that RUD will process the currently stored data before RMC stores the next keyboard data for RUD to process. Upon receipt of a new OPS, new SPEC, or a RESUME keyboard entry, RMC exits.

d. Output - Outputs from this module are specified in Table 3.3.8.1-1.

e. Module Reference -

Process	Section	Reference
RMS Executive	3.3.8.4	SCHEDULE

f. Module Type and Attributes -

Type: Program
Attributes: N/A

g. Template References -

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE REXRMS	RMS Executive
D INCLUDE TEMPLATE CZ1_COMMON	System Services Common Compool
D INCLUDE TEMPLATE DIS_PLAY	Display Presentation and Control
D INCLUDE TEMPLATE DNX_BMS	Application Moding and Sequencer
D INCLUDE DAG#RAM	Common Grammer Macro Set
D INCLUDE DCG#RAM	SPEC Control Segment Grammer Macro Set
D INCLUDE DDG#RAM	Allows references to MCDS keyboard inputs
D INCLUDE ZPRIOTIM	Contains REPLACE names for baseline priorities, phasing, and rates of SCHEDULE'd processes
D INCLUDE TIOMACS	Timer Initiated I/O replaces
D INCLUDE PREMACS	Pre-initialized I/O macros

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions -

- Item entries are passed from DMC to RMC one at a time and RMC WAITs TIME_REX (.08) seconds after each item entry. Thus, if a multiple keyboard entry of 6 items was input, each separate item would require at least .08 seconds to process, resulting in at least .48 seconds to process the complete keyboard entry. If a new SPEC, new OPS or RESUME were entered during this .48 second period, RMC would finish processing the item it was currently working on and the remaining items would not be processed.

- Timer Initiated I/O will control the reading of the MCIU for RMS. A read will start and be completed just before each REX cycle begins. Reads will not occur in the middle of a cycle, even if REX cycle overruns.

TABLE 3.3.8.1-1 RMS Specialist Function Control Segment **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Keyboard item number	D.50	R	UI(DMC)	ITEM_NO		
2	Keyboard item data	D.50	R	UI(DMC)	ITEM_I ITEM_S		
3	Keyboard DEU number	D.50	R	UI(DMC)	D_DEU_NUMBER		
4	RMS SPEC initialization flag	D.51 A.2.32	W	REX	CRAB_RMS_SPEC_INIT		
5	Item entry flag	D.52 A.2.32	W	REX	CRAB_ITEM_ENTRY		
6	Item number	D.53 A.2.32	W	RUD	CRAV_ITEM_NO		
7	Item data	D.53 A.2.32	W	RUD	CRAV_ITEM_INTEGER CRAV_ITEM_SCALAR		
8	DEU number	D.53 A.2.32	W	RUD	CRAV_DEU_NUM		
9	SIP start time	D.54	R	SC (AIB)	CZ1V_A_TSIP		
10	Scheduling phase for REX	ZPRIOTIM TEMPLATE	Z		PHASE_REX		
11	Scheduling priority for REX	ZPRIOTIM TEMPLATE	Z		PRIO_REX		
12	Scheduling frequency of REX	ZPRIOTIM TEMPLATE	Z		TIME_REX		

TABLE 3.3.8.1-2 I/O SVC

DEVICE	DEVICE ID	OP CODE	SVC NO.	SYNC TYPE	COMFAULT STATUS	ICC TYPE	TIME TAG	WAIT	PROT.	STATUS	INPUT OUT-PUT	MAJ FUNC ID	I/O PRIOR-ITY	WORD COUNT	BUFFER	EVENT	BUS NOMINAL
MCIU	57	2	40	RS	Yes	No	No	Yes	Yes	No	I	SM	175	45	CRB	None	LB1

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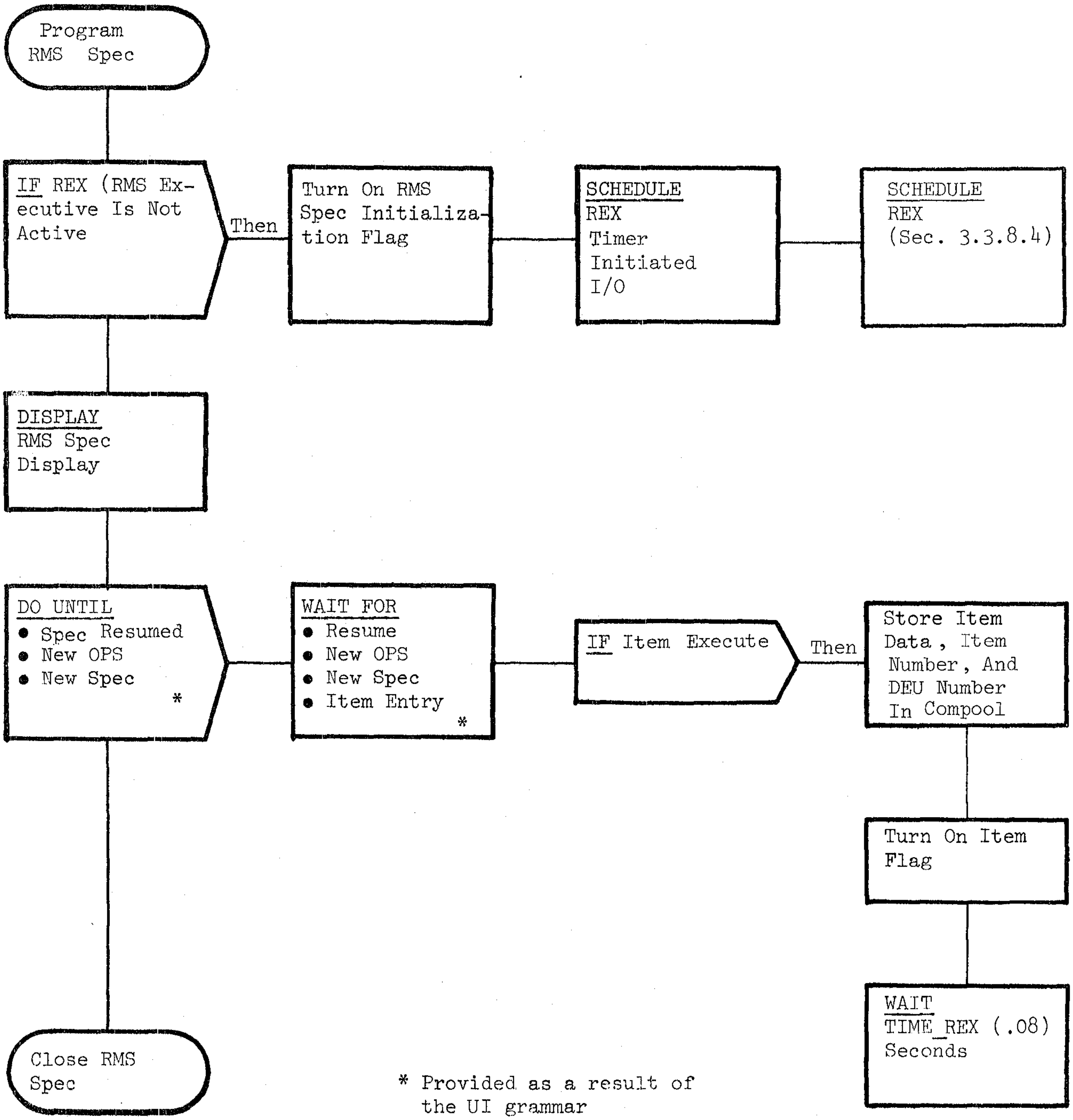

Figure 3.3.8.1-1. RMS Specialist Function Control Segment

3.3.8.2 RMS Item Processor (RUD_KYBD)

The RMS Item Processor (RUD) accomplishes initialization of the RMS software in response to input from the RMS Spec display.

a. Control Interface - RUD is CALL'ed by the RMS Executive (REX) when RMC indicates that a valid entry has been received from UI.

   Invocation: CALL RUD_KYBD

b. Inputs- Inputs to this module are specified in Table 3.3.8.2-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.2-1 through 3.3.8.2-8. RUD processes item entries from the RMS Spec display. An arm is selected for initialization via the PORT or STBD item entry. When a PORT or STBD item is executed, RUD updates the display with an asterisk to show the arm selected. Any saved data associated with the arm selected is recalled to the display, and the old display data not associated with the arm selected is blanked. A valid PL ID or EE item entry will be displayed and saved for recall for the arm currently selected. When the MCIU I/O ON/OFF item is executed, the MCIU I/O is turned on or off to indicate whether or not MCIU data acquisition is to be accomplished. An astersik on the display denotes whether I/O is on or off. The runaway joint consistency check (CNTL ERR ENA/INH) and the Soft Stop Limits (SOFT STOP ENA/INH) are enabled or inhibited by their associated item entries. Asterisks denote their status. Valid Auto Sequence ID entries are displayed and assigned to their corresponding RMS auto sequence mode. RUD accepts and displays START PT item entries. This entry designates which prestored point in the selected auto sequence will be used as the starting point. While the Resolved Position Algorithm (RPO) is active, RUD rejects any OPR CMD MODE item entries (END POS, END ATT, PL INIT ID, and CMD CK). Accepted OPR CMD MODE data is displayed. RUD SCHEDULE's RPO whenever a CMD CK item entry is accepted. If an illegal entry occurs, RUD enables the appropriate UI macro to generate annunciation on the message line - (ILLEGAL ENTRY).

   There is no Spec cleanup processing.

d. Outputs - Output from this module are specified in Table 3.3.8.2-1.

e. Module References -

Process	Section	Reference
Resolved Position Algorithm	3.3.8.9	SCHEDULE

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

D INCLUDE TEMPLATE CRI_LVC	Level C Constants Compool
D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CDL_ANNUN	System Service Annunciation Compool
D INCLUDE TEMPLATE DMA_MAC	System Service Annunciation Routine
D INCLUDE DMA#MACS	System Service Error Annunciation Macro Replace Statements
D INCLUDE ZPRIOTIM	Contains Replace Names for Baseline Priorities, Phasing, and rates of Scheduled Processes
D INCLUDE TEMPLATE CRF_ASC	Pre-stored Auto Sequence Compool

h. Error Handling -

- RUD checks display entries in case of input errors. If a display entry is incorrect, an ILLEGAL ENTRY message is displayed and the entry is not processed.
- Standard FCOS error recovery also exists for this module.

i. Constraints and Assumptions - The user will not execute PORT/STBD items while an OPR CMD check is in progress.

If the ARM and EE IDs are changed while RPO is running, results on the RMS control display may appear inconsistent.

TABLE 3.3.8.2-1 RMS Item Processor

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Item Number	A.2.32, D.53	R	RMC	CRAV_ITEM_NO		
2	Item Data	A.2.32, D.53	R	RMC	CRAV_ITEM_INTEGER		
3	Illegal Entry Flag	E	L		RUD_ILLEGAL_ENTRY		
4	MCIU I/O Flag	A.2.32	O	REX, CRT	CRAB_MCIU_IO	V92X3835X	
5	Case Number	E	L		RUD_CASE_NUM		
6	Array Item	E	L		RUD_ARRAY_ITEM		
7	Soft Stop Limits Enable Inhibit Flag	A.2.32	O	RHM, CRT	CRAB_SOFT_STOP_ENABLE	V92X3120X	
8	Arm Init Flag	A.2.32, D.55	W	RPO	CRAV_ARM_INIT	V92X3830X	
9	OPR CMD Check Index	A.2.32 D.57	O	CRT, RAS	CRAV_OPR_CMD_CK_INDEX	V92X3840X	
10	PL ID	A.2.31	Z		CRIS_PYLD_ID_VALID	V96J6990C-995C	
11	EE ID	A.2.31	Z		CRIS_EE_ID_VALID	V96J6988C-989C	
12	(PORT) RMS PYLD ID	A.2.32	O	RCD, DL, RXY	CRAV_RMS_PL_ID $ (1)	V93J7505C	
13	(STBD) RMS PYLD ID	A.2.32	O	RCD, DL, RXY	CRAV_RMS_PL_ID $ (2)	V93J7506C	
14	(PORT) RMS EE ID	A.2.32 D.58	W	RCD, DL, RPO	CRAV_RMS_EE_ID $ (1)	V93J7507C	
15	(STBD) RMS EE ID	A.2.32 D.58	W	RCD, DL, RPO	CRAV_RMS_EE_ID $ (2)	V93J7508C	
16	SEQ Length	A.2.35	Z		CRFS_SEQ_LENGTH		
17	RMS Auto Seq ID	A.2.32	O	RXY, CRT	CRAV_AUTO_SEQ_ID	V93J7510C-513C	
18	Desired POR Position and Attitude	A.2.32 D.56	W	RPO, CRT	CRAV_POR_COR_DESIRED	V93J7520C-525C	
19	Match	E	L		RUD_MATCH		

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TABLE 3.3.8.2-1 RMS Item Processor (cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
20	Auto Seq Start Pt.	A.2.32	O	RAS, DL, CRT	CRAV_AUTO_SEQ_STR_PT	V93J7550C	
21	Auto Seq Flag	A.2.32	O	RAS	CRAB_AUTO_SEQ_FLAG	V93X7551X	
22	SAVE PYLD ID	A.2.32	I	REX	CRAV_SAVE_PYLD_ID		
23	DISP PYLD ID	A.2.32	O	CRT	CRAV_DISP_PYLD_ID	V92J3845C	
24	SAVE EE ID	A.2.32	I	REX	CRAV_SAVE_EE_ID		
25	DISP EE ID	A.2.32	O	CRT	CRAV_DISP_EE_ID	V92J3846C	
26	Por Cord Desired Blanking Word	A.2.32	O	CRT	CRAV_POR_COR_DES_BM		
27	IDENT	E	L		RUD_IDENT		
28	PYLD INIT ID	A.2.32, D.64	W/O	RPO/RXY	CRAV_PL_INIT	V93J7541C	
29	DISP INIT PYLD	A.2.32	O	CRT	CRAV_DISP_PL_INIT		
30	PL INIT BLANKING WORD	A.2.32	O	CRT	CRAV_PL_INIT_BAM		
31	OPR CMD CK FLAG	A.2.32	W	DL	CRAV_OPR_CMD_CK_FLAG	V92J3675C	
32	DEU number	A.2.32, D.53	R	RMC	CRAV_DEU_NUM		
33	Arm Init Disp	A.2.32	O	CRT	CRAV_ARM_INIT_DISP		
34	Consis Flag	A.2.32	O	RVM, CRT	CRAB_CONSIS_FLAG	V93X7545X	

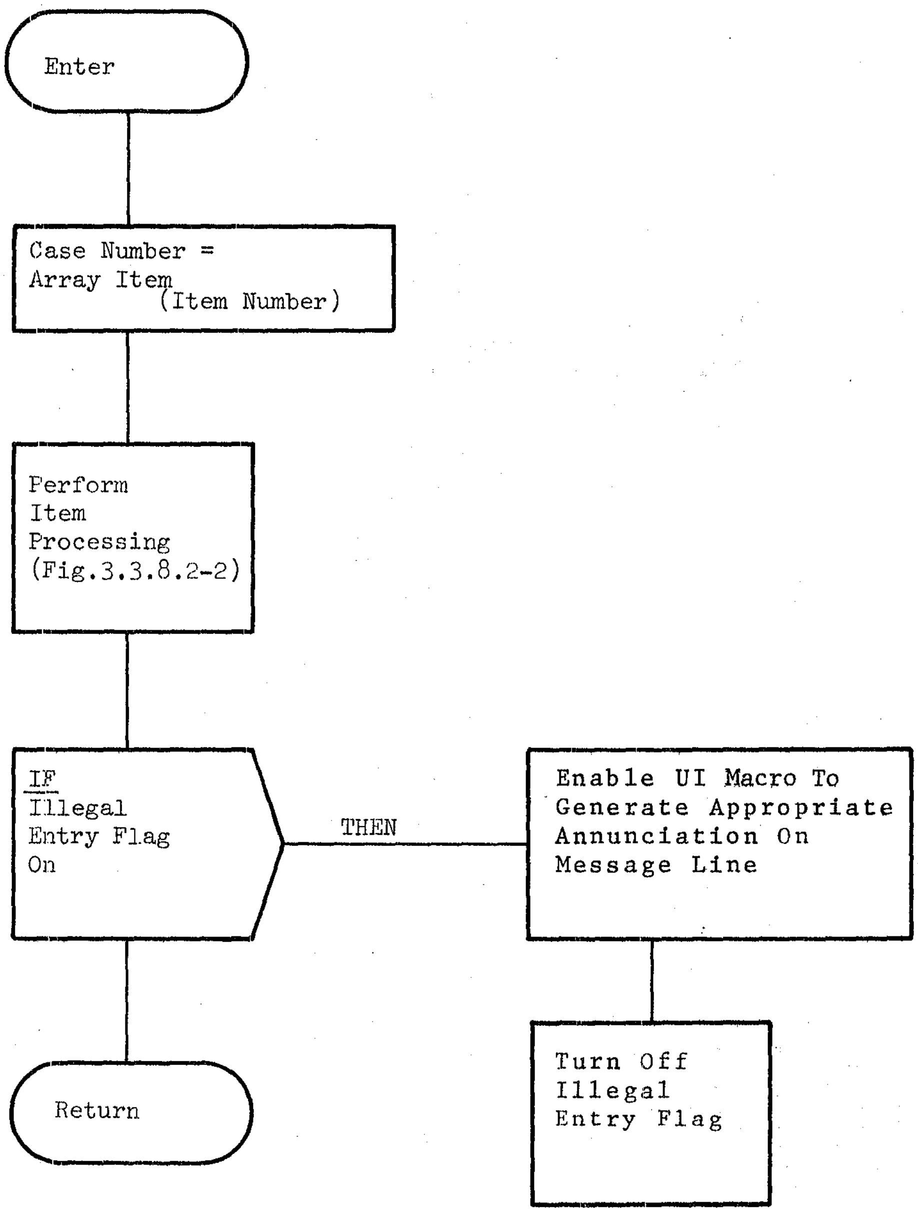
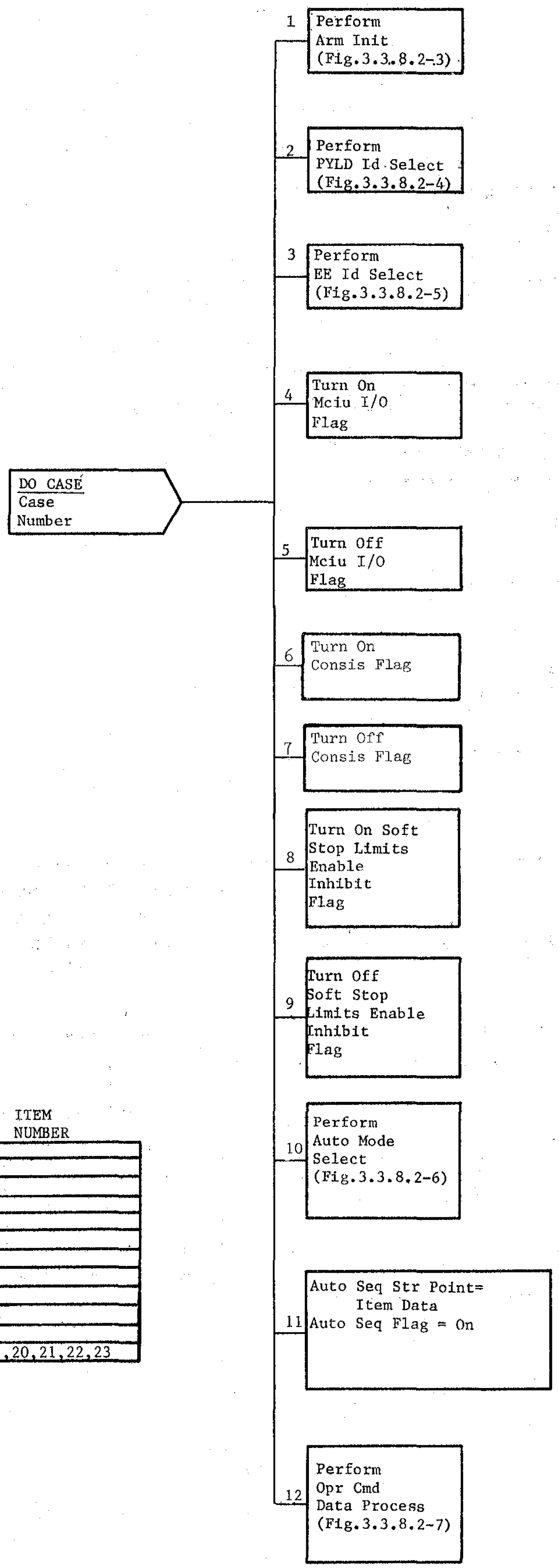


Figure 3.3.8.2-1. RMS Item Processor



CASE NUMBER/	ITEM NUMBER
1	1,2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	11,12,13,14
11	15
12	16,17,18,19,20,21,22,23

Figure 3.3.8.2-2 Item Processing

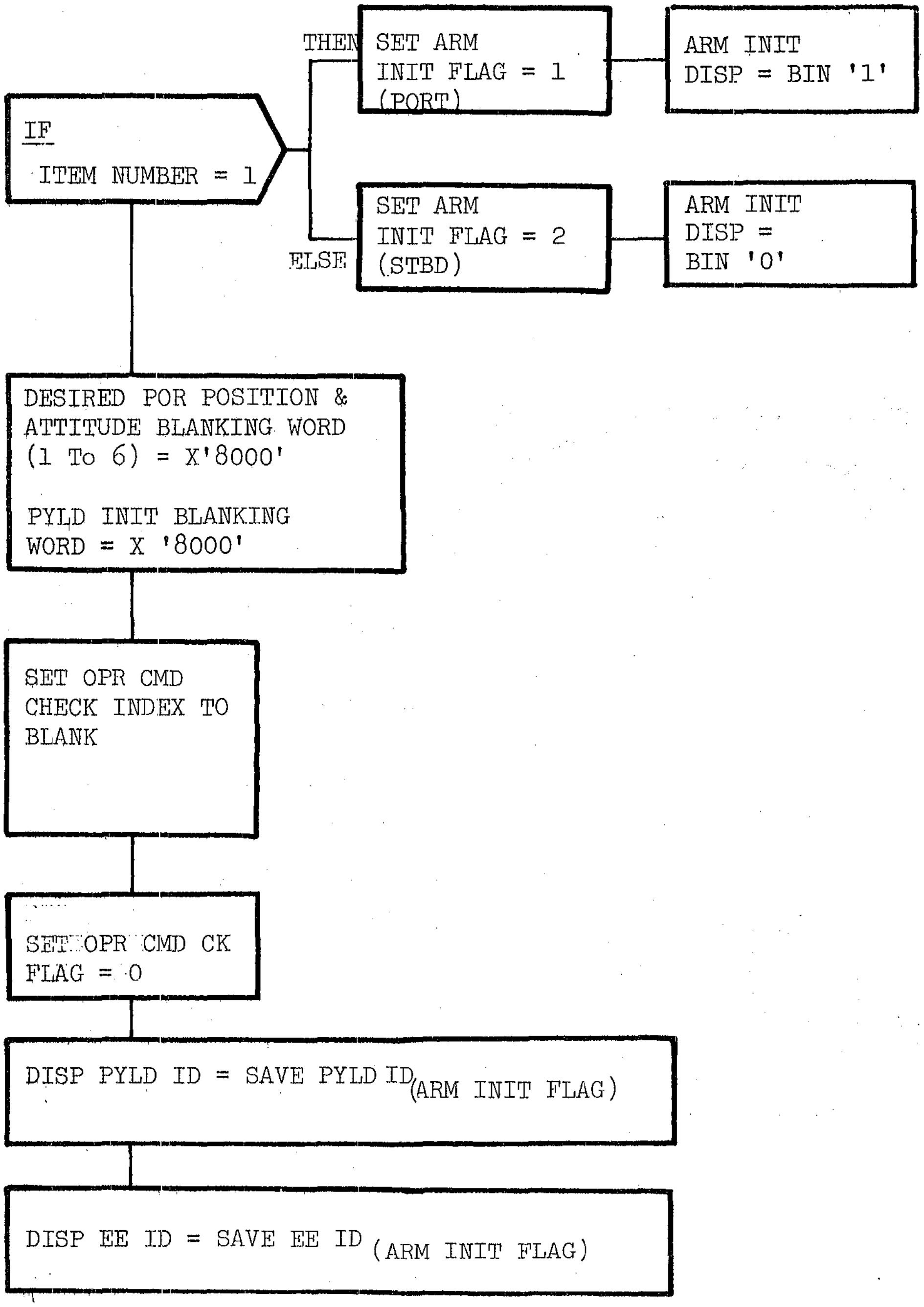


Figure 3.3.8.2-3. ARM INIT

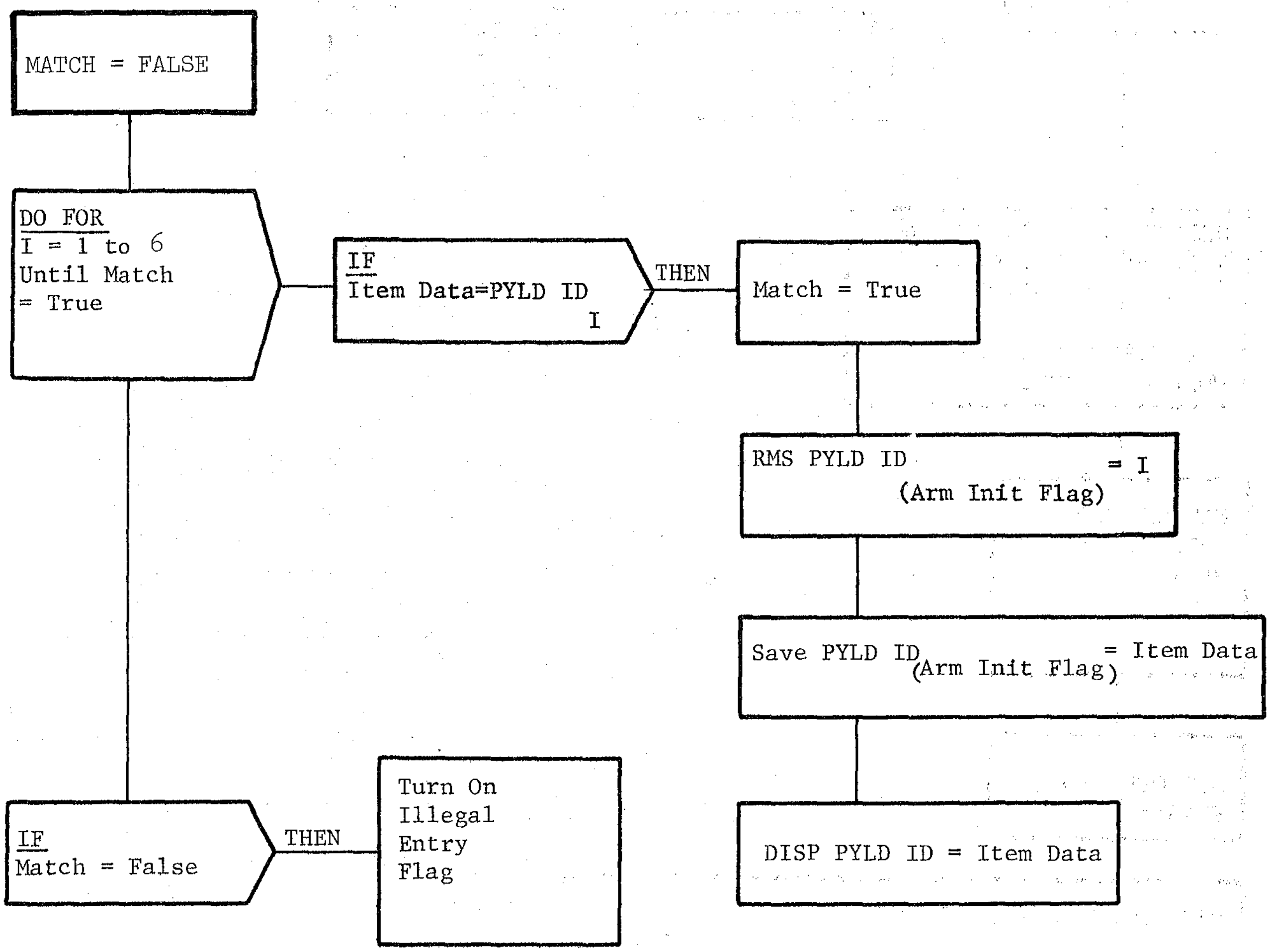


Figure 3.3.8.2-4. PYLD ID Select

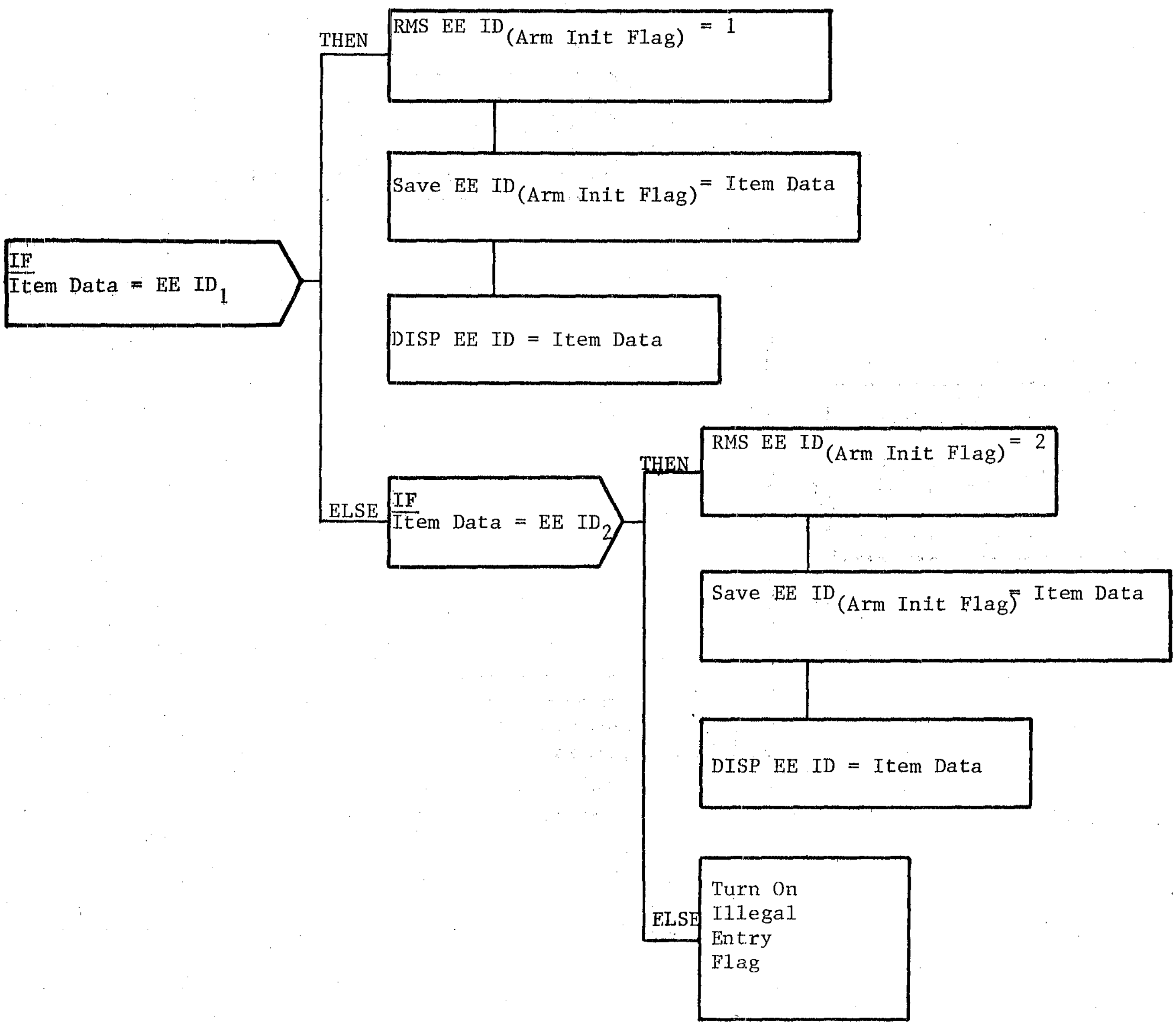


Figure 3.3.8.2-5. EE ID Select

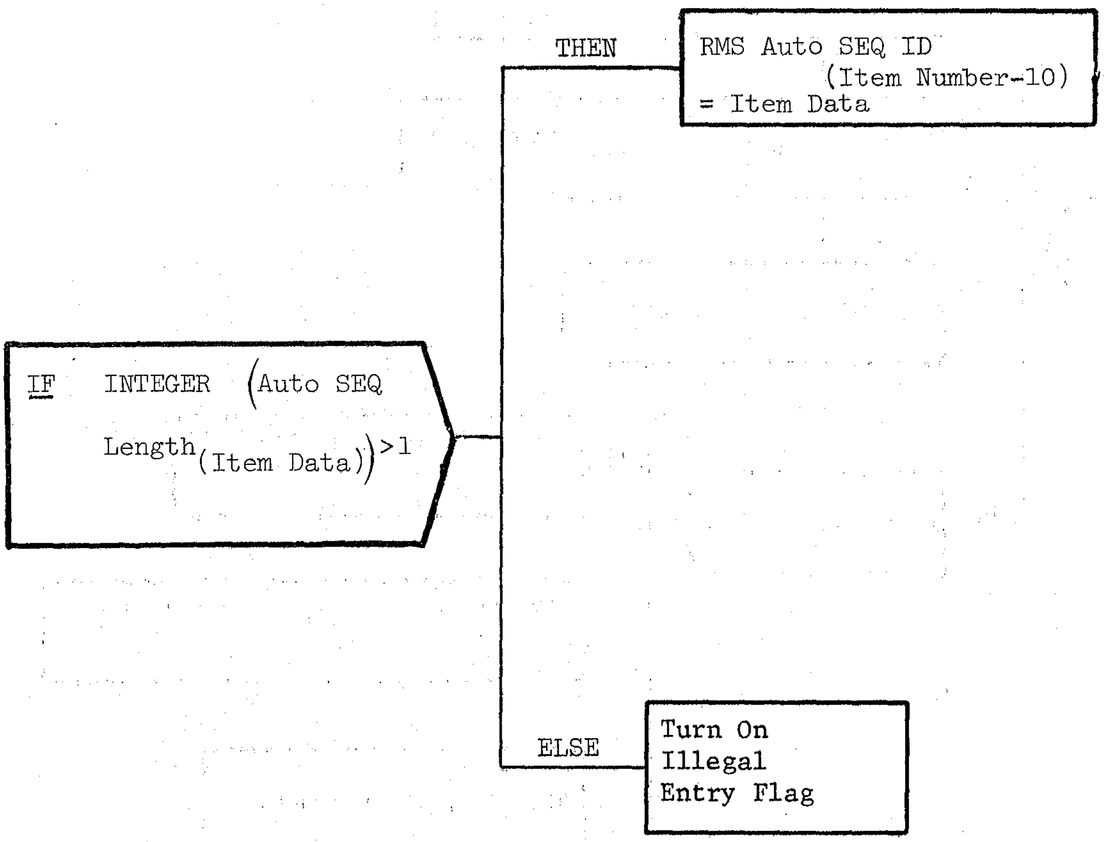


Figure 3.3.8.2-6. Auto Mode Select

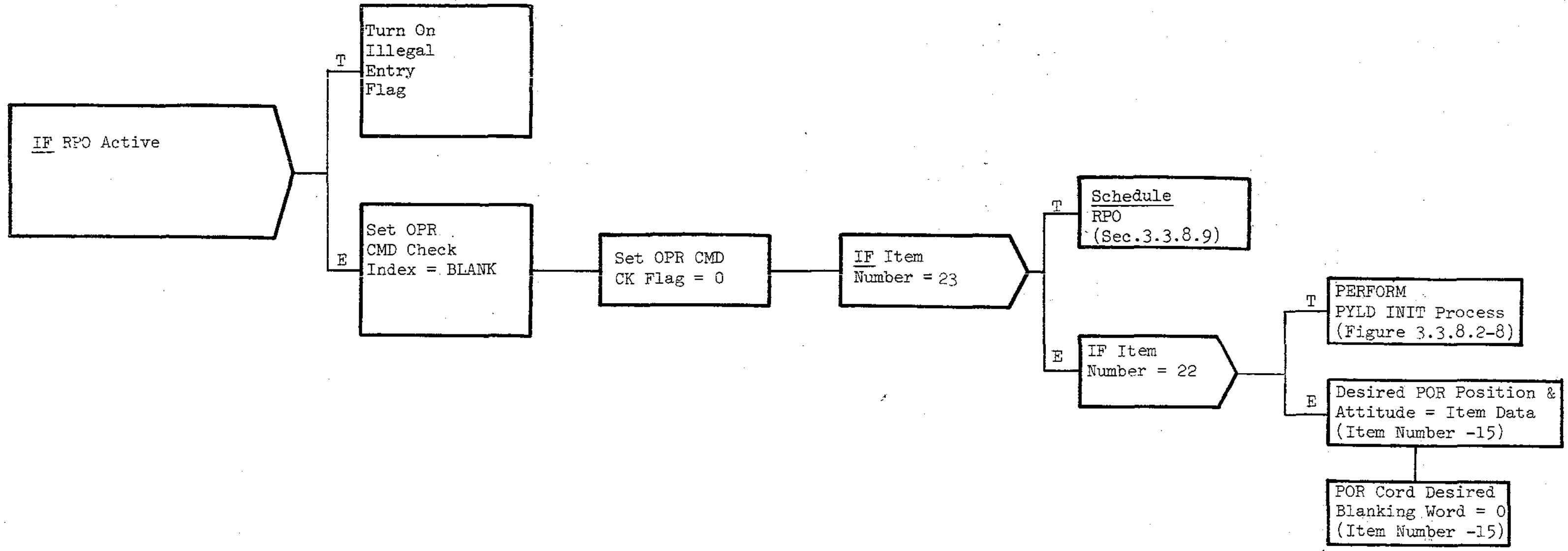


Figure 3 3.8.2-7 OPR CMD Data Processing

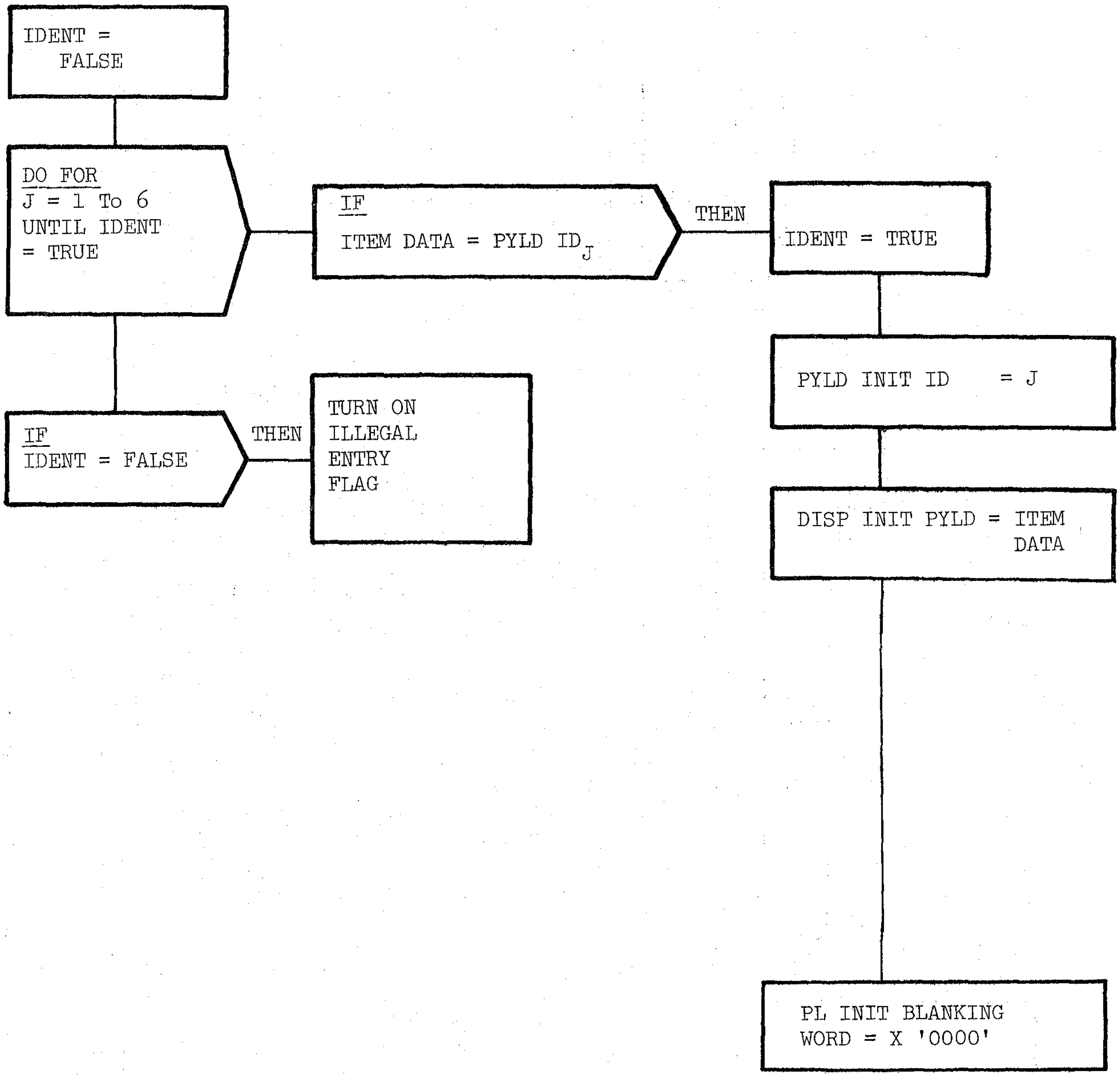


Figure 3.3.8.2-8. PYLD INIT PROCESS

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3.3.8.3 Data Conversion Processor (RYE_CNV)

The Data Conversion Processor (RYE) processes hand controller signals, joint rates, joint position, and converts thermister unit readings to degrees Fahrenheit. These results are placed in the working compool for control decision processing.

a. Control Interface - RYE is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

Invocation: CALL RYE_CNV

b. Inputs - Inputs to this module are specified in Table 3.3.8.3-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.3-1 through 3.3.8.3-5.

RYE begins by performing its Hand Controller (HC) processing for the six component input signals (X, Y, Z, PITCH, YAW, ROLL). A bias value is added and hand controller maximum deflection limit checking is applied to each component. If the resulting component value is within a predefined null deadband, then the component value is set to zero. If any of the HC component values are not within their respective null deadband limits, then the HC NULL flag is turned OFF.

If an arm has been selected, joint rate processing is performed for each joint. First, the smoothing factors K1 and K2 are calculated. Next, the selected arm's payload dependent maximum joint rate limits are selected for use by the RMS software for the current cycle. The filtered motor rates are computed using the smoothing factors K1 and K2, the unfiltered motor rate and the filtered motor rate from the last pass. The filtered motor rates along with the joint gear ratios are then used to compute the joint rates. The filtered motor rates are then stored to be used as last pass rates in the next execution.

If an arm has been selected, joint position processing is performed for each joint. The first five joints are limited to between -180 and +180 and the sixth joint is limited from -450 to +450.

Next, each new temperature thermistor reading for a valid arm is converted to degrees Fahrenheit for temperature limit checking in RIT and display in RDD. Each temperature, as calculated, is stored in an array of LED and ABE temperatures.

At this point, RYE exits. There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.3-1.

e. Module References - None

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f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

D INCLUDE TEMPLATE CRI_LVC	Level C Constants Compool
D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRD_CIL	Constants and I-Load Compool
D INCLUDE TEMPLATE CRC_COT	RMS Constants Table

h. Error Handling Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions -

The TM SPEC input wrist roll range is reset to zero by RMS after RMS takes the actual input value for use by the RMS software. It is assumed that the only values input for wrist roll range are one through six (1-6). Therefore, no validity checking is done.

TABLE 3.3.8.3-1 Data Conversion Processor MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	HC (scaled HC components)	A.2.32	I	RCD	CRAV_HC_COMP_SCALE		
2	MCIU Frame ID Change	A.2.32	I	RQC	CRAV_MCIU_FRAME_ID_CHANGE	V92J3905C	
3	Unfiltered Motor Rates	A.2.32	I	RCD	CRAV_MOT_RATE_RAW		
4	Joint Angle scale	A.2.32	I	RCD	CRAV_JA_SCALE		
5	Selected PYLD index	A.2.32	I	RCD	CRAV_PYLD_ID_ACT		
6	Arm select	A.2.32	I	RCD	CRAV_ARM_SEL		
7	Temp counter	A.2.32	I	RCD	CRAV_RIT_TEMP_CTR		
8	Therm data	A.2.32	I	RCD	CRAV_PS_TEMP_DATA		
9	PORT/STBD temp ID	A.2.32	I	RCD	CRAV_PS_TEMP_ID		
10	Sensor ID	A.2.32	I	RCD	CRAV_SENSOR_ID		
11	(Translational hand controller commands) THC SIG	A.2.32	O	RJS, DL	CRAV_COND_THC_SIG	V92H3125C-127C	
12	(Rotational hand controller commands) RHC SIG	A.2.32	O	RJS, DL	CRAV_COND_RHC_SIG	V92H3130C-132C	
13	HC null flag	A.2.32	O	RWP, RQC, RJS, DL	CRAB_HC_NULL	V92X3121X	
14	Filtered Motor Rates	A.2.32	O	RVM	CRAV_MOT_RATE_FILT	V92U3436C-441C	
15	Maximum joint rate limits	A.2.32	O	RRP, RFP, RSC	CRAV_JNT_RATE_LIM		JRL_MAX
16	Raw joint rates	A.2.32	O	RVM	CRAV_JAR_RAW	V92R3410C-415C	
17	Actual joint rates (Joint Rates)	A.2.32	O	RSC, RWP, RQC, RTV, DL	CRAV_JAR_ATL	V92R3310C-315C	
18	Actual joint angles (Joint Angles)	A.2.32	O	RSC, RWP, RHM, RDD, RKG, RFP, RRP, DL, RVM	CRAV_JA_ATL	V92H3300C-305C	
19	Therm temp	A.2.32	O	RIT, RDD	CRAV_THERM_TEMP	V92T3710C-716C V92T3720C-724C V92T3730C-736C V92T3740C-744C	
20	Null flag	E	L		RYE_NULL_FLAG		
21	K1	E	L		RYE_K1		

TABLE 3.3.8.3-1 Data Conversion Processor (cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
22	K2	E	L		RYE_K2		
23	Motor rates last pass	E	L		RYE_MOT_RATE_PAST		
24	XZI	E	L		RYE_XZI		
25	WRR_RANGE	A.2.32	I/O	RYE/RYE	CRAV_WRR_RANGE		WRR_RANGE
26	TD	E	L		RYE_TD		
27	RT	E	L		RYE_RT		
28	LNTEMP	E	L		RYE_LNTEMP		
29	TK	E	L		RYE_TK		
30	Hand controller biases	A.2.33	Z		CRDS_HC_BIAS	V98U5163C-165C V98U5119C-121C	
31	Hand controller maximum deflection	A.2.33	Z		CRDK_HC_MAX_DEF		
32	Hand controller null deadband	A.2.33	Z		CRDK_HC_NULL_DB		
33	Tach time	A.2.37	R	STM	CRSS_TACH_TIME	V96W4913C	
34	Tach gain	A.2.37	R	STM	CRSS_TACH_GAIN	V96U4912C	
							TBD
							TBD
35	Joint angle rate limit for selected payload	A.2.31	Z		CRIS_PL_JNT_RATE_LIM_COARSE	V98U5200C-5229C V96R5030C- V96R5035C	JRL_PL_ COARSE
36	Radians to degrees conversion factor (π/180)	A.2.33	Z		CRDK_RTD		RTD

TABLE 3.3.8.3-1 Data Conversion Processor (cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
37	Joint gear ratio	A.2.33	Z		CRDK_JNT_GEAR_RATIO		
38	Joint bias	A.2.33	Z		CRDS_JNT_BIAS	V98U5107C-112C V98U5128C-133C	
39	Maximum value of thermister data	A.2.33	Z		CRDK_TD_MAX		TD_MAX
40	Resistance constant in temp. calculation	A.2.33	Z		CRDK_SER_RES		SER_RES
41	Resistance constant in temp. calculation	A.2.33	Z		CRDK_TEMP_RES		TEMP_RES
42	0-order coefficient for temp. conversion	A.2.33	Z		CRDK_TEMP_CNV_COEF_A		A
43	1st-order coefficient for temp. conversion	A.2.33	Z		CRDK_TEMP_CNV_COEF_B		B
44	3rd-order coefficient for temp. conversion	A.2.33	Z		CRDK_TEMP_CNV_COEF_C		C
45	Kelvin to Fahrenheit conversion constant #1	A.2.33	Z		CRDK_K_TO_F1		K_TO_F1
46	Kelvin to Fahrenheit conversion constant #2	A.2.33	Z		CRDK_K_TO_F2		K_TO_F2
47	Wr to EE Angle	A.2.32	O	RKG	CRAV_WR_TO_EE_ANGLE		Wr_TO_ EE_Angle
48	Wr to EE Angle Arm	A.2.33	Z		CRDS_WR_TO_EE_ANGLE_ARM		
49	THC	E	L		RYE_COND_THC_SIG		
50	RHC	E	L		RYE_COND_RHC_SIG	V96H4997C	
51	TM WRR RANGE	A.2.37	R	STM	CRSS_TM_WRR_RANGE	V96H4998C	

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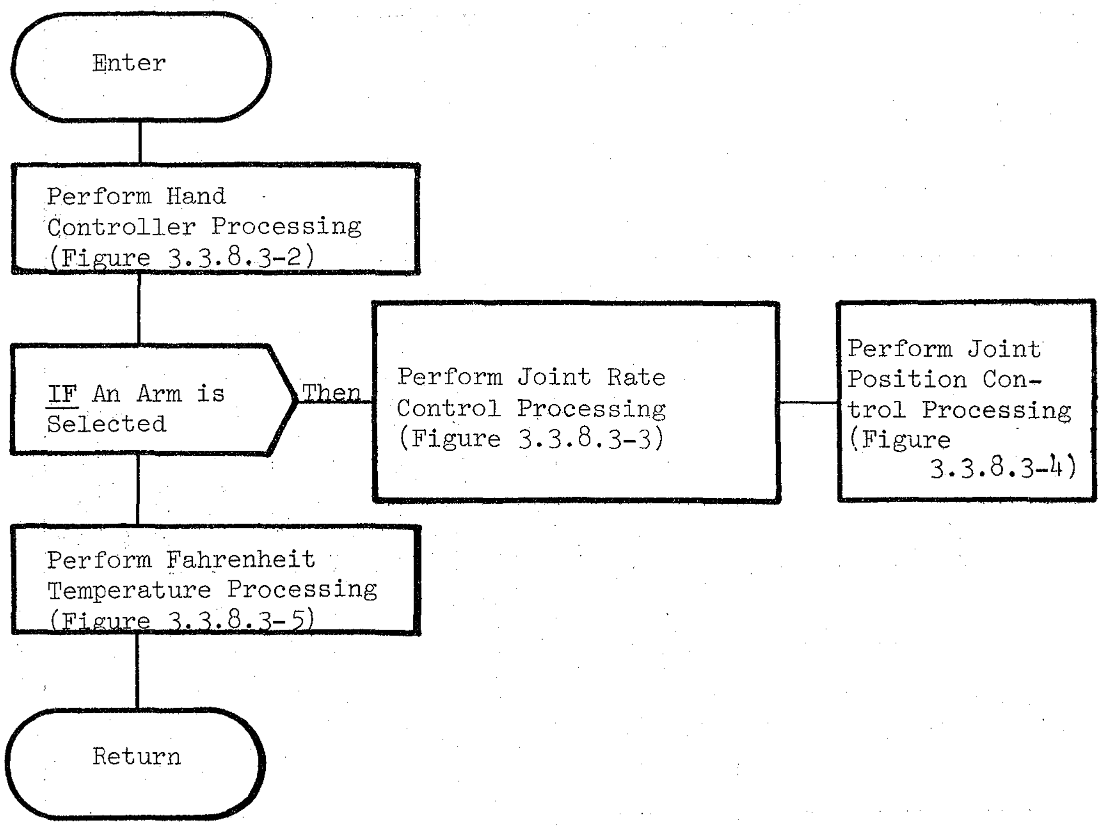

Figure 3.3.8.3-1. Data Conversion Processor

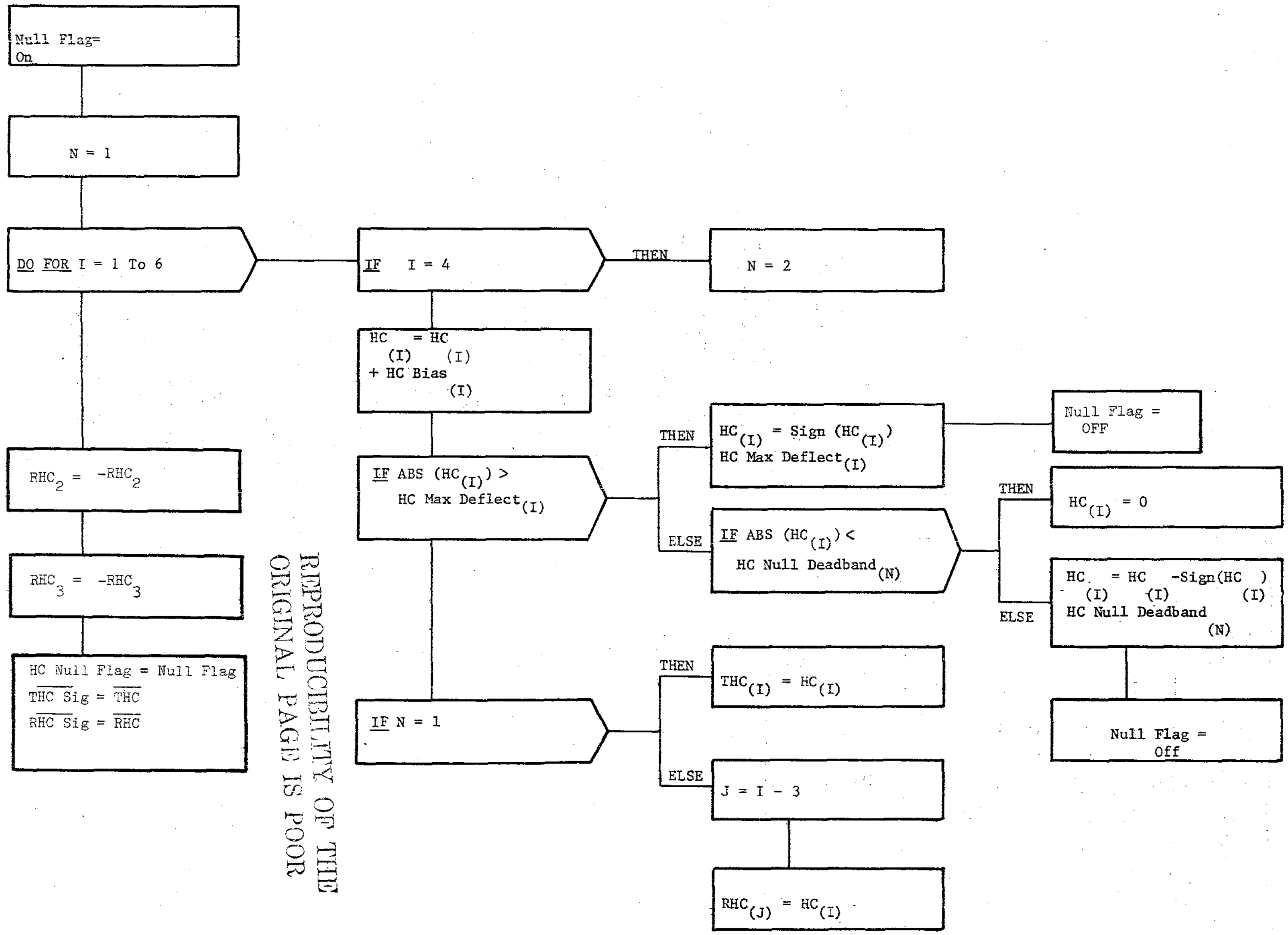

Figure 3.3.8.3-2 Hand Controller Processing

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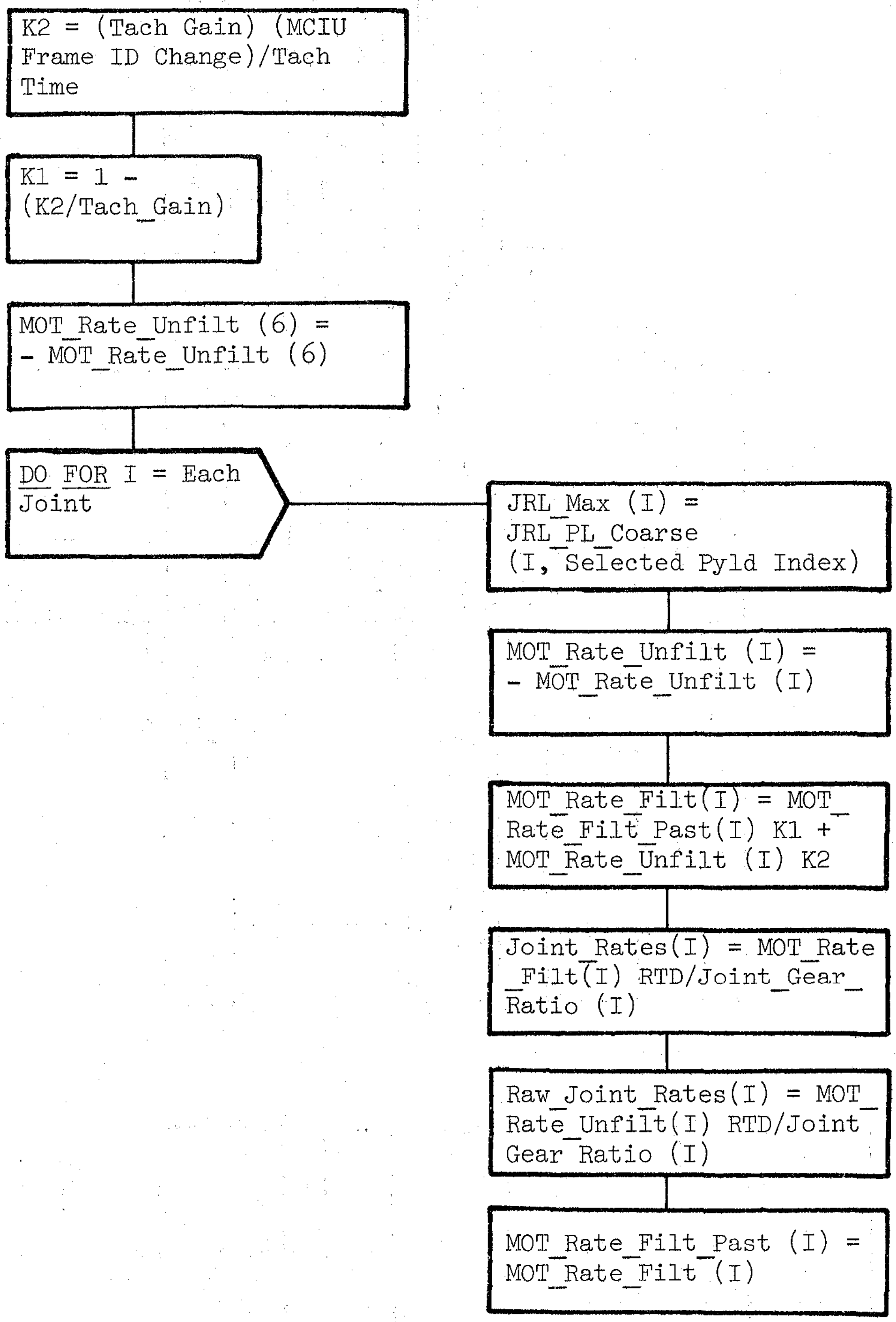

Figure 3.3.8.3-3. Joint Rate Control Processing

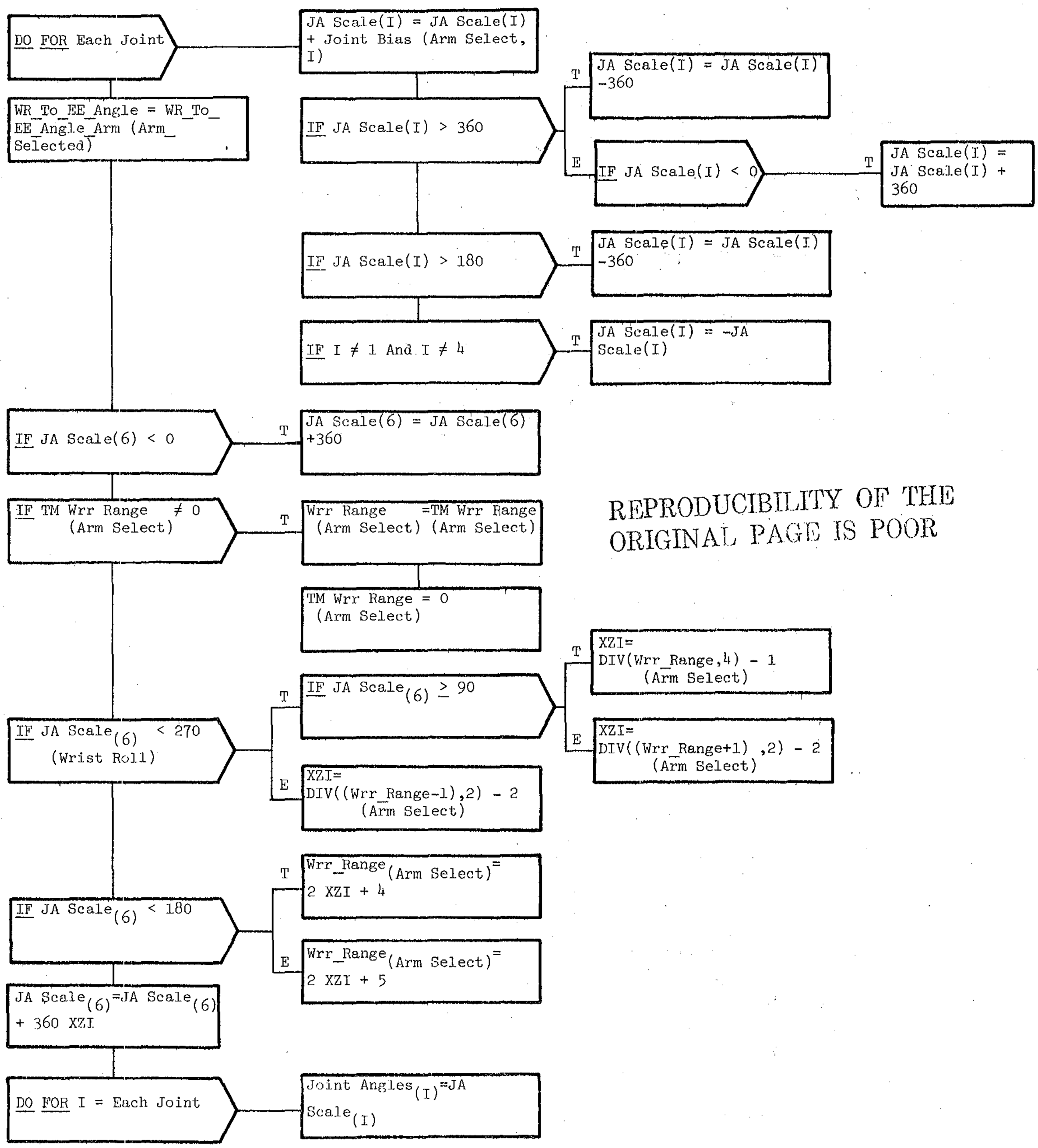

Figure 3.3.8.3-4. Joint Position Control Processing

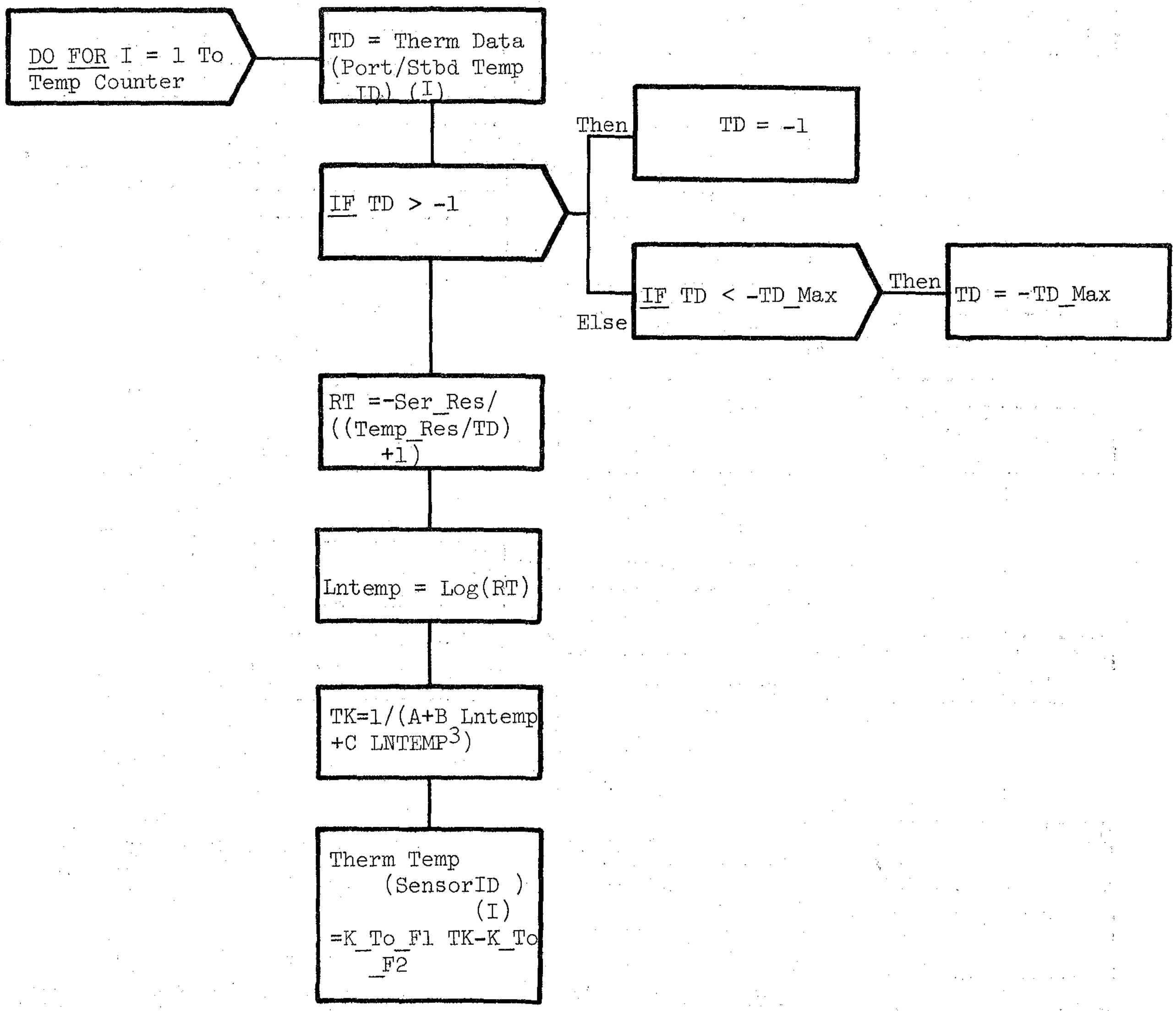

Figure 3.3.8.3-5. Fahrenheit Temperature Processing

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3.3.8.4 RMS Executive (REX_RMSEXEC)

The RMS Executive (REX) provides I/O management and configuration control for the RMS software system.

a. Control Interface - The RMS Executive is SCHEDULE'd by the RMS Specialist Function Control Segment (RMC) to execute at 12.5Hz. REX continues to execute until a new OPS is selected.

Invocation: SCHEDULE REX_RMSEXEC AT PHASE_REX PRIORITY (PRIO_REX), REPEAT EVERY TIME_REX; (Reference SAM 10)

b. Inputs - Inputs to this module are specified in Table 3.3.8.4-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.4-1 through 3.3.8.4-15. The RMS Executive controls 6 basic functions:

1. First pass initialization
2. Item input processing
3. MCIU input and error control
4. Configuration validation and control
5. Function sequencing
6. MCIU output

The first time REX is entered after being scheduled, first pass initialization is done.

Item input processing is done with a CALL to RMS Item Processor (RUD) when a keyboard input is received by RMS Specialist Function Control Segment (RMC).

The configuration item contains the current RMS software configuration. Configuration request is set when a different configuration is required or when one of the non-requested configurations (SUSPEND, TEMP, or IDLE) is required (even if the software is already in that configuration). The variable, configuration request, is always initialized to NONE. It changes only when the operator requests a new configuration or if any condition exists that requires the SUSPEND, TEMP, or IDLE configuration.

The MCIU I/O flag which determines the I/O status (ON or OFF) on the RMS Control Display is tested. Whenever the I/O is OFF the RMS software is to be in the SUSPEND configuration.

When I/O is ON, REX CALL's the Input Processing and Configuration Determination Module (RQC). RQC performs input error processing and performs configuration determination.

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REX CALL's the Configuration Initialization Module (RXY) when the MCIU input is valid and the requested configuration is different from the current configuration, or the requested configuration is SUSPEND, SINGLE, MANUAL, or AUTO, and the requested configuration cannot be equal to NONE.

The configuration state is updated, configuration entry unique processing is performed, and standard reconfiguration initialization is also done.

When MCIU input is valid and the software is not in the SUSPEND configuration, REX CALL's the Position Hold Checks Module (RWP), performs function sequencing, and WRITE's to the MCIU.

Function sequencing is accomplished via a dispatcher and a dispatcher table for the current configuration. The dispatcher issues CALL's to the modules required for the current configuration. The dispatcher tables are specified in Tables 3.3.8.4-2 through 3.3.8.4-6 and contain frequency, phasing, and active/inactive status for each module.

REX cleanup processing consists of saving last pass flags.

d. Outputs - Outputs from this module are specified in Table 3.3.8.4-1.

e. Module References -

Process	Section	Reference
RMS Item Processor (RUD)	3.3.8.2	CALL
Temperature Processor (RIT)	3.3.8.15	CALL
Dedicated Display (RDD)	3.3.8.17	CALL
Kinematic Data Generator (RKG)	3.3.8.6	CALL
Health Monitor (RHM)	3.3.8.14	CALL
Total Velocity (RTV)	3.3.8.12	CALL
Encoder Function (RNC)	3.3.8.16	CALL
Hand Controller (RJS)	3.3.8.8	CALL
Resolved Rate Processor (RRP)	3.3.8.11	CALL
Automatic Sequence Processor (RAS)	3.3.8.10	CALL
Position Hold (RFP)	3.3.8.13	CALL
Single Joint Control (RSC)	3.3.8.7	CALL
Input Processing and Configuration Determination (RQC)	3.3.8.18	CALL
Configuration Initialization (RXY)	3.3.8.19	CALL
Position Hold Checks (RWP)	3.3.8.20	CALL

f. Module Type and Attributes

Type: Program
Attributes: N/A

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g. Template References

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRI_LVC	Level C Compool
D INCLUDE TEMPLATE CRT_DIS	Dispatcher Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool
D INCLUDE TEMPLATE RKGKIN	RKG
D INCLUDE TEMPLATE RJSHAN	RJS
D INCLUDE TEMPLATE RASAUT	RAS
D INCLUDE TEMPLATE RRPRRA	RRP
D INCLUDE TEMPLATE RFPPOS	RFP
D INCLUDE TEMPLATE RSCSIN	RSC
D INCLUDE TEMPLATE RHMHLT	RHM
D INCLUDE TEMPLATE RTVTOT	RTV
D INCLUDE TEMPLATE RDDDDI	RDD
D INCLUDE TEMPLATE RNCENC	RNC
D INCLUDE TEMPLATE RITTEM	RIT
D INCLUDE TEMPLATE RUDKYB	RUD
D INCLUDE TEMPLATE RQCIPC	RQC
D INCLUDE TEMPLATE RXYCIN	RXY
D INCLUDE TEMPLATE RWPPHC	RWP
D INCLUDE TEMPLATE CGE_DISPATCHER	Contains code for hybrid dispatcher
D INCLUDE GEDISP	Contains integer value used by hybrid dispatcher to index through dispatcher table
D INCLUDE PREMACS	Pre-initialized I/O macros
D INCLUDE IOMACS	I/O Macro Replaces

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions

- The minimum time for FCOS to go from the end of an I/O request to the start of an I/O request is 600 microseconds.

TABLE 3.3.8.4-1. RMS Executive MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Configuration Request	A.2.32	I/O	RQC/RXY	CRAV_CONFIG_REQ		
2	RMS SPEC Init Flag	A.2.32, D.51	W/R	REX, RMC/REX	CRAB_RMS_SPEC_INIT		
3	Item Entry Flag	A.2.32, D.52	W/R	REX, RMC/REX	CRAB_ITEM_ENTRY		
4	MCIU I/O Flag	A.2.32	I/O	RXY, RUD/CRT,	CRAB_MCIU_IO	V92X3835X	
5	MCIU Frame Identifier change	A.2.34	I	RQC	CRAV_MCIU_FRAME_ID_CHANGE	V92J3905C	
6	Configuration	A.2.32	I/O	RXY/DL, RQC, RWP	CRAV_CONFIG	V92U3100C	
7	MCIU I/O Last Pass Flag	A.2.32	O	RQC	CRAB_MCIU_IO_ON_OFF_LP		
8	Arm Select Index	A.2.32	I	RCD	CRAV_ARM_SEL		
9	Arm Select Index Last Pass	A.2.32	O	RQC, RXY	CRAV_ARM_SEL_PAST		
10	Control Mode Enter Discrete	A.2.32	I	RCD	CRAB_CONTROL_MODE_ENTER		
11	Control Mode Enter Discrete Last Pass	A.2.32	O	RQC	CRAB_CONTROL_MODE_ENTER PAST		
12	I/O Error Counter	A.2.32	I	RXY, RQC	CRAV_IO_ERROR_COUNT		
13	Dispatcher Table Active Bits (RRP) - AUTO (RFP) - AUTO (RFP) - IDLE (RRP) - MANUAL (RFP) - MANUAL	A.2.36	I	RWP	CRTD_DISPATCH_TBL.FREQ $(34;) $(35;) $(6;) $(24;) $(25;)		
14	Dispatcher Pointer Saved	A.2.32	I	RXY	CRAV_DISPATCHER_POINTER_SAVED		
15	Save PYLD ID	A.2.32	O	RUD	CRAV_SAVE_PYLD_ID		
16	Save EE ID	A.2.32	O	RUD	CRAV_SAVE_EE_ID		
17	Valid PYLD ID	A.2.31	Z		CRIS_PYLD_ID_VALID$(1)	V96J6990C	
18	Valid EE ID	A.2.31	Z		CRIS_EE_ID_VALID$(1)	V96J6988C	

TABLE 3.3.8.4-1 RMS Executive (cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
19	Mode Switch Index	A.2.32	I	RCD	CRAV_MODE_SWITCH_INDEX		
20	Mode Switch Index Last Pass	A.2.32	O	RQC	CRAV_MODE_SWITCH_INDEX_LAST_PASS		
21	Vernier Scaling Req	A.2.32	I	RCD	CRAB_VERN_RATE_REQ		
22	Vernier Scaling Past	A.2.32	O	RJS, RVM	CRAB_VERN_SCALE_PAST	V92X3103X	
23	Rate Hold Request Last Pass	A.2.32	O	RJS	CRAB_RATE_HOLD_LP	V92X3104X	
24	Rate Hold Request	A.2.32	I	RCD	CRAB_RATE_HOLD_REQ		
25	PL Capture Past	A.2.32	O	RJS, RVM	CRAB_PL_CAPTURE_PAST	V92X3112X	
26	PYLD Captured	A.2.32	I	RCD	CRAB_PYLD_CAP		

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Function	Rate	Phase	Active	Frequency	Case Number
Temperature Monitor (RIT)	12.5	1	0	1	8
Dedicated Display (RDD)	12.5	1	0	1	10
Encoder Function (RNC)	12.5	1	0	1	11
End of Table		0	0	0	

Temperature Dispatcher Table

Table 3.3.8.4-2

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Function	Rate	Phase	Active	Frequency	Case Number
Kinematic Data Generator (RKG)	12.5	1	0	1	1
Position Hold (RFP)	12.5	1	1 OR 0	1	5
Health Monitor (RHM)	12.5	1	0	1	7
Temperature Monitor (RIT)	12.5	1	0	1	8
Total Velocity (RTV)	12.5	1	0	1	9
Dedicated Display (RDD)	12.5	1	0	1	10
Encoder Function (RNC)	12.5	1	0	1	11
End of Table Entry		0	0	0	

Idle Dispatcher Table

Table 3.3.8.4-3

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Function	Rate	Phase	Active	Frequency	Case Number
Kinematic Data Generator (RKG)	12.5	1	0	1	1
Hand Controller (RJS)	12.5	1	0	1	2
* Resolved Rate Algorithm (RRP)	12.5	1	0 or 1	1	4
*Position Hold (RFP)	12.5	1	0 or 1	1	5
Health Monitor (RHM)	12.5	1	0	1	7
Temperature Monitor (RIT)	12.5	1	0	1	8
Total Velocity (RTV)	12.5	1	0	1	9
Dedicated Display (RDD)	12.5	1	0	1	10
Encoder Function (RNC)	12.5	1	0	1	11
End of Table Entry		0	0	0	

Manual Dispatcher Table

Table 3.3.8.4-4

*Mutually Exclusive Modules

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Function	Rate	Phase	Active	Frequency	Case Number
Kinematic Data Generator (RKG)	12.5	1	0	1	1
Auto Sequence Processor (RAS)	12.5	1	0	1	3
* Resolved Rate Algorithm (RRP)	12.5	1	1 or 0	1	4
* Position Hold (RFP)	12.5	1	0 or 1	1	5
Health Monitor (RHM)	12.5	1	0	1	7
Temperature Monitor (RIT)	12.5	1	0	1	8
Total Velocity (RTV)	12.5	1	0	1	9
Dedicated Display (RDD)	12.5	1	0	1	10
Encoder Function (RNC)	12.5	1	0	1	11
End of Table Entry		0	0	0	

Auto Dispatcher Table

Table 3.3.8.4-5

*Mutually Exclusive Modules

Function	Rate	Phase	Active	Frequency	Case Number
Kinematic Data Generator (RKG)	12.5	1	0	1	1
Position Hold (RFP)	12.5	1	0	1	5
Single Joint Control (RSC)	12.5	1	0	1	6
Health Monitor (RHM)	12.5	1	0	1	7
Temperature Monitor (RIT)	12.5	1	0	1	8
Total Velocity (RTV)	12.5	1	0	1	9
Dedicated Display (RDD)	12.5	1	0	1	10
Encoder Function (RNC)	12.5	1	0	1	11
End of Table Entry		0	0	0	

Single Dispatcher Table

Table 3.3.8.4-6

Table 3.3.8.4-7 I/O SVC

DEVICE	DEVICE ID	OP CODE	SVC NO.	SYNC TYPE	COMFAULT STATUS	ICC TYPE	TIME TAG	WAIT	PROT.	STATUS	INPUT OUT-PUT	MAJ. FUNC. ID	I/O PRIOR-ITY	WORD COUNT	BUFFER	EVENT	BUS NOMINAL
MCIU	57	1	40	RS	No	No	No	No	No	Yes	0	SM	175	45	CRE	None	LB1

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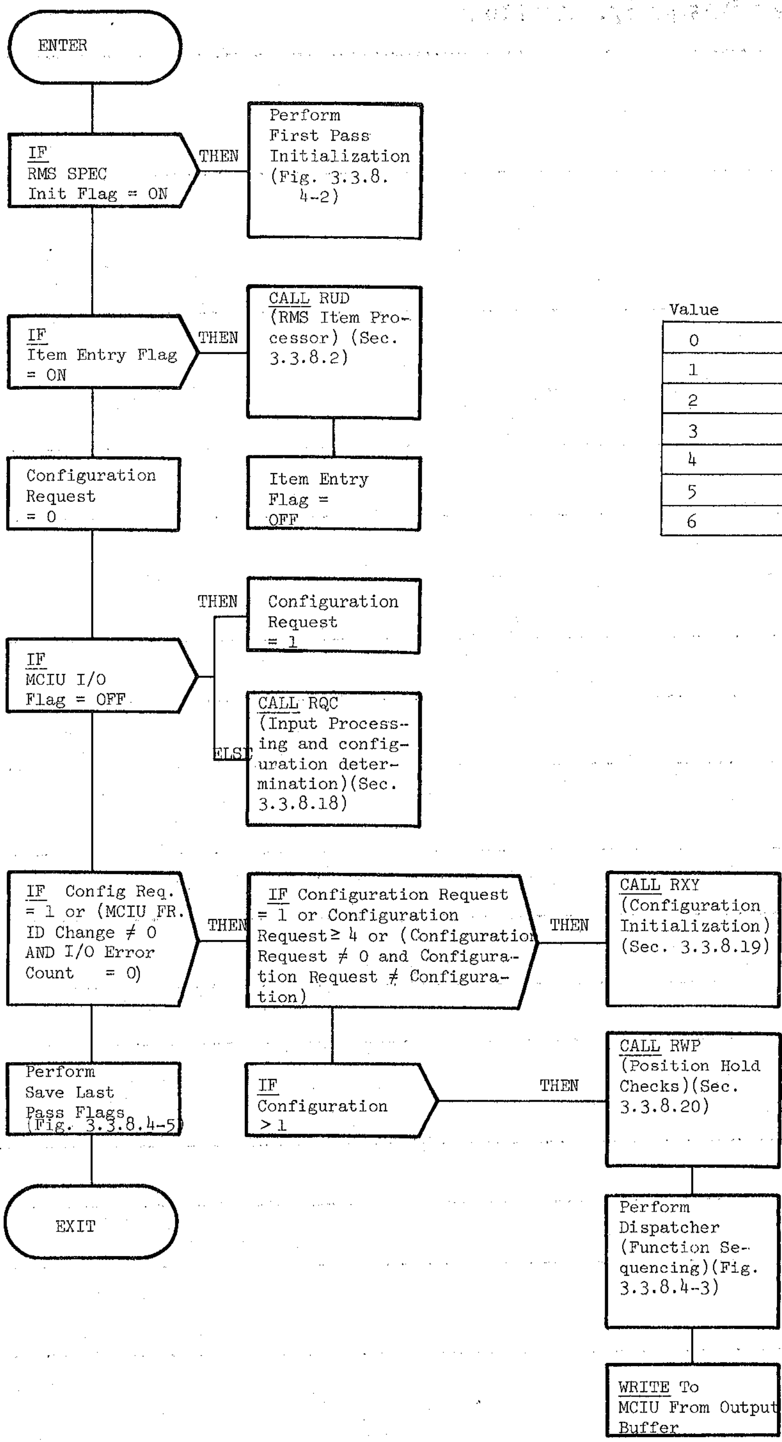


Value	Configuration
0	None
1	Suspend
2	Temp
3	Idle
4	Single
5	Manual
6	Auto

Figure 3.3.8.4-1. RMS Executive

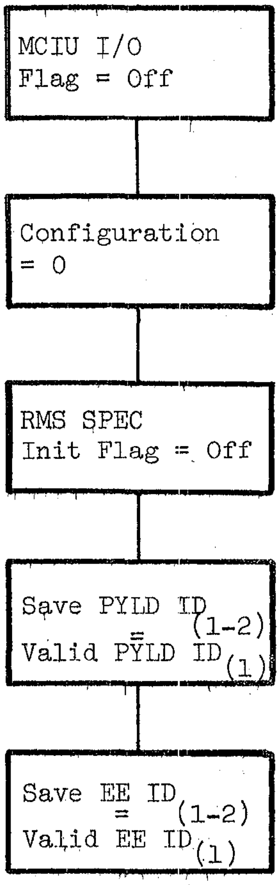
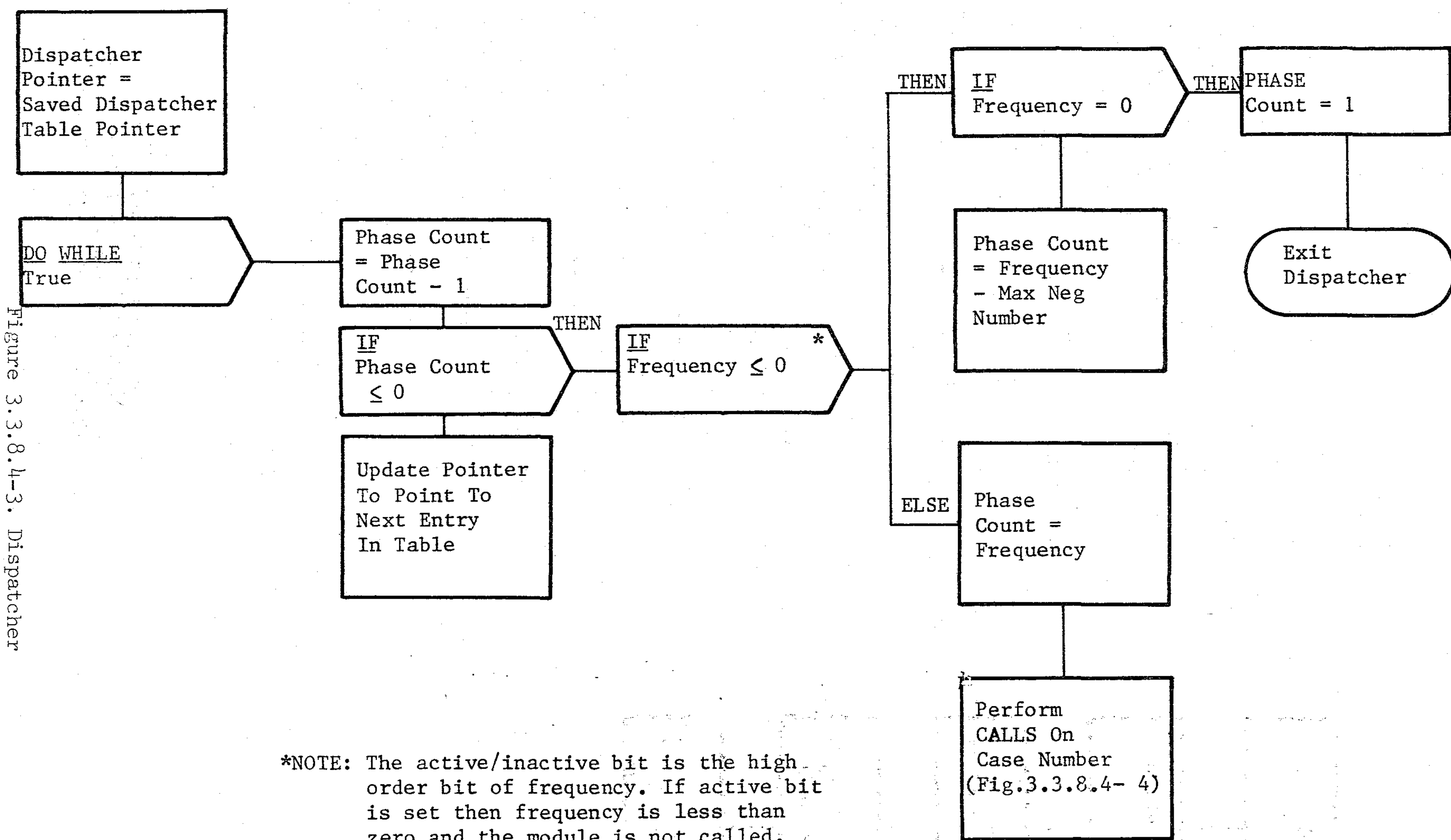


Figure 3.3.8.4-2. First Pass Initialization



*NOTE: The active/inactive bit is the high order bit of frequency. If active bit is set then frequency is less than zero and the module is not called.

Figure 3.3.8.4-3. Dispatcher

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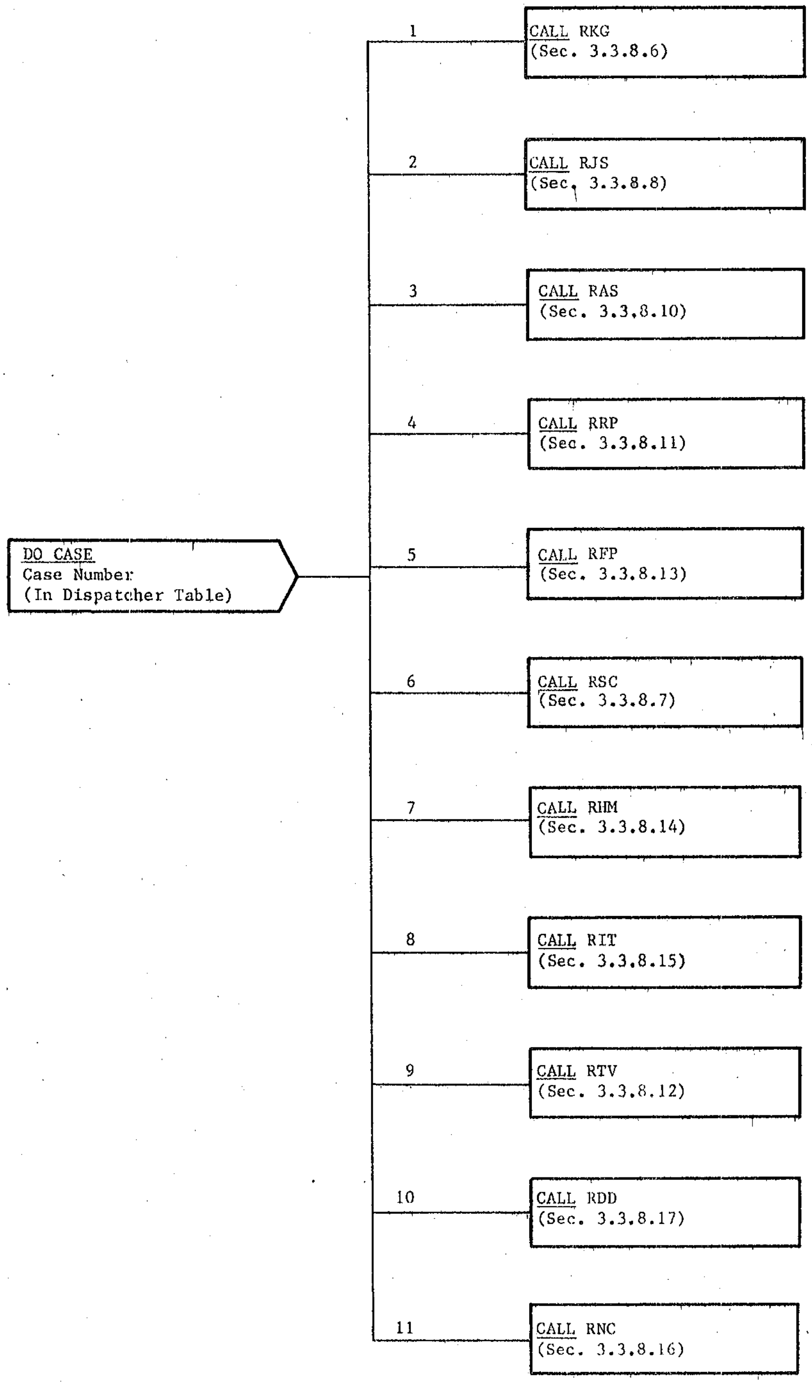

Figure 3.3.8.4-4 CALLS On Case Number

MCIU I/O Flag Last Pass = MCIU I/O Flag

Arm Select Index Last Pass = Arm Select Index

Mode Switch Index Last Pass = Mode Switch Index

Control Mode Enter Discrete Last Pass = Control Mode Enter Discrete

Vernier Scaling Past = Vernier Scaling Request

Rate Hold Req. Last Pass = Rate Hold Request

PYLD Captured Past = PYLD Captured

Figure 3.3.8.4-5. Save Last Pass Flags

3.3.8.5 Manipulator Controller Interface Unit (MCIU) Decoder (RCD DCODE)

The MCIU Output Decoder (RCD) converts MCIU output data to a format that is readily usable by the RMS software. The results of these operations (biasing, scaling, data conversions, integerizing) are stored in the working compool.

a. Control Interface - RCD is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RCD_DCODE

b. Inputs - Inputs to this module are specified in Table 3.3.8.5-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.5-1 through 3.3.8.5-8.

   RCD begins processing by unpacking required discretes into Boolean form (Table 3.3.8.5-2). When switch indexing is performed, the mode switch parameter switch, and joint select switch are integerized to optimize memory usage. Single direct drive positive/negative, auto sequence proceed/stop, capture/release command, rigidize/derigidize command, EE auto/manual, arm select index and EE rigidized/derigidized discretes are also integerized. RCD then sets the selected payload and EE indices to designate the payload and EE data to be used by RMS software based on the state of the arm select indicator and the currently assigned payload and EE IDs.

   Pointers to the thermistor data gathered from the port and starboard arms are processed for use by the Data Conversion Processor (RYE), Section 3.3.8.3. During each cycle, a different subset of the total set of thermistor data is received. This subset contains up to four of the most recent samples which are screened for temperature data, storing their compool storage ID and display storage ID in the working compool.

   RCD next converts the returned rate demand identifier, the hand controller raw signals, the joint encoder raw signals, and the raw tach signals into scalar format for further processing. Finally, RCD takes display data (Table 3.3.8.5-3) from the input compool and places it in the working compool.

   At this point, RCD exits. There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.5-1.

e. Module References - None

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

D INCLUDE TEMPLATE CRB_MCI	Input Compool
D INCLUDE TEMPLATE CRA_TE	Working Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - None

TABLE 3.3.8.5-1. Decoder Function

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	D & C communication failure discrete	A.2.30	R	MCIU	CRBB_DC_MCIU_COMM	V54X2003J	
2	Joint tachometer failure discretes	A.2.30	R	MCIU	CRBB_TACH_FAIL	V54X2202J V54X2302J V54X2402J V54X2502J V54X2602J V54X2702J	
3	Vernier rate select discrete	A.2.30	R	MCIU	CRBB_VERNIER_RATE_REQ	V72K3027J	
4	Rate hold select discrete	A.2.30	R	MCIU	CRBB_RATE_HOLD_REQ	V72K3028J	
5	Control mode enter discrete	A.2.30	R	MCIU	CRBB_CONTROL_MODE_ENTER	V72K2982J	
6	Safing in progress discrete	A.2.30	R	MCIU	CRBB_SAFING_IN_PROG	V54X2023J	
7	All brakes on discrete	A.2.30	R	MCIU	CRBB_ALL_BRAKES_ON	V54X2024J	
8	Payload captured discrete	A.2.30	R	MCIU	CRBB_PYLD_CAPTURED	V54X2027J	
9	Position X/Y/Z select discrete	A.2.30	R	MCIU	CRBB_POSITION_XYZ_REQ	V72K3001J	
10	Attitude P/Yaw/R select discrete	A.2.30	R	MCIU	CRBB_ATTITUDE_PYR_REQ	V72K3002J	
11	Joint angle select discrete	A.2.30	R	MCIU	CRBB_JA_REQ	V72K3003J	
12	Velocity X/Y/Z select discrete	A.2.30	R	MCIU	CRBB_VEL_XYZ_REQ	V72K3004J	
13	Rate P/Yaw/R select discrete	A.2.30	R	MCIU	CRBB_RATE_PYR_REQ	V72K3005J	
14	PORT temp LED/ABE/ID discrete	A.2.30	R	MCIU	CRBB_PORT_TEMP_REQ	V72K3006J	

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TABLE 3.3.8.5.-1 Decoder Function (cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
15	STBD temp LED/ABE/ID discrete	A.2.30	R	MCIU	CRBB_STBD_TEMP_REQ	V72K3007J	
16	Shoulder Yaw joint select discrete	A.2.30	R	MCIU	CRBB_JNT_REQ_SHY	V72K3010J	
17	Shoulder pitch joint select discrete	A.2.30	R	MCIU	CRBB_JNT_REQ_SHP	V72K3011J	
18	Elbow pitch joint select discrete	A.2.30	R	MCIU	CRBB_JNT_REQ_ELP	V72K3012J	
19	Wrist pitch joint select discrete	A.2.30	R	MCIU	CRBB_JNT_REQ_WRP	V72K3013J	
20	Wrist yaw joint select discrete	A.2.30	R	MCIU	CRBB_JNT_REQ_WRY	V72K3014J	
21	Wrist roll joint select discrete	A.2.30	R	MCIU	CRBB_JNT_REQ_WRR	V72K3015J	
22	End effector temp joint select discrete	A.2.30	R	MCIU	CRBB_EE_TEMP_REQ	V72K3016J	
23	Critical temp select discrete	A.2.30	R	MCIU	CRBB_CRIT_TEMP_REQ	V72K3017J	
24	Manual augmented orbiter mode select discrete	A.2.30	R	MCIU	CRBB_MAN_ORB_REQ	V72K2975J	
25	Single joint mode select discrete	A.2.30	R	MCIU	CRBB_SINGL_JNT_REQ	V72K2979J	
26	Manual augmented EE mode select discrete	A.2.30	R	MCIU	CRBB_MAN_EE_REQ	V72K2976J	
27	Manual augmented mixed mode select discrete	A.2.30	R	MCIU	CRBB_MAN_MIX_REQ	V72K2977J	
28	Manual augmented pay-load mode select discrete	A.2.30	R	MCIU	CRBB_MAN_PYLD_REQ	V72K2978J	
29	Operator command mode select discrete	A.2.30	R	MCIU	CRBB_OPR_CMD_REQ	V72K2970J	
30	Auto sequence 1 mode select discrete	A.2.30	R	MCIU	CRBB_AUTO_1_REQ	V72K2971J	

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TABLE 3.3.8.5-1 Decoder Function (cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
31	Auto sequence 2 mode select discrete	A.2.30	R	MCIU	CRBB_AUTO_2_REQ	V72K2972J	
32	Auto sequence 3 mode select discrete	A.2.30	R	MCIU	CRBB_AUTO_3_REQ	V72K2973J	
33	Auto sequence 4 mode select discrete	A.2.30	R	MCIU	CRBB_AUTO_4_REQ	V72K2974J	
34	Test mode select discrete	A.2.30	R	MCIU	CRBB_TEST_REQ	V72K2981J	
35	Single direct drive positive discrete	A.2.30	R	MCIU	CRBB_SINGL_DIR_POS	V72K3020J	
36	Single direct drive negative discrete	A.2.30	R	MCIU	CRBB_SINGL_DIR_NEG	V72K3021J	
37	Auto sequence proceed discrete	A.2.30	R	MCIU	CRBB_SEQ_PROCEED	V72K2983J	
38	Auto sequence stop discrete	A.2.30	R	MCIU	CRBB_SEQ_STOP	V72K2984J	
39	Capture command	A.2.30	R	MCIU	CRBB_CAPTURE_CMD	V54X2035J	
40	Release command	A.2.30	R	MCIU	CRBB_RELEASE_CMD	V54X2036J	
41	Rigidize command	A.2.30	R	MCIU	CRBB_RIG_CMD	V54X2037J	
42	Derigide command	A.2.30	R	MCIU	CRBB_DERIG_CMD	V54X2038J	
43	Port arm selected	A.2.30	R	MCIU	CRBB_PORT_ARM_ACT	V54X2025J	
44	STBD arm selected	A.2.30	R	MCIU	CRBB_STBD_ARM_ACT	V54X2026J	
45	EE rigidized flag	A.2.30	R	MCIU	CRBB_EE_RIG	V54X2031J	
46	EE derigidized flag	A.2.30	R	MCIU	CRBB_EE_DERIG	V54X2032J	
47	Raw thermister identifier	A.2.30	R	MCIU	CRBV_RAW_THRM_ID	V54T2110J V54T2130J V54T2150J V54T2170J	
48	Raw thermister parameter	A.2.30	R	MCIU	CRBV_RAW_THRM	V54T2100J V54T2120J V54T2140J V54T2160J	

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TABLE 3.3.8.5-1 Decoder Function (cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
49	Returned rate demand identifier	A.2.30	R	MCIU	CRBV_RATE_DMD_ID_RET	V54J2810J	
50	Raw hand controller signals (X, Z, Yaw) (Y, P, R)	A.2.30	R	MCIU	CRBV_RAW_SIG1 CRBV_RAW_SIG2	V72K3030J V72K3032J V72K3036J V72K3031J V72K3035J V72K3037J	
51	Joint position encoder signal	A.2.30	R	MCIU	CRBV_RAW_ENCOD	V54H2205J V54H2305J V54H2405J V54H2505J V54H2605J V54H2705J	
52	Raw tachometer signal	A.2.30	R	MCIU	CRBV_RAW_TACH	V54L2201J V54L2301J V54L2401J V54L2501J V54L2601J V54L2701J	
53	RMS payload identifier	A.2.32	I	RUD	CRAV_RMS_PL_ID	V93J7505C V93J7506C	
54	RMS end effector identifier	A.2.32 D.58	R	RUD	CRAV_RMS_EE_ID	V93J7507C V93J7508C	
55	MCIU frame ID change	A.2.32	I	RQC	CRAV_MCIU_FRAME_ID_CHANGE	V92J3905C	
56	Parameter switch index	A.2.32	O	RDD	CRAV_PARM_SWITCH_INDEX		
57	Joint switch index	A.2.32	O	RSC,RDD,RWP	CRAV_JNT_SEL_ID		
58	Mode switch index	A.2.32	O	RQC, RXY, REX	CRAV_MODE_SWITCH_INDEX		
59	Single direct drive pos/neg	A.2.32	O	RSC,RQC	CRAV_SING_DRV_POSNEG		
60	Auto sequence proceed/stop	A.2.32	O	RAS,RQC	CRAV_AUTO_GO_STOP		
61	Capture/release command	A.2.32	O	RNC,RHM,RVM	CRAV_CAP_REL_CMD		

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TABLE 3.3.8.5-1 Decoder Function (cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
62	Rigidize/derigidize command	A.2.32	0	RNC,RHM, RVM	CRAV_RIG_DERIG_CMD		
63	Arm select index	A.2.32	0	RQC, RAS, RKG, RNC, RDD, RYE, RXY, REX	CRAV_ARM_SEL		
64	EE rigidized/derigidized	A.2.32	0	RHM,RNC, RVM	CRAV_EE_RIG_DERIG		
65	Selected payload index	A.2.32	0	RJS, RAS, RSC, RYE	CRAV_PYLD_ID_ACT		
66	Selected EE index	A.2.32	0	RKG,RAS	CRAV_EE_ID_ACT		
67	D & C communication failure	A.2.32	0	RCD	CRAB_DC_COMM_FAIL		
68	Joint tach failure	A.2.32	0	RVM	CRAB_JNT_TACH_FAIL		
69	Vernier rate select	A.2.32	0	RJS,RSC,REX, RVM	CRAB_VERN_RATE_REQ		
70	Rate hold select	A.2.32	0	RJS,REX	CRAB_RATE_HOLD_REQ		
71	Control mode enter	A.2.32	0	RQC,REX	CRAB_CONTROL_MODE_ENTER		
72	Safing in progress	A.2.32	0	RQC	CRAB_SAFING_IN_PROG		
73	All brakes on	A.2.32	0	RQC, RVM	CRAB_ALL_BRAKES_ON		
74	Payload captured	A.2.32	0	RJS,RHM,RAS,REX, RVM	CRAB_PYLD_CAP		
75	Temp counter	A.2.32	0	RIT,RYE	CRAV_RIT_TEMP_CTR		
76	PORT/STBD temp ID	A.2.32	0	RYE	CRAV_PS_TEMP_ID		
77	Therm data	A.2.32	0	RYE	CRAV_PS_TEMP_DATA		
78	Sensor ID	A.2.32	0	RIT,RYE	CRAV_SENSOR_ID		
79	Returned rate demand identifier	A.2.32	0	RVM	CRAV_RATE_DMD_ID_RET		
80	HC	A.2.32	0	RYE	CRAV_HC_COMP_SCALE		
81	Unfiltered motor rates	A.2.32	0	RYE	CRAV_MOT_RATE_RAW		

TABLE 3.3.8.5-1 Decoder Function (cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
82	End-Effector Failure Discrete	A.2.30	R	MCIU	CRBB_EE_FAIL	V54X2009J	
83	End effector Failure	A.2.32	O	RHM	CRAB_EE_FAIL		
84	EE Hardware Bite Discrete	A.2.30	R	MCIU	CRBB_EEEU_BITE_FLAG$(6)	V54X2723J	
85	EE Hardware Bite	A.2.32	O	RHM	CRAB_EEEU_BITE_FLAG		
86	Sensor ID Table	E	L		RCD_SENSOR_ID_TABLE		
87	MCIU Failure Warning Discrete	A.2.30	R	MCIU	CRBB_MCIU_FAIL	V54X2020J	
88	MCIU Failure Warning	A.2.32	O	RDD	CRAB_MCIU_ANNUN	V54X2020J	
89	GPC Data Failure Warning Discrete	A.2.30	R	MCIU	CRBB_GPC_FAIL	V54X2022J	
90	GPC Data Failure Warning	A.2.32	O	RDD	CRAB_GPC_ANNUN	V54X2022J	
91	ABE Failure Warning Discrete	A.2.30	R	MCIU	CRBB_ABE_FAIL	V54X2021J	
92	ABE Failure Warning	A.2.32	O	RDD	CRAB_ABE_ANNUN	V54X2021J	

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TABLE 3.3.8.5-1 Decoder Function (cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
93	Temperature Data Counter (N)	E	L		RCD_N		
94	Joint Angle Scale	A.2.32	O	RYE	CRAV_JA_SCALE		
95	Word 2	A.2.30	R	MCIU	CRBV_WORD1$(2;)	V54M3402P	
96	Word 7	A.2.30	R	MCIU	CRBV_WORD7$(1;)	V54M3407P	
97	Word 10	A.2.30	R	MCIU	CRBV_WORD7$(2;)	V54M3410P	
98	Word 13	A.2.30	R	MCIU	CRBV_WORD7$(3;)	V54M3413P	
99	Word 16	A.2.30	R	MCIU	CRBV_WORD7$(4;)	V54M3416P	
100	Word 19	A.2.30	R	MCIU	CRBV_WORD7$(5;)	V54M3419P	
101	Word 22	A.2.30	R	MCIU	CRBV_WORD7$(6;)	V54M3422P	
102	Display Word 2	A.2.32	O	CRT	CRAV_DISPLAY_WORD2		
103	Display Word 7	A.2.32	O	CRT	CRAV_DISPLAY_WORD7		
104	Display Word 10	A.2.32	O	CRT	CRAV_DISPLAY_WORD10		
105	Display Word 13	A.2.32	O	CRT	CRAV_DISPLAY_WORD13		
106	Display Word 16	A.2.32	O	CRT	CRAV_DISPLAY_WORD16		
107	Display Word 19	A.2.32	O	CRT	CRAV_DISPLAY_WORD19		
108	Display Word 22	A.2.32	O	CRT	CRAV_DISPLAY_WORD22		
109	EE Auto	A.2.30	R	MCIU	CRBB_EE_AUTO_MODE_SEL	V72K2990J	
110	EE Manual	A.2.30	R	MCIU	CRBB_EE_MANUAL_MODE_SEL	V72K2991J	
111	EE Auto/Manual	A.2.32	O	RVM	CRAV_EE_AUTO_MANUAL		

Table 3.3.8.5-2 MCIU Converted Discrete List

Discrete	Input Compool Name	Working Compool Name
Joint Tachometer Failure -Shoulder Yaw -Shoulder Pitch -Elbow Pitch -Wrist Pitch -Wrist Yaw -Wrist Roll	CRBB_TACH_FAIL	CRAB_JNT_TACH_FAIL
Vernier Rate Select	CRBB_VERNIER_RATE_REQ *	CRAB_VERN_RATE_REQ
Rate Hold Select	CRBB_RATE_HOLD_REQ	CRAB_RATE_HOLD_REQ
Control Mode Enter	CRBB_CONTROL_MODE_ENTER	CRAB_CONTROL_MODE_ENTER
Safing in Progress	CRBB_SAFING_IN_PROG	CRAB_SAFING_IN_PROG
All Brakes On	CRBB_ALL_BRAKES_ON	CRAB_ALL_BRAKES_ON
Payload Captured	CRBB_PYLD_CAPTURED	CRAB_PYLD_CAP
End Effector Failure	CRBB_EE_FAIL	CRAB_EE_FAIL
EE Hardware Bite	CRBB_EEEU_BITE_FLAG	CRAB_EEEU_BITE_FLAG
MCIU Failure Warning	CRBB_MCIU_FAIL	CRAB_MCIU_ANNUN
GPC Data Failure Warning	CRBB_GPC_FAIL	CRAB_GPC_ANNUN
ABE Failure Warning	CRBB_ABE_FAIL	CRAB_ABE_ANNUN
D & C Communication Failure	CRBB_DC_MCIU_COMM	CRAB_DC_COMM_FAIL

* CRAB_VERN_RATE_REQ is set to the opposite state of CRBB_VERNIER_RATE_REQ

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Table 3.3.8.5-3. MCIU to GPC Display Words

Discrete	Input Compool Word	Working Compool Word
D & C Communication Failure Thermistor Circuit Failure MADC out of Tolerance MCPC out of Tolerance Interface Control Failure End Effector Failure MCIU-ABE Communication Failure	CRBV_WORD2	CRAV_DISPLAY_WORD2
Shoulder Yaw Tachometer Failure MDA Failure SPA 28V Power Failure SPA Commutator Failure	CRBV_WORD7$(1;)	CRAV_DISPLAY_WORD7
Shoulder Pitch Tachometer Failure MDA Failure Shoulder/Elbow JPC Failure SPA 28V Power Failure SPA Commutator Failure	CRBV_WORD7$(2;)	CRAV_DISPLAY_WORD10
Elbow Pitch Tachometer Failure MDA Failure SPA 28V Power Failure SPA Commutator Failure	CRBV_WORD7$(3;)	CRAV_DISPLAY_WORD13
Wrist Pitch Tachometer Failure MDA Failure Wrist JPC Failure SPA 28V Power Failure SPA Commutator Failure	CRBV_WORD7$(4;)	CRAV_DISPLAY_WORD16
Wrist Yaw Tachometer Failure MDA Failure SPA 28 V Power Failure SPA Commutator Failure	CRBV_WORD7$(5;)	CRAV_DISPLAY_WORD19
Wrist Roll Tachometer Failure MDA Failure SPA 28 V Power Failure SPA Commutator Failure	CRBV_WORD7$(6;)	CRAV_DISPLAY_WORD22

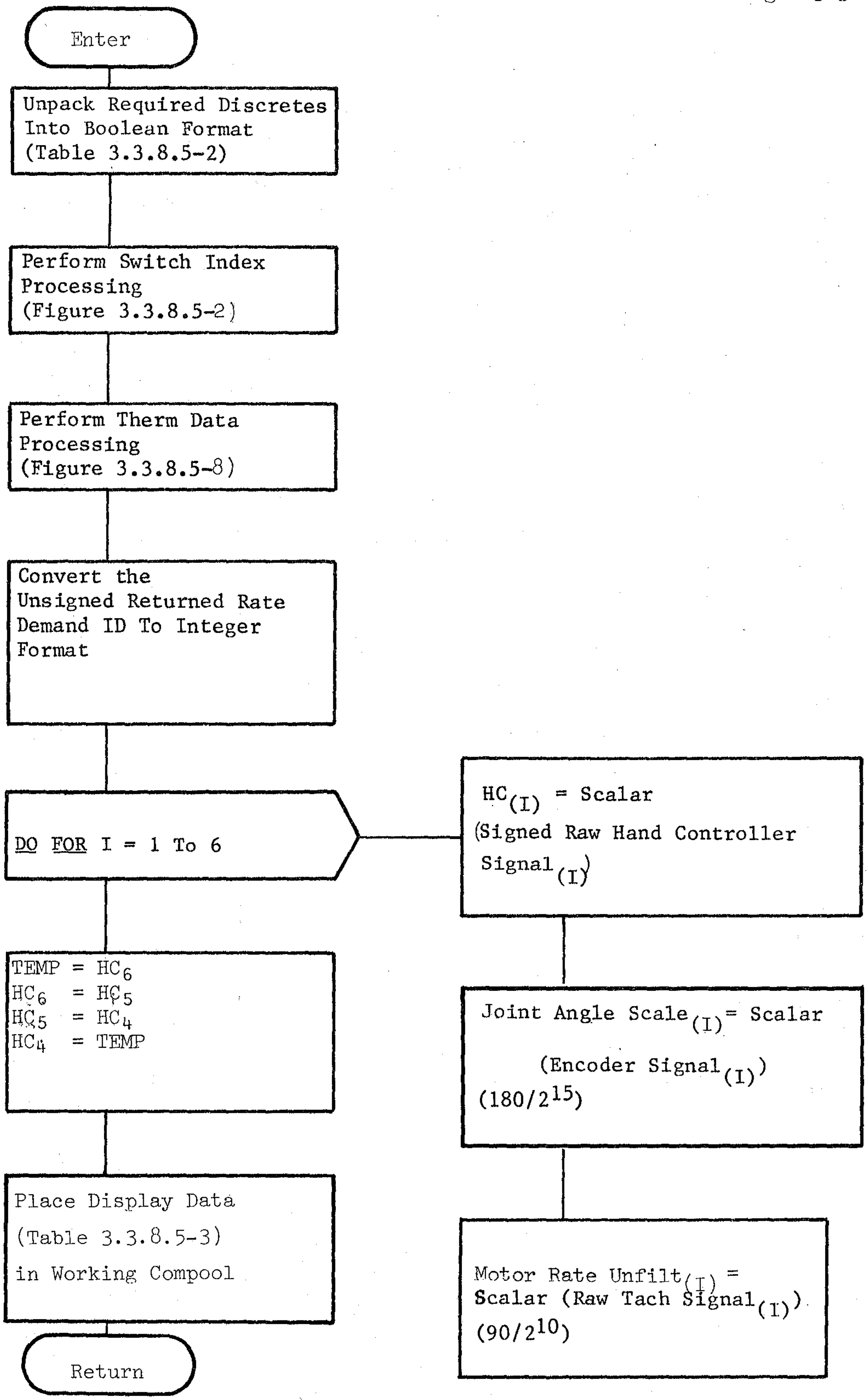


Figure 3.3.8.5-1. MCIU Decoder

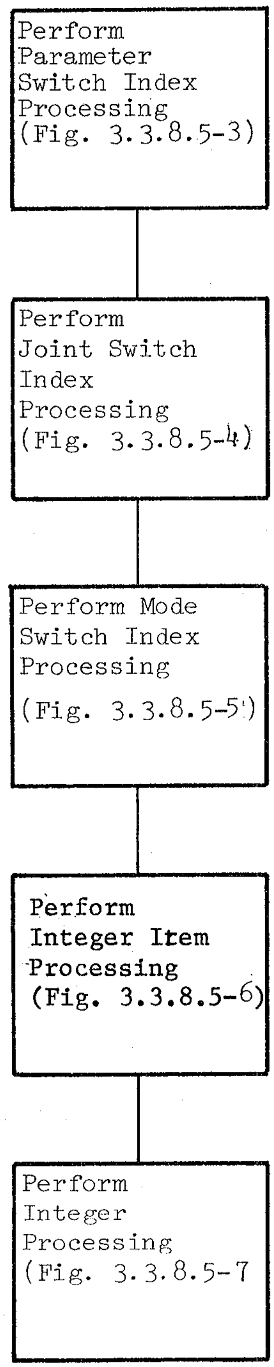
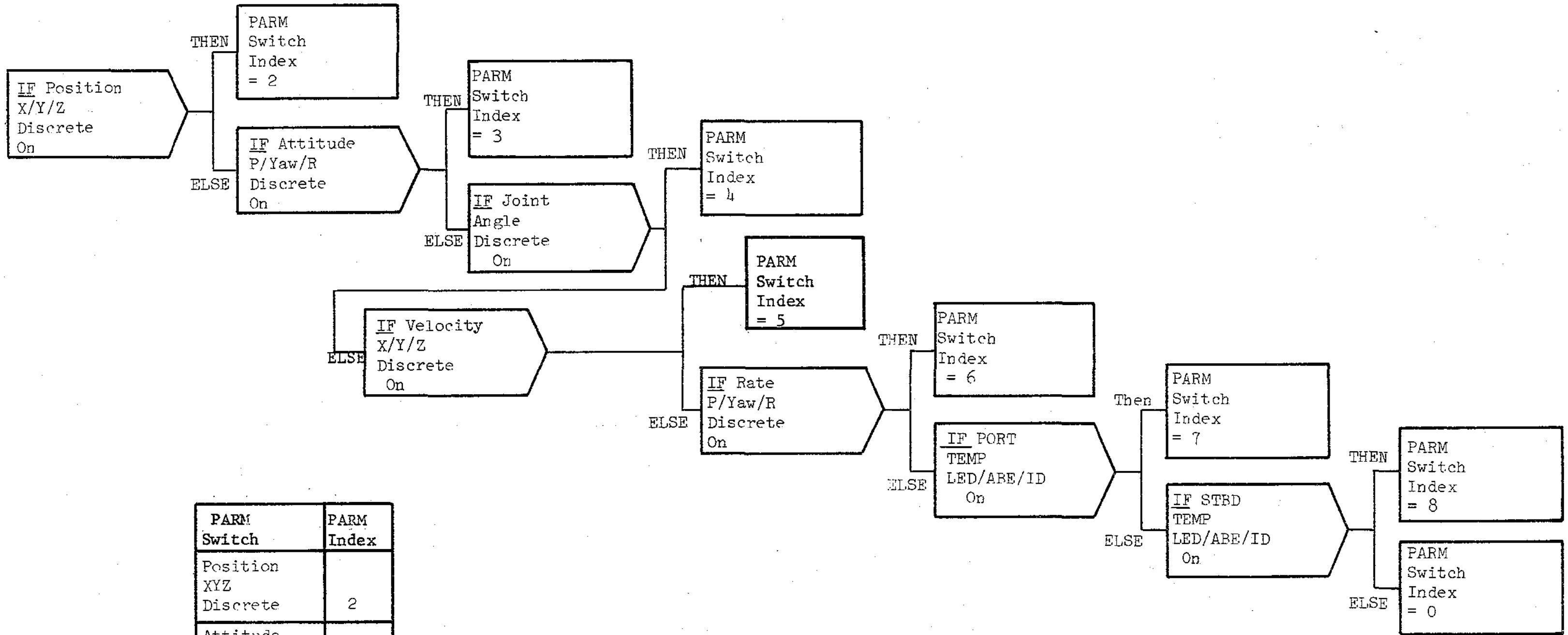


Figure 3.3.8.5-2. Switch Index Processing



PARM Switch	PARM Index
Position XYZ Discrete	2
Attitude P/Yaw/R Discrete	3
Joint Angle Discrete	4
Velocity X/Y/Z Discrete	5
Rate P/Yaw/R Discrete	6
PORT TEMP LED/ABE/ID Discrete	7
STBD TEMP LED/ABE/ID Discrete	8
NULL	0

Figure 3.3.8.5-3 Parameter Switch Index Processing

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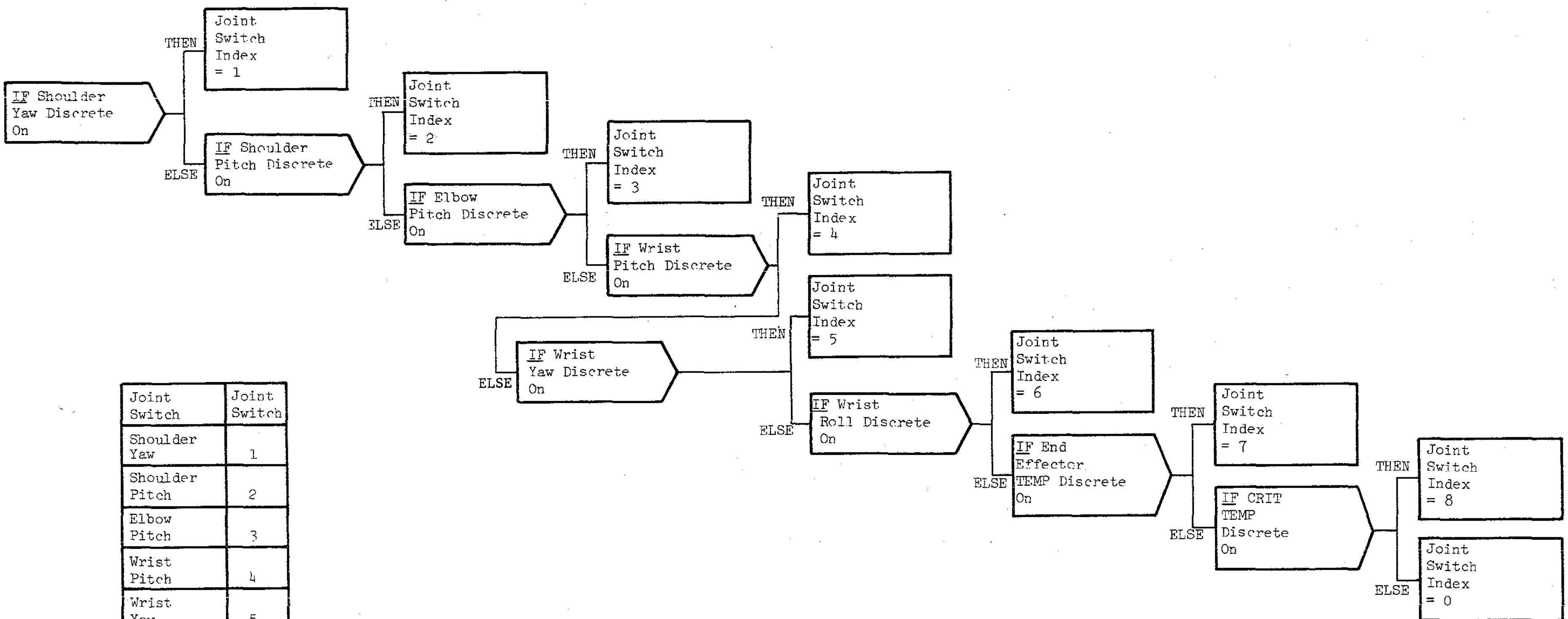

Joint Switch	Joint Switch
Shoulder Yaw	1
Shoulder Pitch	2
Elbow Pitch	3
Wrist Pitch	4
Wrist Yaw	5
Wrist Roll	6
End Effector TEMP	7
CRIT TEMP	8
NULL	0

Figure 3.3.8.5-4 Joint Switch Index Processing

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Mode	Index
Auto 1	1
Auto 2	2
Auto 3	3
Auto 4	4
OPR CMD	5
MAN ORB	6
MAN EE	7
MAN MIX	8
MAN PL	9
Single	10
Test	11
Null	0

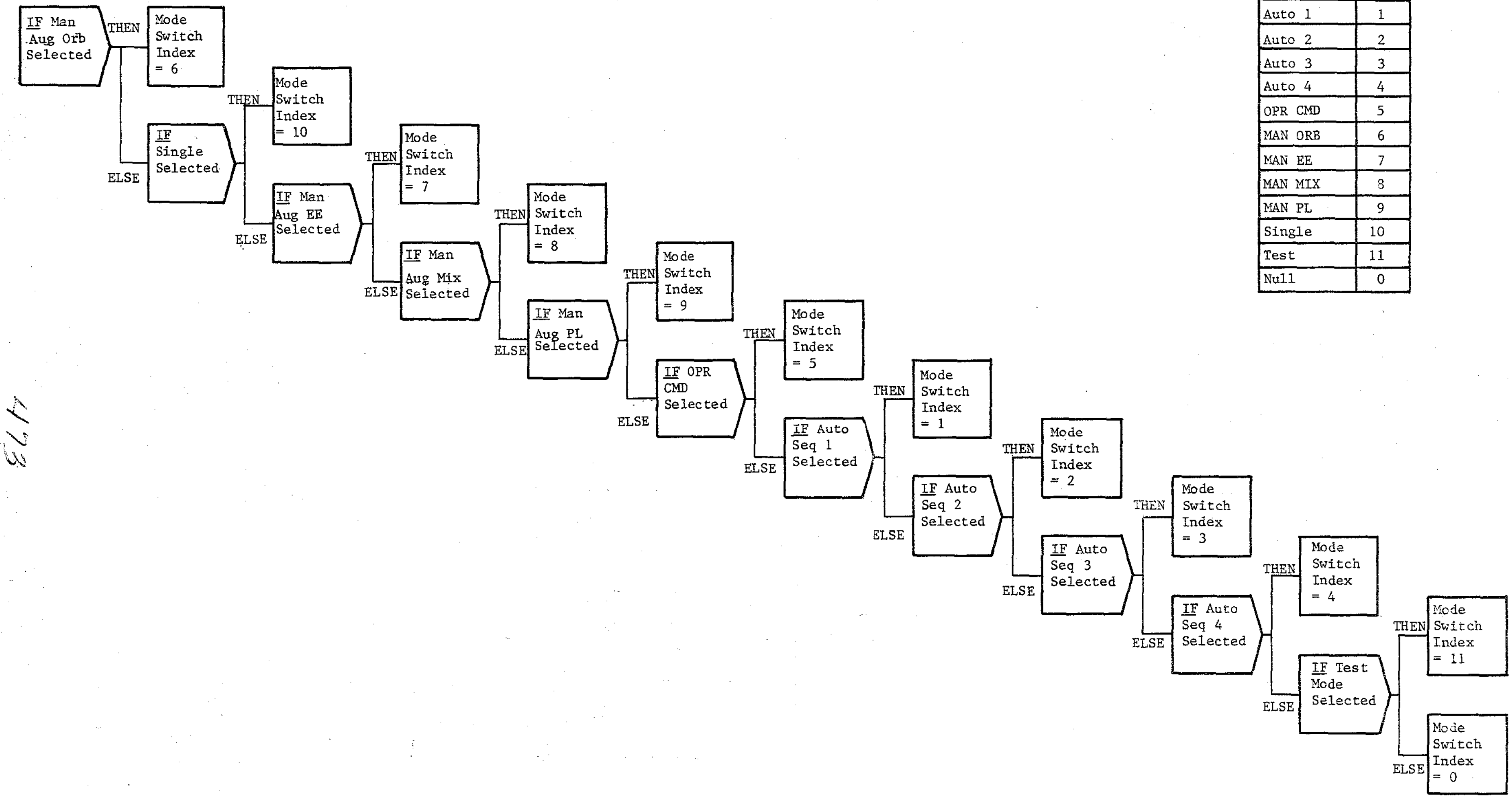


Figure 3.3.8.5-5 Mode Switch Index Processing

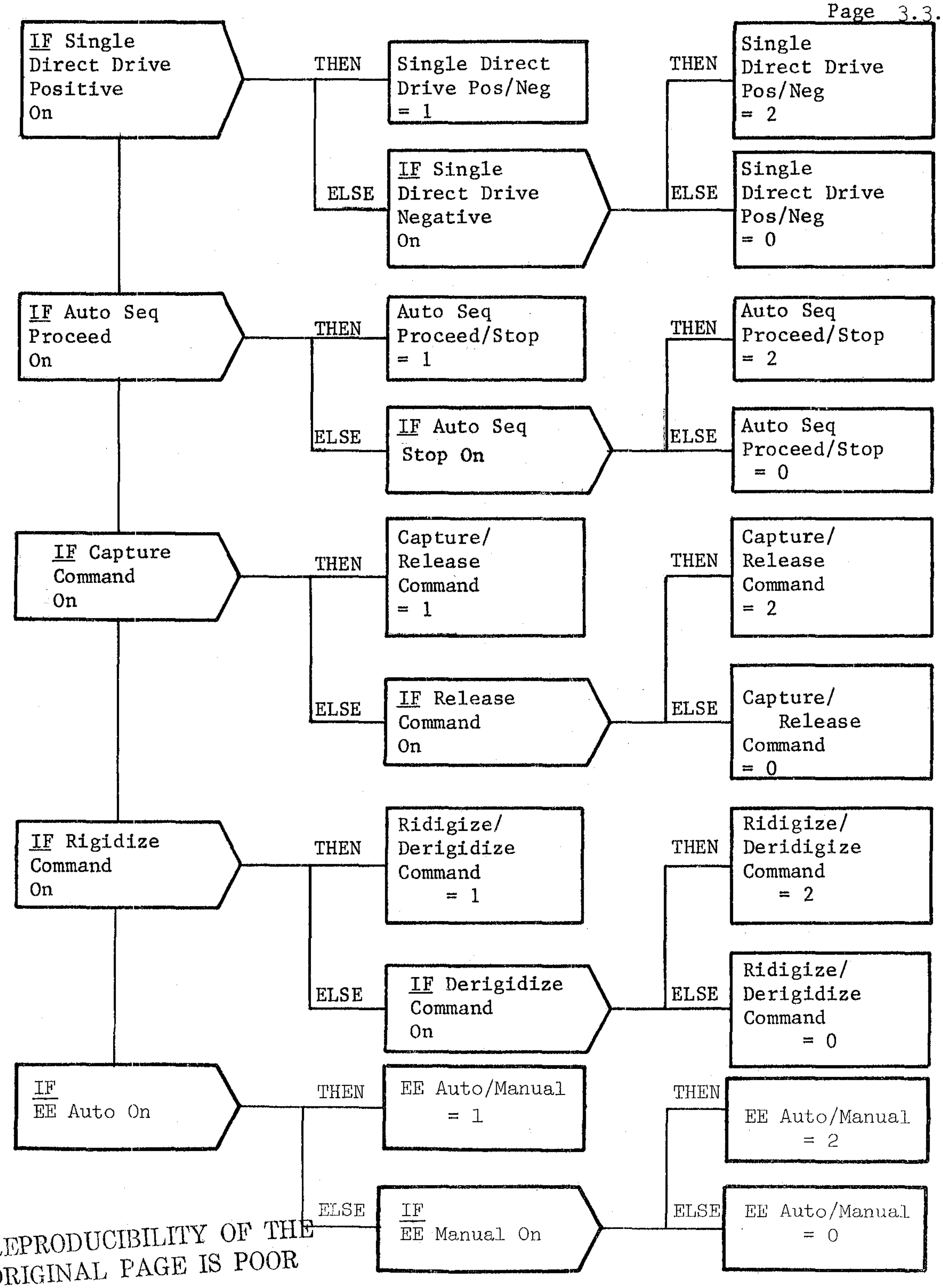


Figure 3.3.8.5-6 Integer Item Processing

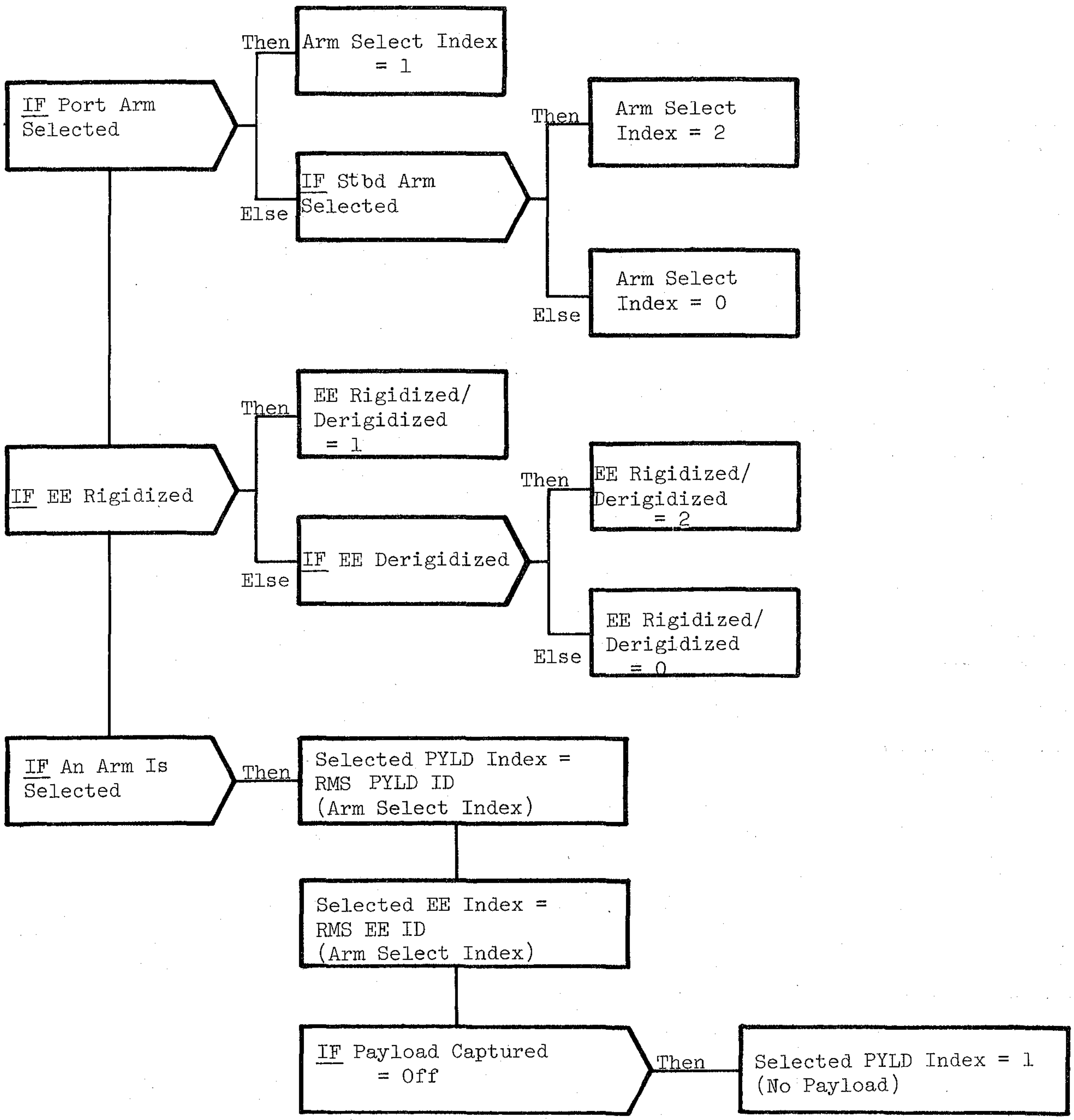
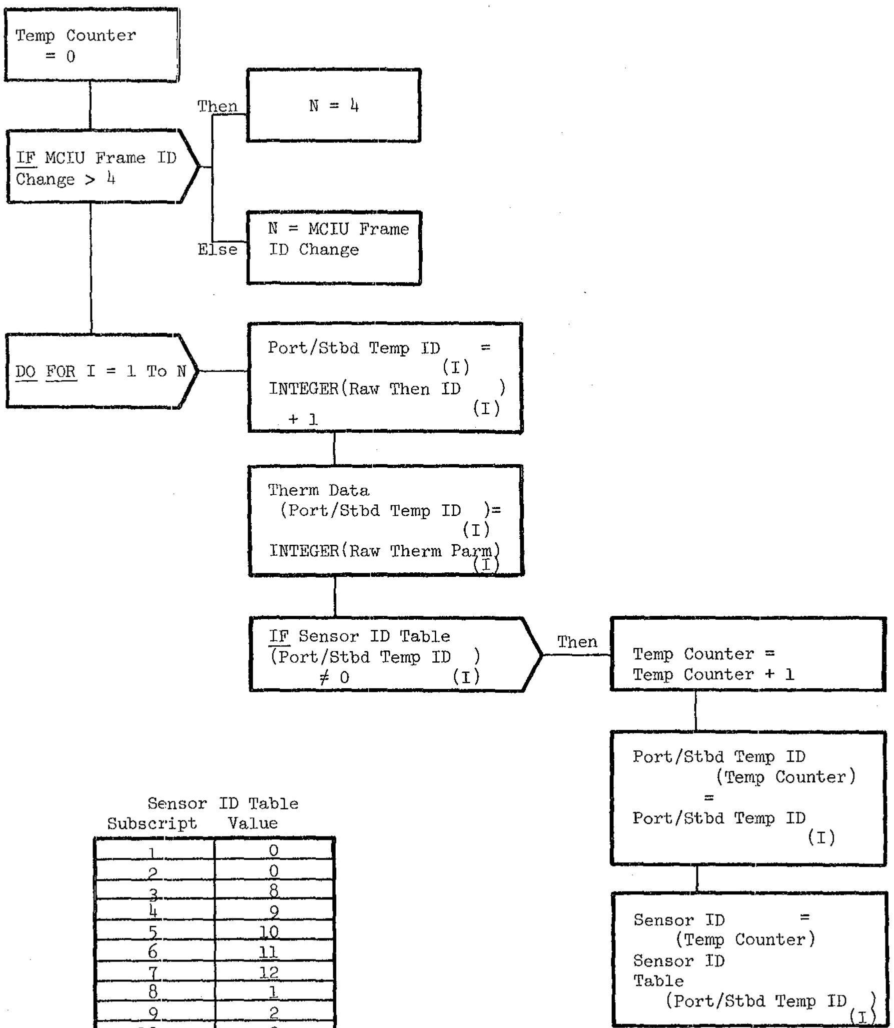


Figure 3.3.8.5-7 Integer Processing



Sensor ID Table

Subscript	Value
1	0
2	0
3	8
4	9
5	10
6	11
7	12
8	1
9	2
10	3
11	4
12	5
13	6
14	7
15	0
16	0
17	0
18	20
19	21
20	22
21	23
22	24
23	13
24	14
25	15
26	16
27	17
28	18
29	19
30	0
31	0
32	0

Figure 3.3.8.5-8 Therm Data Processing

3.3.8.6 Kinematic Data Generator (RKG_KINGEN)

The Kinematic Data Generator (RKG) computes the sines and cosines of the arm joint angles, computes the R-matrices, and derives the point of resolution (POR) position and attitude from joint angle data.

a. Control Interface - RKG is CALL'ed by the RMS Executive (REX) at 12.5 HZ.

   Invocation: CALL RKG_KINGEN

b. Inputs - Inputs to this module are specified in Table 3.3.8.6-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.6-1 through 3.3.8.6-7. The HAL variable names and other symbols taken directly from the Level C FSSR are documented in the module data list under the Requirement Symbol heading. RKG computes the sine and cosine of each joint angle. Also computed are the sines and cosines of the sum of the shoulder pitch and elbow pitch and the sum of the shoulder pitch, elbow pitch, and wrist pitch. These sines and cosines are used in the computation of the following matrices.

   1. POR REF to OS REF
   2. POR REF to AM REF
   3. OS REF to AM REF

   Also used in the computation of the above matrices are the arm swingout angle, EE REF to AM REF R-Matrix for the active arm, and the PL REF to EE REF R-Matrix for the selected payload.

   The distance computations determine the following distances used in later computations: the distance from the wrist yaw joint to the end effector tip; the distance from the wrist pitch joint to the end effector tip, projected onto the X-Z plane of the arm reference frame, and the X-component (in the arm reference frame) of the vector from the shoulder yaw joint to the wrist yaw joint.

   The distances calculated above, arm member lengths, and sine and cosines of the joint angles are used to compute the position of the point of resolution in the arm reference frame. The point of resolution position in the orbiter structural frame and in the orbiter body axis frame is computed using the attach point for the active arm, the transpose of the OS to AM R-Matrix, the point of resolution position in the AM reference frame computed above, and the vector from the end effector tip to the point of resolution for the selected payload.

   The Euler angles defining the POR attitude in the OS Reference frame are computed using the POR to OS R-Matrix.

   There is no SPEC initialization or clean up processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.6-1.

e. Module References - None

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRD_CIL	Constants and I-Load Compool
D INCLUDE TEMPLATE CRI_LVC	Level C Constants Compool

h. Error Handling - The inputs to the inverse trigonometric functions are tested to eliminate any out-of-range inputs that cause a run-time error message. Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - The point of resolution and attitude computations assume that the arm has been swung out (swing out angle is a constant in computations).

The first payload subscript in the arrays V_EE_POR_SEL and PL_TO_EE_OP_SEL reference the no payload case. Therefore, the first vector and matrix, respectively, should be initialized to a (0,0,0) vector and a 3X3 identity matrix.

In order to protect the arcsin function from arguments outside of the range [-1,1] , ABS ($POR\_TO\_OS_{(2,1)}$) is restricted to be less than 1.

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TABLE 3.3.8.6-1 Kinematic Data Generator

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Arm Select Index	A.2.32	I	RCD	CRAV_ARM_SEL		
2	Actual Joint Angles	A.2.32	I	RYE	CRAV_JA_ATL	V92H3300C-305C	JOINT_ ANGLES
3	Selected EE Index	A.2.32	I	RCD	CRAV_EE_ID_ACT		RMS_EE_SEL
5	POR INDEX	A.2.32	I	RXY	CRAV_POR_INDEX	V92X3107X	
5	End Effector Length	A.2.31	Z		CRIS_L_EEAP_EET	V98U524C-255C	L_EEAP_EET
6	Payload to EE Transformation Matrices	A.2.31	Z		CRIS_PL_TO_EE_OP_SEL	V98U5308C-352C V96U6707C-715C	PL_TO_EE_ OP_SEL
7	Sine of Port Swing Out Angle	A.2.33	Z		CRDK_SWOUT_SIN_PORT		SWOUT_SIN _PORT
8	Cosine of Port Swing Out Angle	A.2.33	Z		CRDK_SWOUT_COS_PORT		SWOUT_COS
9	Radians to Degrees Conversion Factor(180/π)	A.2.33	Z		CRDK_RTD		RTD
10	Degrees to Radians Conversion Factor(π/180)	A.2.33	Z		CRDK_DTR		DTR
11	Feet to inches Conversion Factor	A.2.33	Z		CRDK_FT_TO_IN		FT_TO_IN
12	Length from WRR to EE AP	A.2.33	Z		CRDK_L_WR_EEAP		L_WP_EEAP
13	Length from WRY TO WRR	A.2.33	Z		CRDK_L_WY_WR		L_WY_WR
14	Length from WRP to WRY	A.2.33	Z		CRDK_L_WP_WY		L_WP_WY
15	Length from ELP to WRP	A.2.33	Z		CRDK_L_ELP_WP		L_ELP_WP
16	Elbow Offset	A.2.33	Z		CRDK_EL_OFFSET		EL_OFFSET
17	Length from SHY TO SHP	A.2.33	Z		CRDK_L_SHY_SHP		L_SHY_SHP
18	Length from SHP to ELP	A.2.33	Z		CRDK_L_SHP_ELP		L_SHP_ELP
19	Arm Attach Point	A.2.33	Z		CRDK_ARM_ATTH_PT		ATTH_PT

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TABLE 3.3.8.6-1 Kinematic Data Generator (Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
20	Sines of Joint Angles	A.2.32	O	RTV, RRP	CRAV_JA_SIN	V92H3340C-345C	JOINT_ ANGLE_SIN S1-S6
21	Cosines of Joint Angles	A.2.32	O	RTV, RRP	CRAV_JA_COS	V92H3350C-355C	JOINT_ ANGLE_COS C1-C6
22	Sine of (SHP Angle + ELP Angle)	A.2.32	O	RTV	CRAV_JA_SIN23	V98U3347C	S23
23	Cosine of (SHP Angle + ELP Angle)	A.2.32	O	RTV	CRAV_JA_COS23	V98U3350C	C23
24	Sine of (SHP Angle + ELP Angle + WRP Angle)	A.2.32	O	RTV, RRP	CRAV_JA_SIN234	V92H3348C	S234
25	Cosine of (SHP Angle + ELP Angle + WRP Angle)	A.2.32	O	RTV, RRP	CRAV_JA_COS234	V92H3358C	C234
26	X-Component of Arm Referenced Vector from SHY to WRY	A.2.32	O	RTV, RRP, DL	CRAV_X_SHY_WY	V92H3338C	X_SHY_WY
27	Distance from WRY to EE Tip	A.2.32	O	RTV, RRP	CRAV_L_WY_EET	V92H3337C	L_WY_EET
28	Transformation Matrices (POR to OS) (POR to AM) (OS to AM)	A.2.32	O	RTV, RJS, RAS	CRAV_TRFM_MAT$(1) CRAV_TRFM_MAT$(2) CRAV_TRFM_MAT$(3)	V92U3390C-398C V92U3400C-408C V92U3380C-388C	
29	Position of POR in OS (POR_POS_OS)	A.2.32	O	RAS,CRT	CRAV_POR_POS_OS	V92H3330C-332C	POR_POS_STR
30	Euler Angles of POR in OS (Pitch, Yaw, Roll) (POR_ATD_OS)	A.2.32	O	RDD, CRT, DL	CRAV_POR_ATD_OS	V92H3333C-335C	
31	Distance from WRP to EE Tip Projected onto X-Z plane of AM	A.2.32	O	RTV, RRP	CRAV_L_WP_EET_IP	V92H3336C	L_WP_EET_ IP

TABLE 3.3.8.6-1 Kinematic Data Generator (Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
32	POR Position in AM	E	L		RKG_POR_POS_ARM		POR_POS_ARM
33	Sine of Swing Out Angle	E	L		RKG_SWOUT_SIN		SWOUT_SIN
34	EE Ref to AM Ref Matrix	E	L		RKG_EE_TO_AM		
35	EE to POR Vectors	A.2.31	Z		CRIS_V_EE_POR_SEL	V96U6770C-6787C	V_EE_POR_ SEL
36	Selected vector from EE to POR	A.2.32	O	RTV,RAS ,RJS	CRAV_V_EE_POR	V92H3421C-423C	V_EE_POR
37	PL Ref to EE Ref Matrix	E	L		RKG_PL_TO_EE		
38	Positioned point of resolution in body axis frame	A.2.32	O	RDD,CRT	CRAV_POR_POS_DISP	V92H3417C-419C	POR_POS_ DISP
39	Rotation angle of end effector from WRR frame	A.2.32	I	RYE	CRAV_WR_TO_EE_ANGLE		WR_TO_EE_ ANGLE

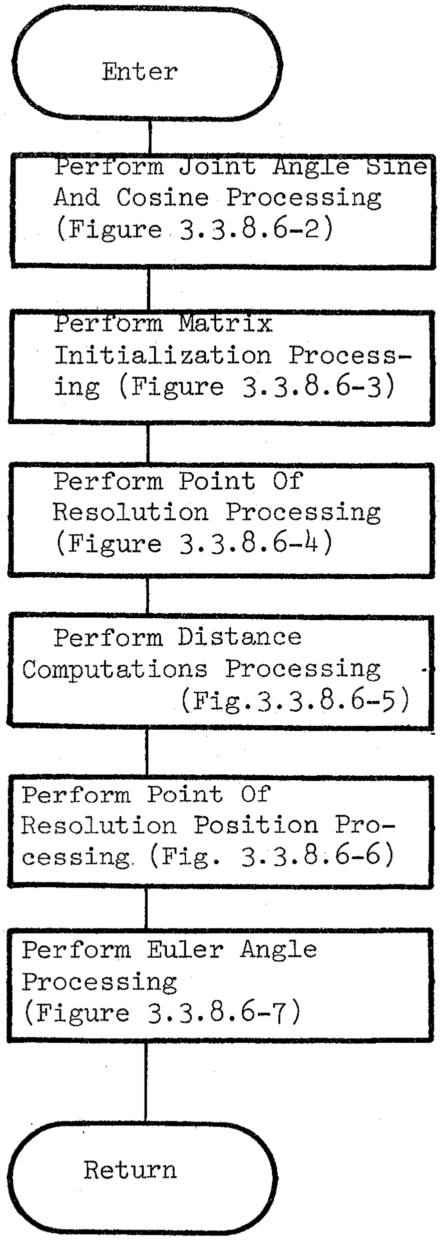

Figure 3.3.8.6-1. Kinematic Data Generator

DO FOR
I = Each Joint
Except Wrist Roll

S_I = SIN(JOINT_ANGLES$_I$DTR)

C_I = COS(JOINT_ANGLES$_I$DTR)

S_6 = SIN((JOINT_ANGLES$_6$ + WR_TO_EE_ANGLE) DTR)

C_6 = COS((JOINT_ANGLES$_6$ + WR_TO_EE_ANGLE) DTR)

S23 = SIN (DTR(JOINT_ANGLES$_2$ + JOINT_ANGLES$_3$))

C23 = COS (DTR(JOINT_ANGLES$_2$ + JOINT_ANGLES$_3$))

S234 = SIN (DTR(JOINT_ANGLES$_2$ + JOINT_ANGLES$_3$
+ JOINT_ANGLES$_4$))
C234 = COS (DTR(JOINT_ANGLES$_2$ + JOINT_ANGLES$_3$
+ JOINT_ANGLES$_4$))

Figure 3.3.8.6-2. Joint Angle Sine and Cosine Processing

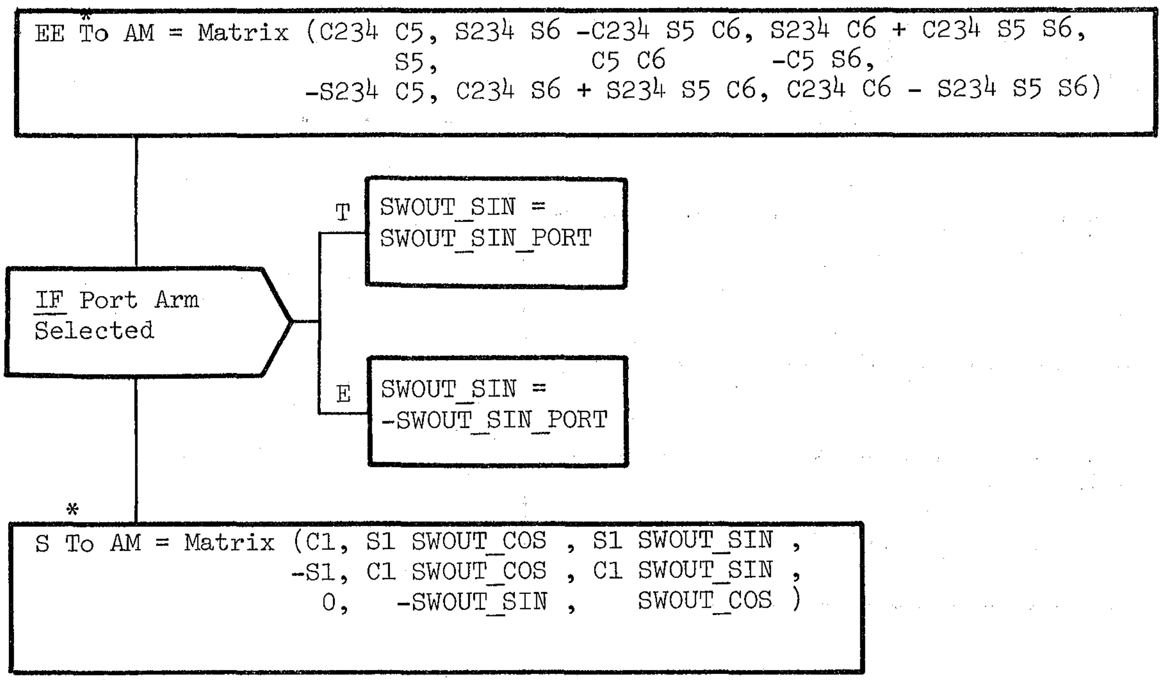

Figure 3.3.8.6-3 Matrix Initialization Processing

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$V\_EE\_POR_{(1)} = V\_EE\_POR\_SEL_{(POR\ INDEX\ :1)}$

$V\_EE\_POR_{(2)} = -V\_EE\_POR\_SEL_{(POR\ INDEX\ :2)}$

$V\_EE\_POR_{(3)} = -V\_EE\_POR\_SEL_{(POR\ INDEX\ :3)}$

$PL\_TO\_EE_{(1,1)} = PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 1,1)}$

$PL\_TO\_EE_{(1,2)} = -PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 1,2)}$

$PL\_TO\_EE_{(1,3)} = -PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 1,3)}$

$PL\_TO\_EE_{(2,1)} = -PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 2,1)}$

$PL\_TO\_EE_{(2,2)} = PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 2,2)}$

$PL\_TO\_EE_{(2,3)} = PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 2,3)}$

$PL\_TO\_EE_{(3,1)} = -PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 3,1)}$

$PL\_TO\_EE_{(3,2)} = PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 3,2)}$

$PL\_TO\_EE_{(3,3)} = PL\_TO\_EE\_OP\_SEL_{(POR\ INDEX:\ 3,3)}$

$POR\_\overset{*}{TO}\_AM = (EE\_\overset{*}{TO}\_AM)\ (PL\_\overset{*}{TO}\_EE)$

$POR\_\overset{*}{TO}\_OS = (OS\_\overset{*}{TO}\_AM)^{T}\ (POR\_\overset{*}{TO}\_AM)$

Figure 3.3.8.6-4. Point of Resolution Processing

L_WY_EET = L_WY_WR + L_WR_EEAP
+ L_EEAP_EET(RMS_EE_SEL)

L_WP_EET_IP = L_WP_WY_ + L_WY_EET C_5

X_SHY_WY = L_SHP_ELP C_2

+ L_ELP_WP C23
+ L_WP_WY C234
+ EL_OFFSET (S23 - S_2)

Figure 3.3.8.6-5. Distance Computations Processing

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$POR\_POS\_ARM_1 = X\_SHY\_WY + L\_WY\_EET\ C234\ C_5$

$POR\_POS\_ARM_2 = L\_WY\_EET\ S_5$

$POR\_POS\_ARM_3 = L\_SHY\_SHP - L\_SHP\_ELP\ S_2$
$-L\_ELP\_WP\ S23 - L\_WP\_WY\ S234$

$+ EL\_OFFSET\ (C23 - C_2)$

$- L\_WY\_EET\ S234\ C_5$

$POR\_PO\bar{S}\_ARM = FT\_TO\_IN\ (POR\_PO\bar{S}\_ARM + POR\_\overset{*}{T}O\_AM$
$V\ \bar{E}\bar{E}\ POR)$

$POR\_PO\bar{S}\_OS = ATT\bar{H}\_PT_{Arm\ Select\ Index} + (OS\ \overset{*}{T}o\ AM)^T POR\_EE\_PO\bar{S}\_ARM$

$POR\_POS\_DISP_{(1)} = -POR\_POS\_OS_{(1)}$
$POR\_POS\_DISP_{(2)} = POR\_POS\_OS\ (2)$

$POR\_POS\_DISP_{(3)} = -POR\_POS\_OS_{(3)}$

Figure 3.3.8.6-6. Point of Resolution Position Processing

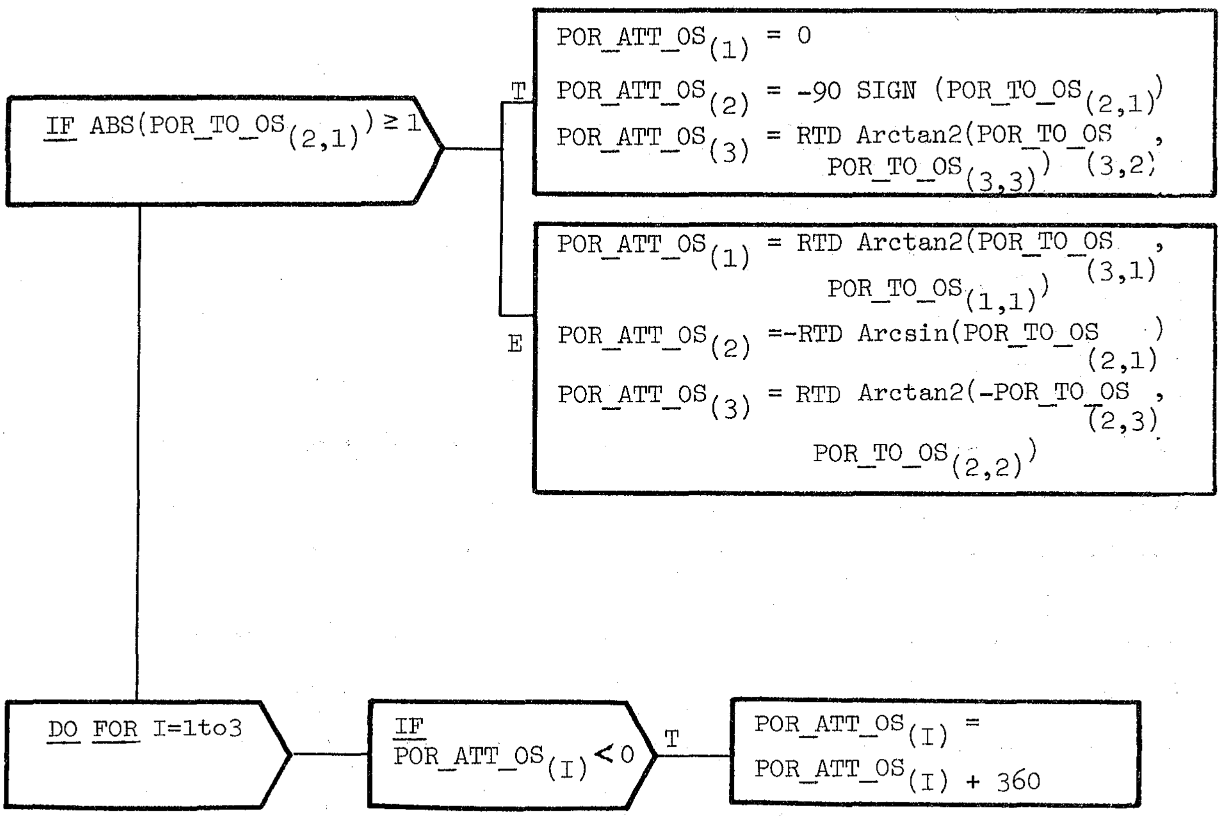

Figure 3.3.8.6-7. Euler Angle Processing

3.3.8.7 Single Joint Control (RSC_SINCTL)

The Single Joint Control module (RSC) provides for control of individual joints (one at a time) in accordance with operator inputs via the joint select switch and single/direct drive switch on the RMS dedicated D&C panel. This module allows an operator to operate a single joint of the RMS while the other joints hold their last commanded position.

a. Control Interface - RSC is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RSC_SINCTL

b. Input - Inputs to this module are specified in Table 3.3.8.7-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.7-1 through 3.3.8.7-3. RSC performs first pass initialization. If the selected joint is new, RSC resets the RSC position hold flag, the ramp counter, and the past value of the arm direction. If the selected joint is unchanged, is now moving, and was at rest last pass, the ramp counter is reset.

   If the joint is not commanded, and if the RSC position hold flag is off and the arm is at rest, the RSC joint angle is set to the current joint angle and RSC position hold flag is set. Otherwise, the joint rate is set to zero. If the RSC position hold flag is on, the joint rate command is computed.

   If the joint is commanded, and if vernier scaling is desired, the vernier joint rates are used. If not, the coarse rates are selected. For the commanded joint, the joint rate is set to the rate computed earlier. Joint dependent rate sign changes are done next. The RSC position hold flag is reset and the joint rate is ramped up to the appropriate limit over several cycles. The joint rate is held until another operator choice of either joint or direction is made. All other joints are held at the same positions as when the operated joint was selected. There is no SPEC initialization or clean up processing.

d. Output - Outputs for this module are specified in Table 3.3.8.7-1.

e. Module References - None

f. Module Type and Attributes -

   Type: External Procedure
   Attributes: Default (serially reusable with no protective mechanism)

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g. Template References -

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRD_CIL	Constants and I-Load Compool
D INCLUDE TEMPLATE CRI_LVC	Level C Constants Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - RSC overlays the position hold value from RFP for the selected joint to be commanded in single configuration.

TABLE 3.3.8.7-1 Single Joint Control

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	JNT Rate LIM	A.2.32	I	RYE	CRAV_JNT_RATE_LIM		
2	First Pass Flag	A.2.32	I	RXY	CRAB_RSC_FIRST_PASS	V92X3149X	
3	Vernier Scaling Req	A.2.32	I	RCD	CRAB_VERN_RATE_REQ		
4	JNT Last Pass	A.2.32	O	RWP	CRAV_JNT_PAST		
5	SINGL Dir Drive Pos/Neg	A.2.32	I	RCD	CRAV_SING_DRV_POSNEG		
6	Selected PYLD Index	A.2.32	I	RCD	CRAV_PYLD_ID_ACT		
7	JNT Switch Index	A.2.32	I	RCD	CRAV_JNT_SEL_ID		
8	Joint Angles	A.2.32	I	RYE	CRAV_JA_ATL	V92H3300C-305C	
9	Min Rate Flag	A.2.34	W	MCIU	CREB_MIN_RATE_ACT	V72X2938J	
10	JNT Rate CMD	A.2.32	O	RNC, DL, RTV, RHM	CRAV_JAR_CMD	V92R3205C-210C	
11	Joint Angle Rate	A.2.32	I	RYE	CRAV_JAR_ATL	V92R3310C-315C	
12	Mode Change Threshold	A.2.33	Z		CRDK_MODE_CHG_THRESH		
13	JRL PYLD Vernier	A.2.31	Z		CRIS_PL_JNT_RATE_LIM_VERN	V96R5070C-5075C	
14	Joint Angle Conversion Factor	A.2.31	Z		CRDK_RFP_JNT_CF		
15	Vernier Lim	A.2.33	Z		CRDK_VERN_LIM		
16	Coarse Lim	A.2.33	Z		CRDK_COARSE_LIM		
17	Counter	E	L		RSC_COUNTER		
18	RSC JNT RATE LIM	E	L		RSC_JNT_RATE_LIM		
19	Counter Lim	E	L		RSC_COUNTER_LIM		
20	SINGL DIR DRIVE Pos/Neg Past	E	L		RSC_SING_DRV_POSNEG_PAST		
21	RSC Pos Hold Flag	E	L		RSC_POS_HOLD		
22	Delta Joint Angle	E	L		RSC_DELTA_JA		
23	RSC JNT ANGLE	E	L		RSC_JA		
24	RSC JNT Rate Cmd	E	L		RSC_JAR_CMD		

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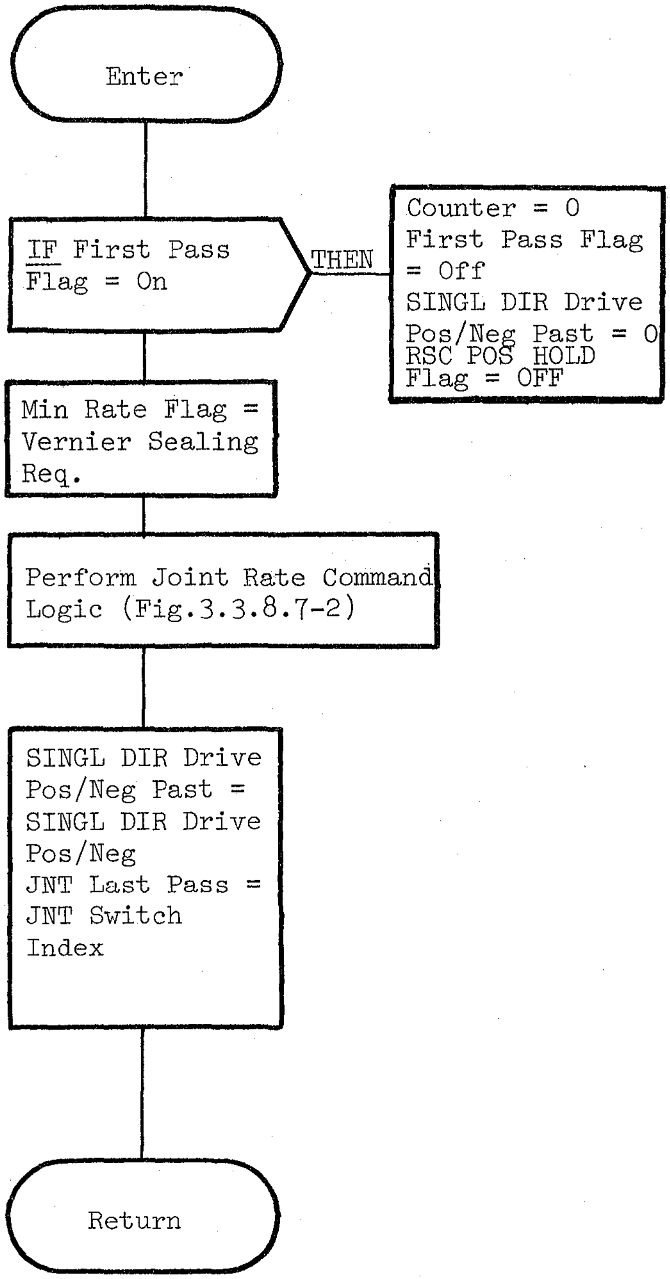

Figure 3.3.8.7-1. Single Joint Control

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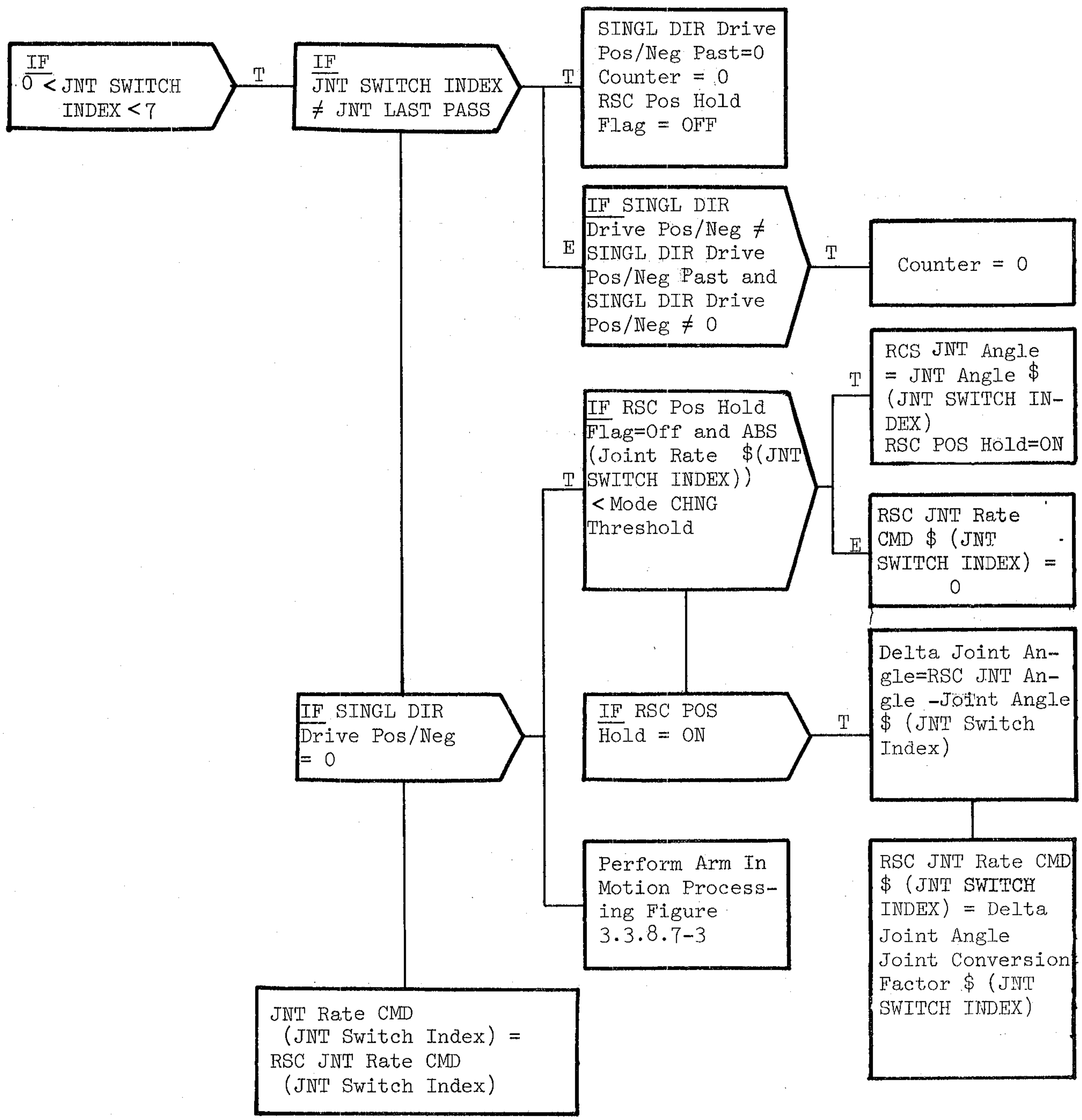

Figure 3.3.8.7-2. Joint Rate Command Logic

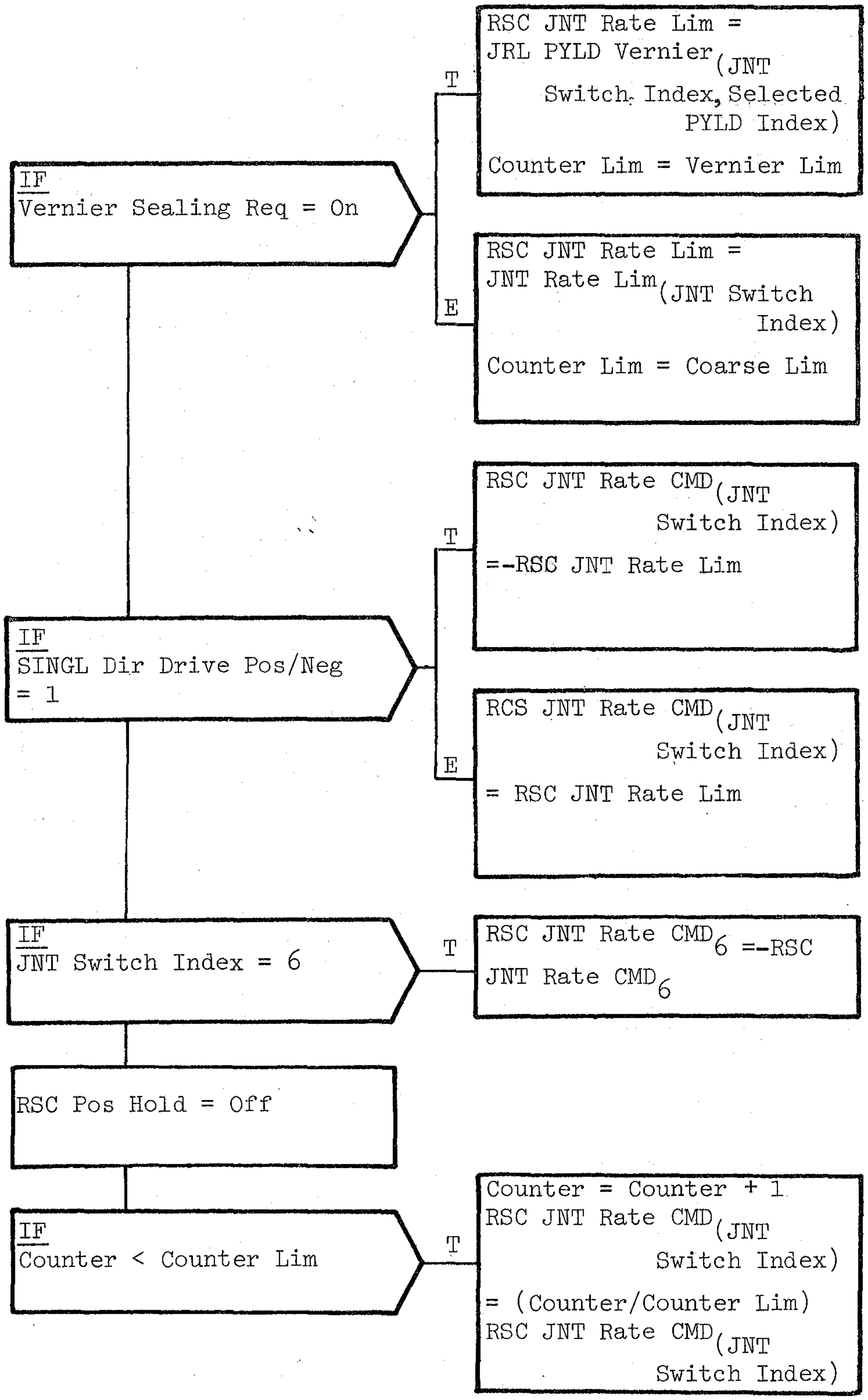

Figure 3.3.8.7-3. Arm In Motion Processing

3.3.8.8 Hand Controller (RJS_HANDCTL)

The Hand Controller (RJS) module converts hand controller deflections into point of resolution (POR) rate commands, interprets rate hold requests and subsequent hand controller inputs, limits resultant POR rate commands and transforms those commands from the coordinate system selected by the operator to the arm reference system.

a. Control Interface - RJS is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RJS_HANDCTL

b. Inputs - Inputs to this module are specified in Table 3.3.8.8-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.8.8-1 through 3.3.8.8-5. When entered, RJS determines if there has been an operator request to select or deselect the rate hold mode by comparing the state of the rate hold push button for the current and previous cycles. If its state has changed then the state of the rate hold processing is changed. A change in the state of payload capture also changes the state of rate hold processing. Initially, the state of rate hold processing is OFF. RJS determines the appropriate set of limits to be applied to POR rate command resultants. RJS then converts hand controller deflections into POR rate commands using a normal set of scaling factors. If the rate hold mode is selected for the first time, the EE rates at the time of selection are retained until the rate hold mode is de-selected. On all subsequent times that RJS processes in a rate hold mode, and the hand controllers are nulled, all inputs are treated as biases to the previously saved translation and rotation rate commands. The POR rate commands in the rate hold mode are then computed as the sum of the retained rates and the biases. Whether or not in the rate hold mode, the commanded translational and rotational rate vectors are scaled such that its resultant magnitude is equal to the appropriate maximum rate. POR rate commands are transformed from the selected reference system to the arm reference system.

d. Outputs - Outputs from this module are specified in Table 3.3.8.8-1.

e. Module References - None

f. Module Type and Attributes -

   Type: External Procedure

   Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

   D INCLUDE TEMPLATE CRA_TE Working Compool
   D INCLUDE TEMPLATE CRC_COT RMS Constants Table
   D INCLUDE TEMPLATE CRD_CIL Constants and I-Load Compool
   D INCLUDE TEMPLATE CRE_MCO Output data Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - None

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TABLE 3.3.8.8-1 Hand Controller MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Rate Hold Req	A.2.32	I	RCD	CRAB_RATE_HOLD_REQ		
2	HC Null Flag	A.2.32	I	RYE	CRAB_HC_NULL	V92X3121X	
3	TD Ref ID	A.2.32	I	RXY	CRAV_TD_REF_ID	V92U3110C	
4	RD Ref ID	A.2.32	I	RXY	CRAV_RD_REF_ID	V92U3115C	
5	Vernier Scaling Req	A.2.32	I	RCD	CRAB_VERN_RATE_REQ		
6	PL Capture	A.2.32	I	RCD	CRAB_PYLD_CAP		
7	PL ID	A.2.32	I	RCD	CRAV_PYLD_ID_ACT		
8	THC Sig	A.2.32	I	RYE	CRAV_COND_THC_SIG	V92H3125C-127C	
9	RHC Sig	A.2.32	I	RYE	CRAV_COND_RHC_SIG	V92H3130C-132C	
10	TRFM MAT (POR To OS) (POR To AM) (AS To AM)	A.2.32	I	RKG	CRAV_TRFM_MAT	V92U3390C-398C V92U3400C-408C V92U3380C-388C	
11	Rate Hold Req Flag Lp	A.2.32	I	REX	CRAB_RATE_HOLD_LP	V92X3104X	
12	Vernier Scaling Past	A.2.32	I	REX	CRAB_VERN_SCALE_PAST	V92X3103X	
13	Rate Hold REQ Flag	A.2.32	I	RXY	CRAB_RATE_HOLD_REQ_FLAG	V92X3113X	
14	PL Capture Past	A.2.32	I	REX	CRAB_PL_CAPTURE_PAST	V92X3112X	
15	Selected Vector from EE to POR	A.2.32	I	RKG	CRAV_V_EE_POR	V92H3421C-23C	
16	EE Trans Rate Cmd	A.2.32	O	RRP, DL	CRAV_EE_XLT_RATE_CMD_AM	V92R3175C-177C	
17	EE Rot Rate Cmd	A.2.32	O	RRP, DL	CRAV_EE_ROT_RATE_CMD_AM	V92R3180C,181C,182C	
18	Rate Hold Sel Flag	A.2.34	W	MCIU	CREB_RATE_HOLD_ACT	V72X2940J	
19	Min Rate Flag	A.2.34	W	MCIU	CREB_MIN_RATE_ACT	V72X2938J	
20	HC Max Deflect	A.2.33	Z		CRDK_HC_MAX_DEF		
21	HC Null Deadband	A.2.33	Z		CRDK_HC_NULL_DB		
22	DTR	A.2.33	Z		CRDK_DTR		DTR
23	Sel PL Trans Rate Vernier	A.2.37	R	STM	CRSS_TRNS_RATE_PYLD_SEL_VRN	V93R7605C,V93R7631C-635C	

TABLE 3.3.8.8-1. Hand Controller (cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
24	Sel PL Rot Rate Vernier	A.2.37	R	STM	CRSS_ROT_RATE_PYLD_SEL_VRN	V93R7606C V93R7641C-645C	
25	Sel PL Trans Rate Coarse	A.2.37	R	STM	CRSS_TRNS_RATE_PYLD_SEL_CRS	V93R7600C V93R7611C-615C	
26	Sel PL Rot Rate Coarse	A.2.37	R	STM	CRSS_ROT_RATE_PYLD_SEL_CRS	V93R7601C V93R7621C-625C	
27	Sel PL Trans Rate Vern Com	A.2.37	R	STM	CRSS_TRNS_RATE_PL_SEL_VRN_COM	V96R6741C-746C	
28	Sel PL Rot Rate Vern Com	A.2.37	R	STM	CRSS_ROT_RATE_PL_SEL_VRN_COM	V96R6760C-765C	
29	Sel PL Trans Rate Coarse Com	A.2.37	R	STM	CRSS_TRNS_RATE_PL_SEL_CRS_COM	V93R7650C-655C	
30	Sel PL Rot Rate Coarse Com	A.2.37	R	STM	CRSS_ROT_RATE_PL_SEL_CRS_COM	V96R6860C-865C	
31	Vernier Scaling Save	E	L		RJS_VERN_SCALE_SAVE		
32	Max Trans Save	E	L		RJS_MAX_TRANS_SAVE		
33	Max Trans	E	L		RJS_MAX_TRANS		
34	Max Rot Save	E	L		RJS_MAX_ROT_SAVE		
35	Max Rot	E	L		RJS_MAX_ROT		
36	THC Save	E	L		RJS_THC_SAVE		
37	THC Rate Cmd	E	L		RJS_THC_RATE_CMD		
38	RHC Save	E	L		RJS_RHC_SAVE		
39	RHC Rate Cmd	E	L		RJS_RHC_RATE_CMD		
40	Null Local	E	L		RJS_NULL_LOCAL		
41	Min Rate Local	E	L		RJS_MIN_RATE_LOCAL		
42	Max Trans Com	E	L		RJS_MAX_TRANS_COM		
43	Max Rot Com	E	L		RJS_MAX_ROT_COM		

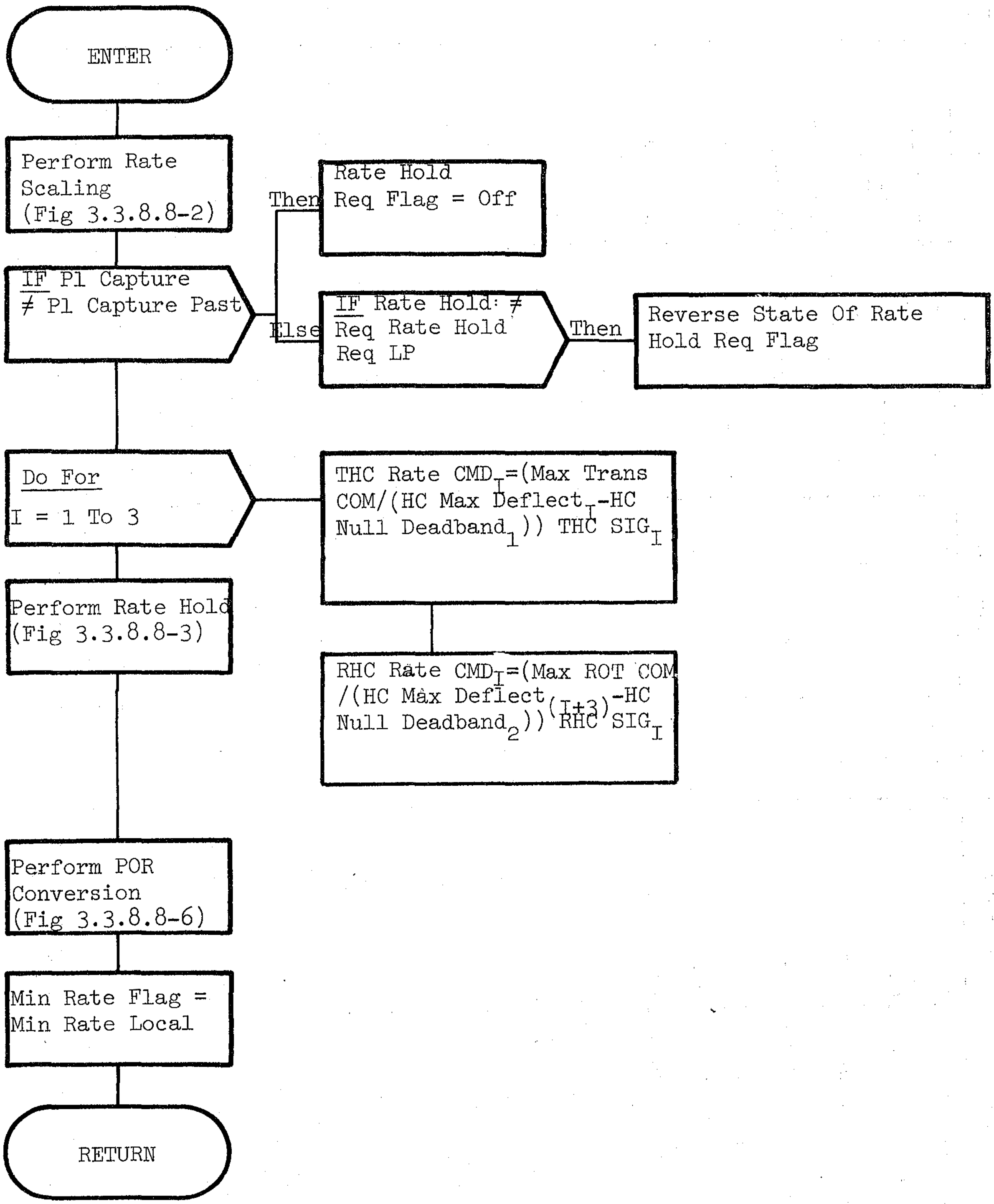

Figure 3.3.8.8-1. Hand Controller

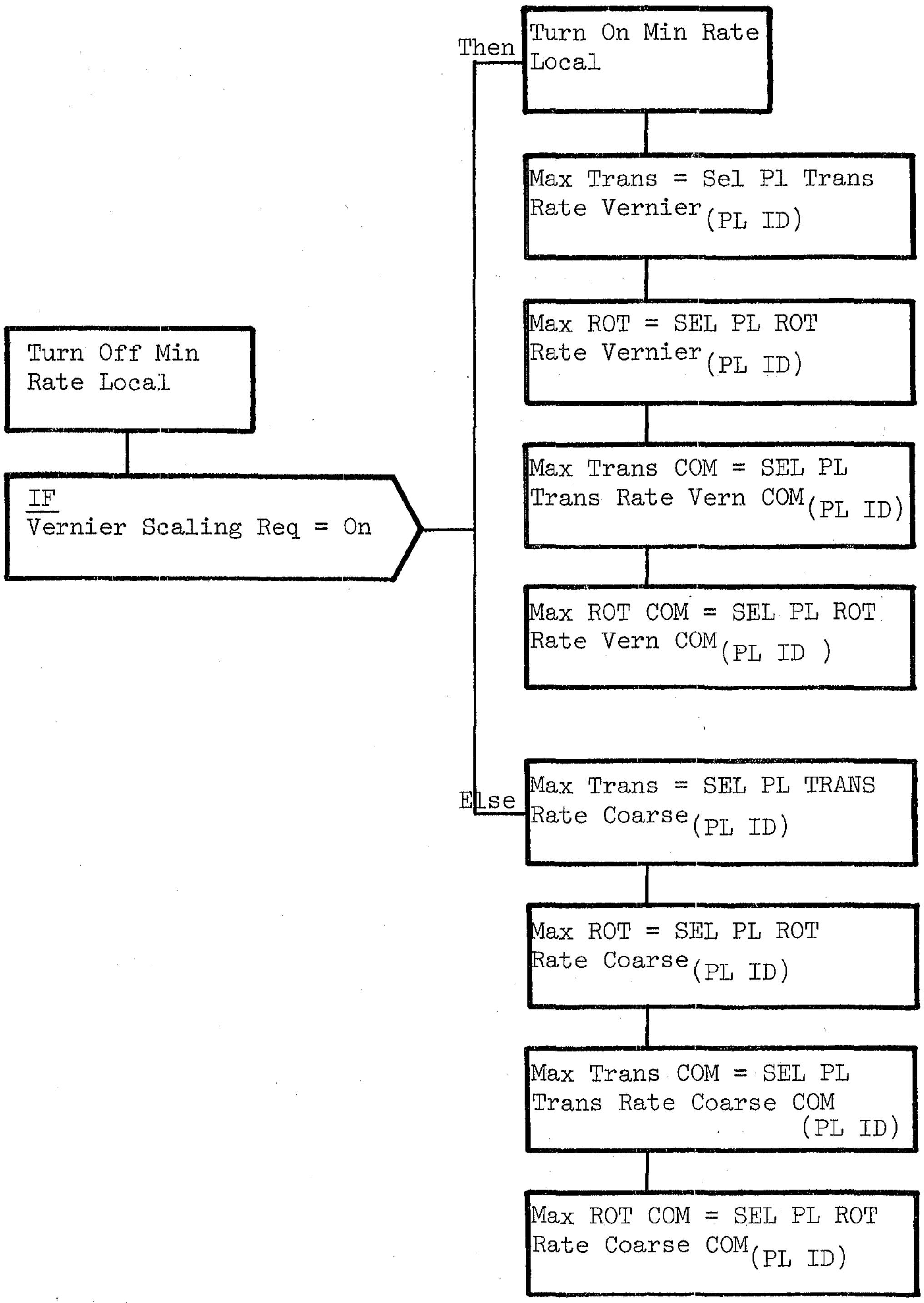

Figure 3.3.8.8-2. Rate Scaling

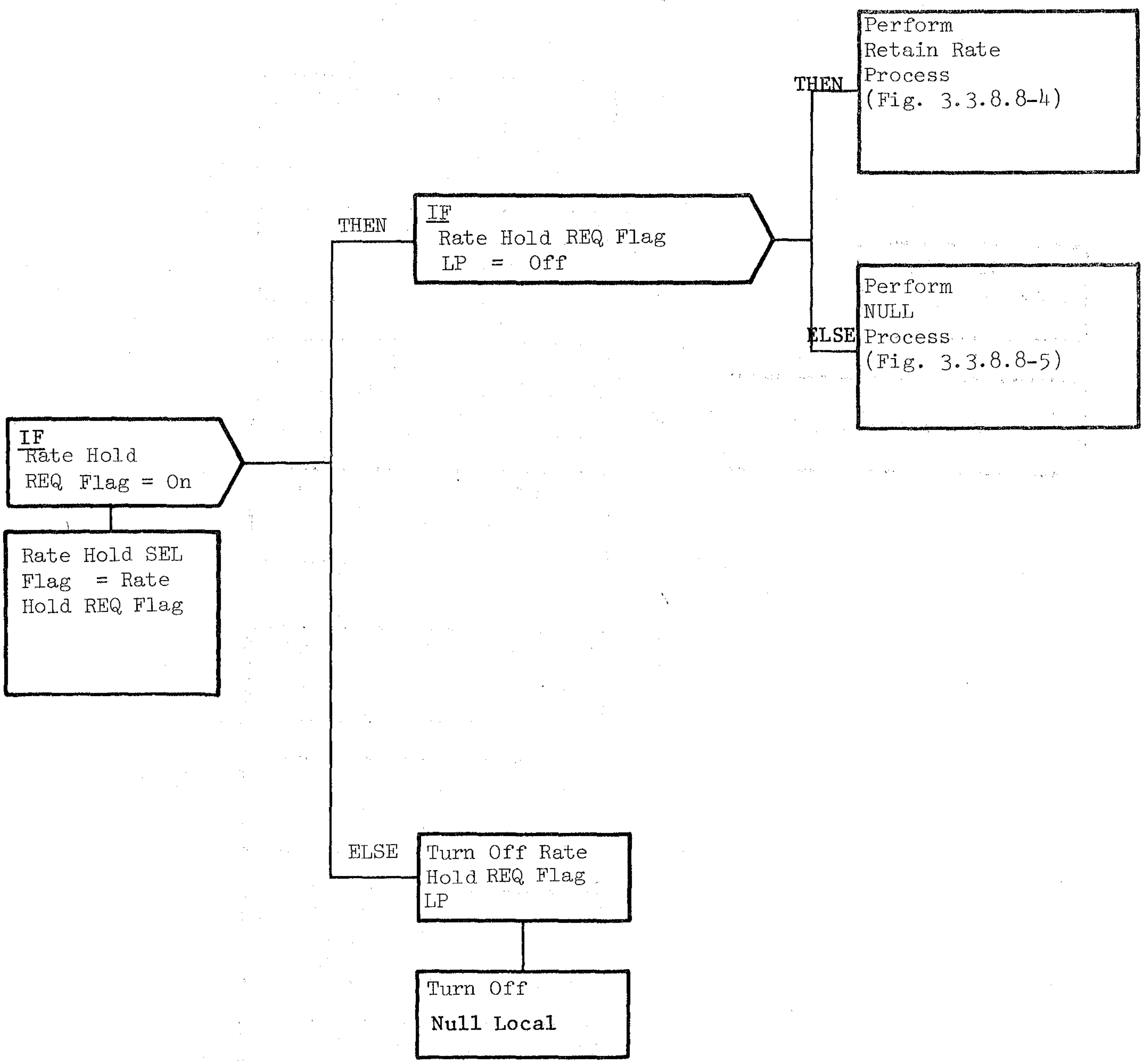

Figure 3.3.8.8-3. Rate Hold

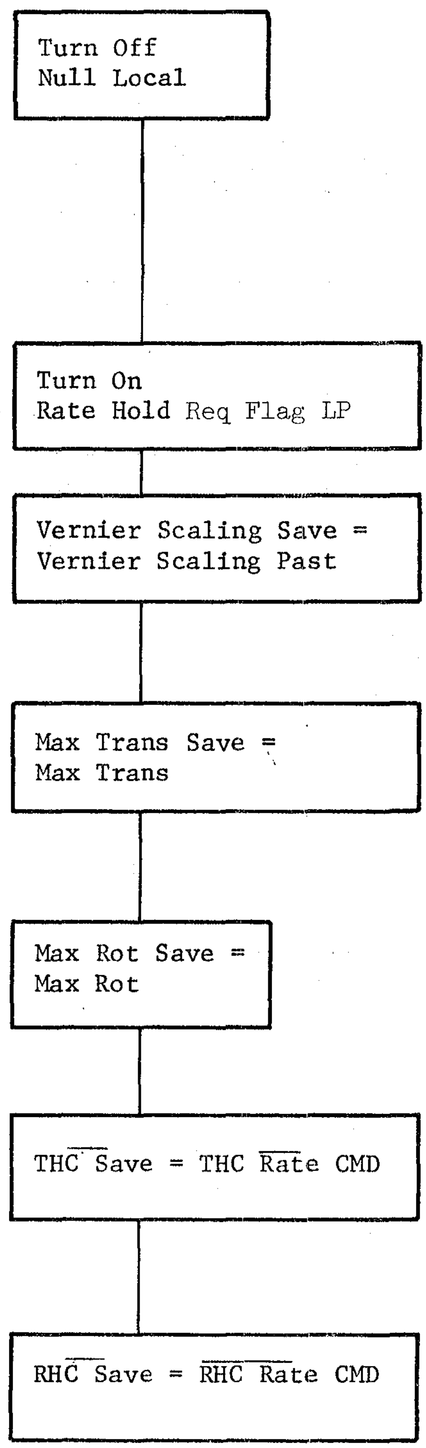

Figure 3.3.8.8-4. Retain Rate Process

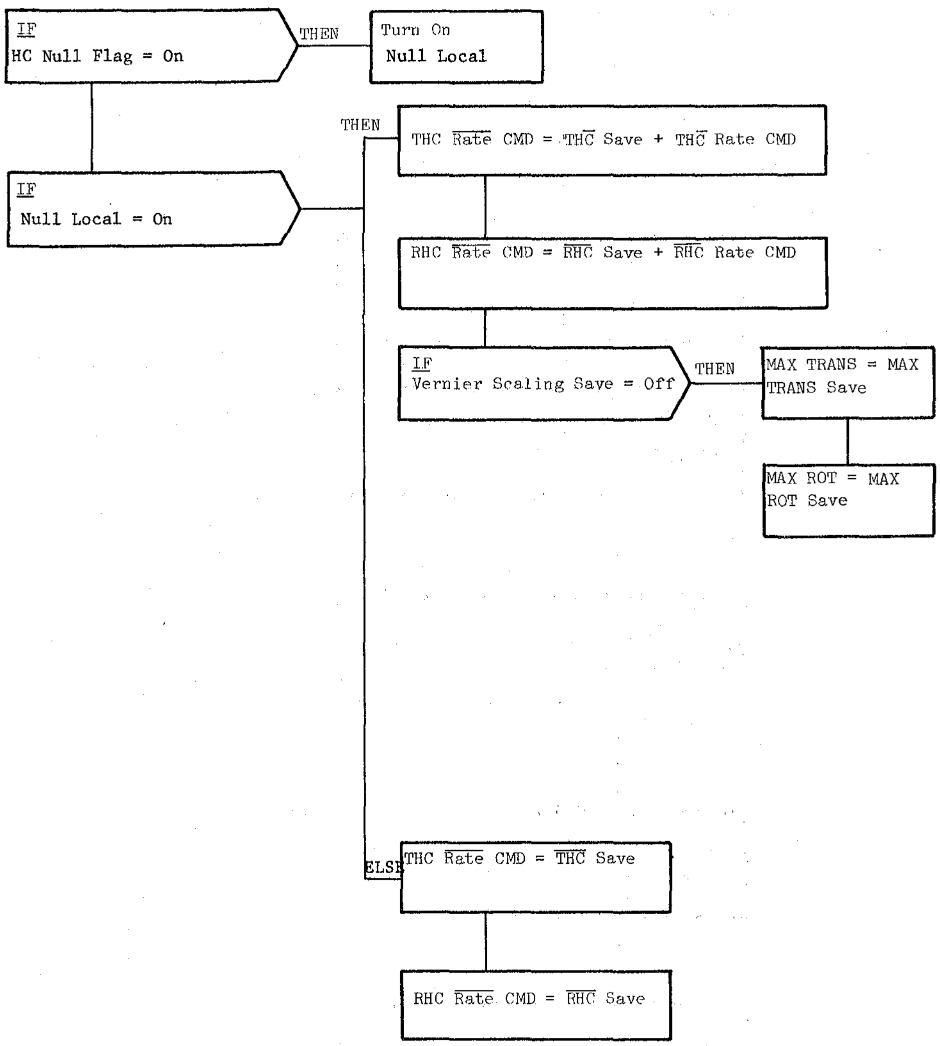

Figure 3.3.8.8-5. Null Process

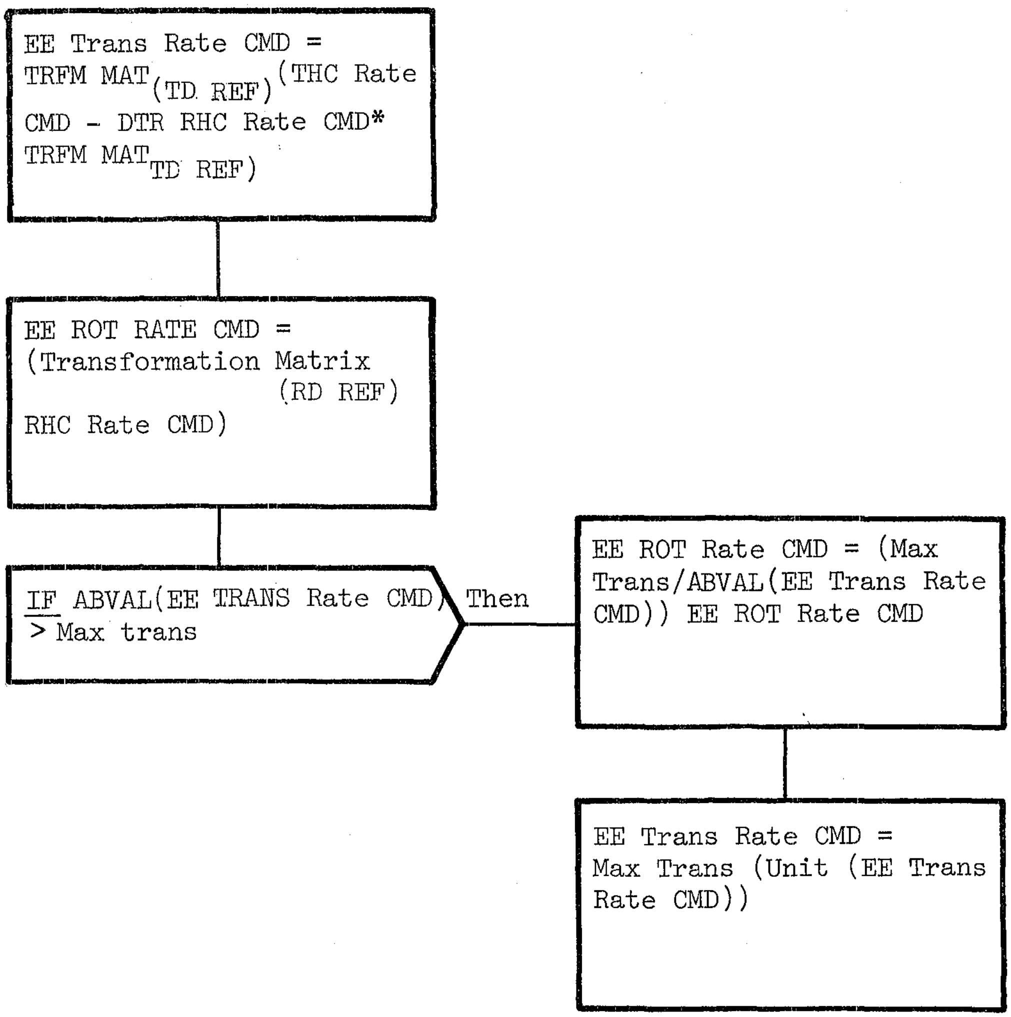

Figure 3.3.8.8-6. POR Conversion

3.3.8.9. Resolved Position Algorithm (RPO_RPOS)

The Resolved Position Algorithm (RPO) module determines the validity of a desired point of resolution (POR) position and attitude for a chosen arm, end effector, and payload. The desired point of resolution may be either the end effector or some other point associated with a payload.

a. Control Interface - RPO is SCHEDULE'd by the RMS Item Processor (RUD_KYBD) on demand.

   Invocation: SCHEDULE RPO_PROS PRIORITY (PRIO_RPO)

b. Inputs - Inputs to this module are specified in Table 3.3.8.9-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.9-1 through 3.3.8.9-9. The HAL variable names and other symbols taken directly from the Level C FSSR are documented in the module data list under the Requirement Symbol heading.

   RPO begins processing by copying the input data into local storage and then setting up various vectors to be used in the subsequent reference frame calculations. Next the shoulder and wrist yaw angles are processed. Based on the occurrence of the wrist yaw singularity, a single or dual pass flag is set. Next RPO computes elbow and shoulder pitch angles. If the wrist singularity condition did not occur, then the wrist pitch is also calculated. At any point where the calculated angle exceeds the soft stop limits, the fail flag is turned ON and second iteration is tested. If a second iteration occurs, the pitch inputs are modified and the second iteration controls are set to terminate after completion of the second iteration.

   RPO checks the fail flag and sets the operator command check index to 'GOOD' or 'FAIL' accordingly for CRT display and for output to the Automatic Sequence Processor (RAS).

   At this point RPO returns. There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.9-1.

e. Module References - None

f. Module Type and Attributes -

   Type: Program

   Attributes: N/A

g. Template References -

D	INCLUDE TEMPLATE CRD_CIL	Constants and I-Load Compool
D	INCLUDE TEMPLATE CRA_TE	Working Compool
D	INCLUDE TEMPLATE CRI_LVC	Level C Constants Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - RPO checks to see if the arm can attain some combination of joint angles that will place the point of resolution (POR) at the coordinates input by the operator. The 'GOOD' response indicates that the point is attainable by the hardware, not that the point is desirable or safe or avoids collision. Since RPO is not an exact inversion of the RKG major function, RPO cannot validate every point attainable by the arm. While RPO is active, the RMS Item Processor (RUD) inhibits the updating of the OPR CMD sequence data via an illegal entry message. The integrity of the data processed by RPO and subsequently by the Automatic Sequence Processor (RAS) is ensured by the blanking of the OPR CMD CHECK INDEX prior to SCHEDULE'ing RPO. RAS receives its data directly from RPO only after a successful verification of a sequence. The 'FAIL' or blank status of the OPR CMD CHECK INDEX inhibits execution of the data by RAS.

TABLE 3.3.8.9-1 Resolved Position Algorithm

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Desired point of resolution (POR) (X,Y,Z) in orbiter structural force	D.56 A.2.32	R	RUD	CRAV_POR_COR_DESIRED$(1to3)	V93J7520C-522C	OPR_POR_POS_DES
2	Desired point of resolution (POR) attitude (P,YAW,R) in rotation axis frame.	D.56 A.2.32	R	RUD	CRAV_POR_CORD_DESIRED$(4to6)	V93J7523C-525C	OPR_POR_ATT DES
3	Arm initialization flag	D.55 A.2.32	R	RUD	CRAV_ARM_INIT	V92X3830X	ARM_INIT_FLAG
4	RMS EE SEL	D.58 A.2.32	R	RUD	CRAV_RMS_EE_ID	V93J7507C V93J7508C	
5	OPR CMD check index	D.57 A.2.32	W	CRT, RAS	CRAV_OPR_CMD_CK_INDEX	V92X3640X	
6	Good arm init	D.59 A.2.32	W	RAS	CRAV_GOOD_ARM_INIT	V92X3830X	
7	Good EE selected	A.2.32	O	RPO	CRAV_GOOD_EE_SEL		
8	Good POR POS DES	D.61 A.2.32	W	RAS	CRAV_GOOD_POR_POS_DES	93J7520C-522C	
9	Good POR ATD DES	D.62 A.2.32	W	RAS	CRAV_GOOD_POR_ATD_DES	93J7523C-525C	
10	Desired point of resolution (POR) position (X, Y,Z) in orbiter structural frame	E	L		RPO_XYZ		XYZ
11	Desired point of resolution (POR) attitude (P,YAW,R) in rotation axis frame.	E	L		RPO_PYR		PYR
12	AIF (arm init flag)	E	L		RPO_AIF		
13	EE SEL	E	L		RPO_EE_SEL		
14	Sine of swingout joint angle	E	L		RPO_SIN_SWOUT		SIN_SWOUT
15	L ELP WY Sum of RATIO_ELW_CEPS and L_WP_WY	A.2.33	Z		CRDK_L_ELP_WY		

TABLE 3.3.8.9-1 Resolved Position Algorithm (cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
16	Sine of desired POR pitch attitude	E	L		RPO_SP		SP
17	Cosine of desired POR pitch attitude	E	L		RPO_CP		CP
18	Sine of desired POR yaw attitude	E	L		RPO_SY		SY
19	Cosine of desired POR yaw attitude	E	L		RPO_CY		CY
20	Length between wrist yaw joint and selected end-effector tip	E	L		RPO_L_WY_EET		L_WY_EET
21	Position vector from shoulder to wrist yaw joint	E	L		RPO_POS_SHY_WRY		POS_SHY_WRY
22	Fail Flag	E	L		RPO_FAIL_FLAG		
23	Sine of shoulder yaw joint	E	L		RPO_S1		S1
24	Cosine of shoulder yaw joint	E	L		RPO_C1		C1
25	Position vector from shoulder pitch to wrist yaw joint	E	L		RPO_POS_SHP_WRY		POS_SHP_WRY
26	SWRY (Sine of WRY)	E	L		RPO_SWRY		
27	PASS1 Flag	E	L		RPO_PASS1_FLAG		
28	PASS2 Flag	E	L		RPO_PASS2_FLAG		

TABLE 3.3.8.9-1 Resolved Position Algorithm (cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
29	Sine of shoulder, elbow, wrist pitch joint angle sum	E	L		RPO_S234		S234
30	Cosine of shoulder, elbow, wrist, pitch joint angle sum	E	L		RPO_C234		C234
31	Sum of shoulder, elbow, wrist pitch joint angles	E	L		RPO_SUM_PITCH		SUM_PITCH
32	NUM1	E	L		RPO_NUM1		
33	DEN1	E	L		RPO_DEN1		
34	K	E	L		RPO_K		
35	Elbow pitch joint angle	E	L		RPO_ELP		ELP
36	Shoulder pitch joint angle	E	L		RPO_SHP		SHP
37	Wrist pitch joint angle	E	L		RPO_WRP		WRP
38	SWRY MIN	A.2.33	Z		CRDK_SWRY_MIN		
39	Factor to convert feet to inches	A.2.33	Z		CRDK_FT_TO_IN		FT_TO_IN
40	Degrees to radians conversiton factor (π/180)	A.2.33	Z		CRDK_DTR		DTR
41	Sine of port swingout angle	A.2.33	Z		CRDK_SWOUT_SIN_PORT		SWOUT_SIN_PORT
42	Cosine of port swingout angle	A.2.33	Z		CRDK_SWOUT_COS_PORT		SWOUT_COS
43	Length from wrist yaw to wrist roll joint	A.2.33	Z		CRDK_L_WY_WR		L_WY_WR
44	Length from wrist roll to end effector attach point	A.2.33	Z		CRDK_L_WR_EEAP		L_WR_EEAP

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TABLE 3.3.8.9-1 Resolved Position Algorithm (cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
45	Length from end-effector attach point to tip	A.2.31	Z		CRIS_L_EEAP_EET	V98U5254C-255C	L_EEAP_EET
46	Location of the MPM OS selected arm manipulator positioning mechanism in the orbiter structural frame (X,Y,Z)	A.2.33	Z		CRDK_MPM_ATTH_PT		
47	Length from manipulator positioning mechanism to swingout joint	A.2.33	Z		CRDK_L_MPM_SWOUT		L_MPM_SWOUT
48	Length from swingout to shoulder yaw joint	A.2.33	Z		CRDK_L_SWOUT_SHY		L_SWOUT_SHY
49	Length from shoulder yaw to shoulder pitch joint	A.2.33	Z		CRDK_L_SHY_SHP		L_SHY_SHP
50	Length from wrist pitch to wrist yaw joint	A.2.33	Z		CRDK_L_WP_WY		L_WP_WY
51	Radians to degrees conversion factor (180/π)	A.2.33	Z		CRDK_RTD		RTD
52	Ratio of (L_SHP_ELP/COS DELTA)	A.2.33	Z		CRDK_RATIO_SHEL_CDEL		RATIO_SHEL_ CDEL
53	Ratio of (L_ELP_WP/COS EPSILON)	A.2.33	Z		CRDK_RATIO_ELW_CEPS		RATIO_ELW_ CEPS
54	Sum of DELTA and EPSILON	A.2.33	Z		CRDK_DELTA_EPSILON		DELTA_EPSILON
55	Arctangent of (elbow off-set/L_SHP_ELP)	A.2.33	Z		CRDK_RRP_DELTA		DELTA
56	Shoulder pitch lower limit	A.2.33	Z		CRDK_LOW_SW_STOP_LIM$(2)		SHP_MIN
57	Shoulder pitch upper limit	A.2.33	Z		CRDK_UP_SW_ STOP_LIM$(2)		SHP_MAX
58	Elbow pitch lower limit	A.2.33	Z		CRDK_LOW_SW_STOP_LIM$(3)		ELP_MIN
59	Elbow pitch upper limit	A.2.33	Z		CRDK_UP_SW_STOP_LIM$(3)		ELP_MAX
60	Wrist pitch lower limit	A.2.33	Z		CRDK_LOW_SW_STOP_LIM$(4)		WRP_MIN
61	Wrist pitch upper limit	A.2.33	Z		CRDK_UP_SW_STOP_LIM$(4)		WRP_MAX

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TABLE 3.3.8.9-1 Resolved Position Algorithm (cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
62	APZERO	A.2.33	Z		CRDK_APZERO		
63	Good PL INIT	D.63 A.2.32	W	RAS	CRAV_GOOD_PL_INIT	V92J3677C	PLIDNT
64	PL INIT ID	D.64 A.2.32	R	RUD	CRAV_PL_INIT	V93J7541C	PL_INIT_ID
65	PID	E	L		RPO_PID		
66	Sine of desired POR roll attitude	E	L		RPO_SR		SR
67	Cosine of desired POR roll attitude	E	L		RPO_CR		CR
68	POR TO OS (Transformation matrix from POR frame to orbiter structural frame)	E	L		RPO_POR_TO_OS		
69	Vector from end effector tip to point of resolution	E	L		RPO_V_EE_POR		V_EE_POR
70	Vector from end effector tip to point of resolution in payload frame	A.2.31	Z		CRIS_V_EE_POR_SEL	V96U6770C-787C	V_EE_POR_SEL

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TABLE 3.3.8.9-1 Resolved Position Algorithm (cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
71	Vector from the payload POR to the end effector tip in end effector frame	E	L		RPO_PL_TO_EE		PL_TO_EE
72	Transformation matrix from payload operating frame to end effect or operating frame	A.2.31	Z		CRIS_PL_TO_EE_OP_SEL	V98U5308C-352C V96U6707C-715C	PL_TO_EE_OP_SEL
73	EE TO OS (Transformation matrix from end effector to orbiter structural frame)	E	L		RPO_EE_TO_OS		
74	OS TO SWOUT (Transformation matrix from the orbiter structural to swing out frame)	E	L		RPO_OS_TO_SWOUT		
75	Position vector from wrist yaw joint to end effector tip	E	L		RPO_POS_WRY_EET		POS_WRY_EET
76	Position vector from the manipulator positioning mechanism to swing out joint	E	L		RPO_POS_MPM_SWOUT		POS_MPM_SWOUT
77	Position vector from swing out joint to shoulder yaw joint	E	L		RPO_POS_SWOUT_SHY		POS_SWOUT_SHY
78	Shoulder yaw joint angle	E	L		RPO_SHY		SHY
79	SWOUT TO AM (Transformation matrix from the swing out to arm reference frame)	E	L		RPO_SWOUT_TO_AM		

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TABLE 3.3.8.9-1 Resolved Position Algorithm (cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
80	EE TO AM (Transformation matrix from end effector to arm reference frame)	E	L		RPO_EE_TO_AM		
81	Position vector from shoulder yaw to shoulder pitch joint	E	L		RPO_POS_SHY_SHP		POS_SHY_SHP
82	Position vector from shoulder pitch to wrist pitch joint	E	L		RPO_POS_SHP_WRP		POS_SHP_WRP
83	NUM2	E	L		RPO_NUM2		
84	NUM3	E	L		RPO_NUM3		
85	S3DE	E	L		RPO_S3DE		
86	OPR CMD CK FLAG	A.2.32	W	DL	CRAV_OPR_CMD_CK_FLAG	V92J3675C	
87	Good XYZ	E	L		RPO_GOOD_XYZ		

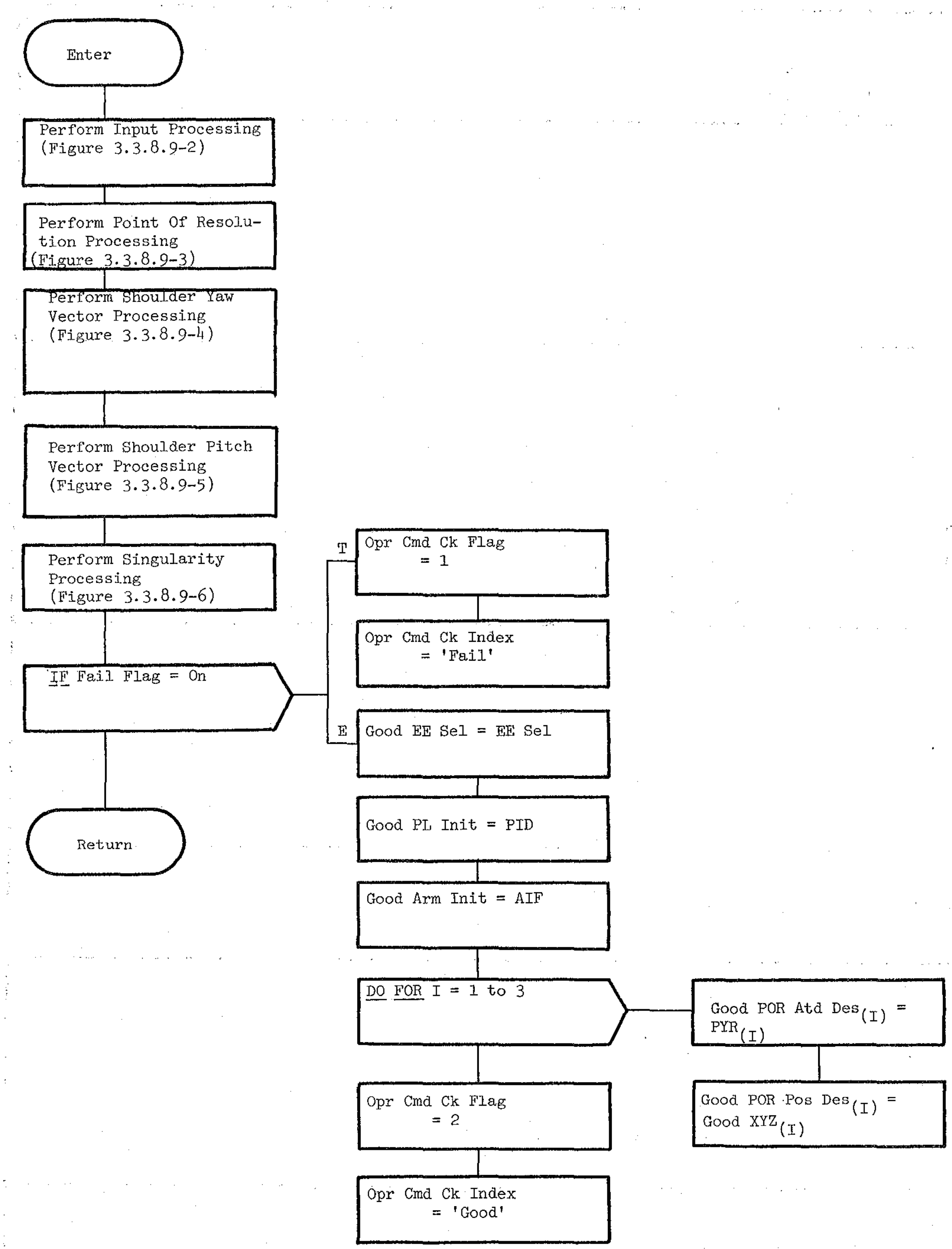

Figure 3.3.8.9-1. Resolved Position Algorithm

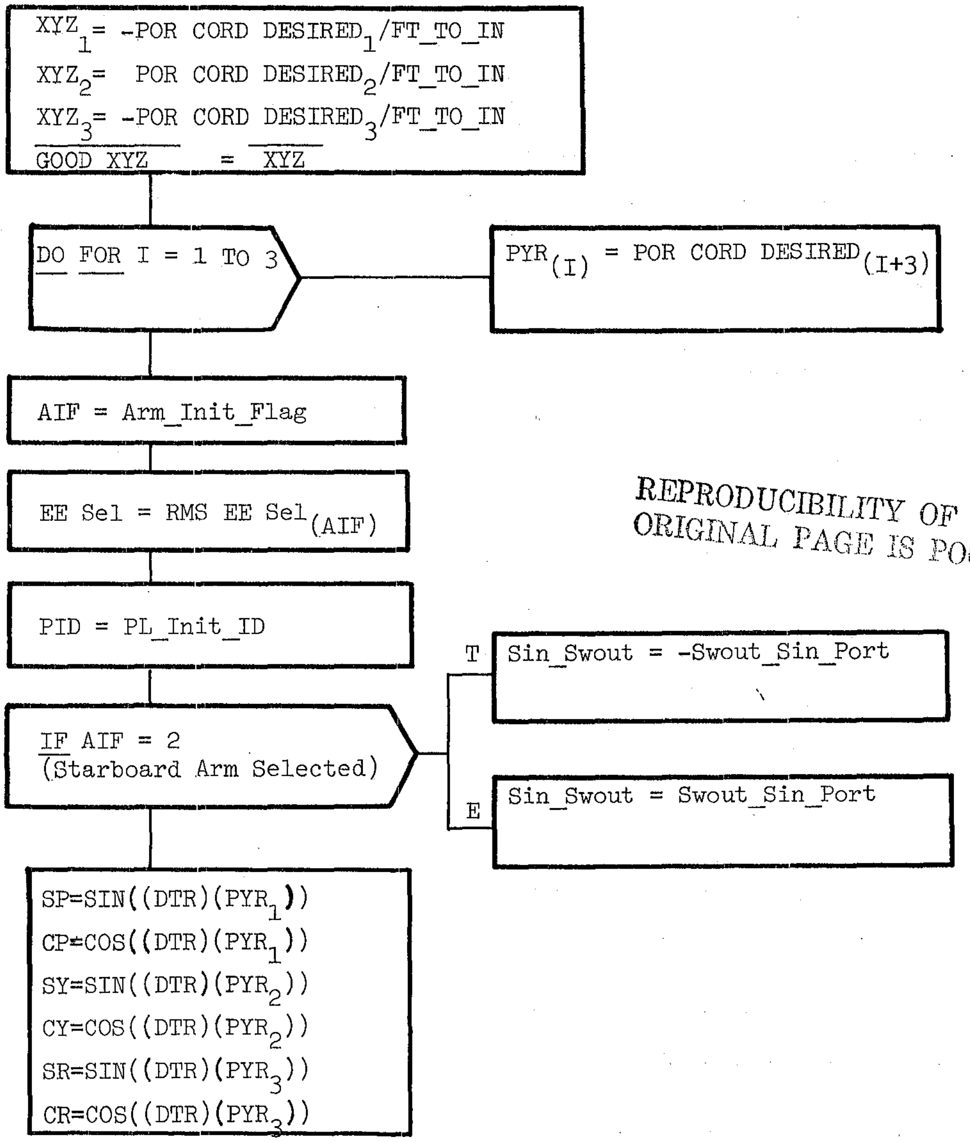

Figure 3.3.8.9-2. Input Processing

BOOK: OFT SM Detailed Design Specification

POR *To OS = MATRIX
(CY CP, CR SY CP-SR SP,-SR SY CP-CR SP,
-SY, CR CY , -SR CY
CY SP, CR SY SP+SR CP,-SR SY SP+CR CP)

$V\_EE\_POR_{(1)} = V\_EE\_POR\_SEL_{(PID:1)}$
$V\_EE\_POR_{(2)} = -V\_EE\_POR\_SEL_{(PID:2)}$
$V\_EE\_POR_{(3)} = -V\_EE\_POR\_SEL_{(PID:3)}$

$PL\_TO\_EE_{(1,1)} = PL\_TO\_EE\_OP\_SEL_{(PID:1,1)}$
$PL\_TO\_EE_{(1,2)} = -PL\_TO\_EE\_OP\_SEL_{(PID:1,2)}$
$PL\_TO\_EE_{(1,3)} = -PL\_TO\_EE\_OP\_SEL_{(PID:1,3)}$
$PL\_TO\_EE_{(2,1)} = -PL\_TO\_EE\_OP\_SEL_{(PID:2,1)}$
$PL\_TO\_EE_{(2,2)} = PL\_TO\_EE\_OP\_SEL_{(PID:2,2)}$
$PL\_TO\_EE_{(2,3)} = PL\_TO\_EE\_OP\_SEL_{(PID:2,3)}$
$PL\_TO\_EE_{(3,1)} = -PL\_TO\_EE\_OP\_SEL_{(PID:3,1)}$
$PL\_TO\_EE_{(3,2)} = PL\_TO\_EE\_OP\_SEL_{(PID:3,2)}$
$PL\_TO\_EE_{(3,3)} = PL\_TO\_EE\_OP\_SEL_{(PID:3,3)}$

$X\bar{Y}Z = X\bar{Y}Z - (POR \overset{*}{To}\ OS)\ (V\_E\bar{E}\_POR)$

$EE\_\overset{*}{To}\_OS = (POR\ To\ OS)\ (PL\_\overset{*}{TO}\_EE)^T$

Figure 3.3.8.9-3. Point of Resolution Processing

```
OS *To SWOUT = MATRIX
( 1      ,    0    ,       0
  0      ,COS_SWOUT, SIN_SWOUT,
  0     ,-SIN_SWOUT,COS_SWOUT)
```

```
L_WY_EET = L_WY_WR + L_WR_EEAP +
L_EEAP_EET(EE SEL)
```

```
POS_WRY_EET = EE *To OS
(VECTOR (L_WY_EET,0,0,))
```

```
POS_MPM_SWOUT = VECTOR
(0, 0, L_MPM_SWOUT)
```

```
POS_SWOUT_SHY = VECTOR
(0, 0, L_SWOUT_SHY)
```

```
POS_SHY_WRY = OS *To SWOUT
(XYZ - MPM_OS(AIF)
- POS_MPM_SWOUT
- POS_WRY_EET      )
- POS_SWOUT_SHY
```

Figure 3.3.8.9-4. Shoulder Yaw Vector Processing

SHY = RTD ARCTAN 2
($POS\_SHY\_WRY_2$, $POS\_SHY\_WRY_1$)

S1 = SIN(DTR SHY)

C1 = COS(DTR SHY)

SWOUT To* AM = MATRIX
(C1, S1, 0,
-S1, C1, 0,
 0 , 0 , 1,

EE To* AM =(SWOUT To* AM)
(OS To* SWOUT) (EE To* OS)

POS_SHY_SHP = VECTOR
(0, 0, L_SHY_SHP)

POS_SHP_WRY =
(SWOUT_To*_AM)
(POS_SHY_WRY)
-(POS_SHY_SHP)

Figure 3.3.8.9-5. Shoulder Pitch Vector Processing

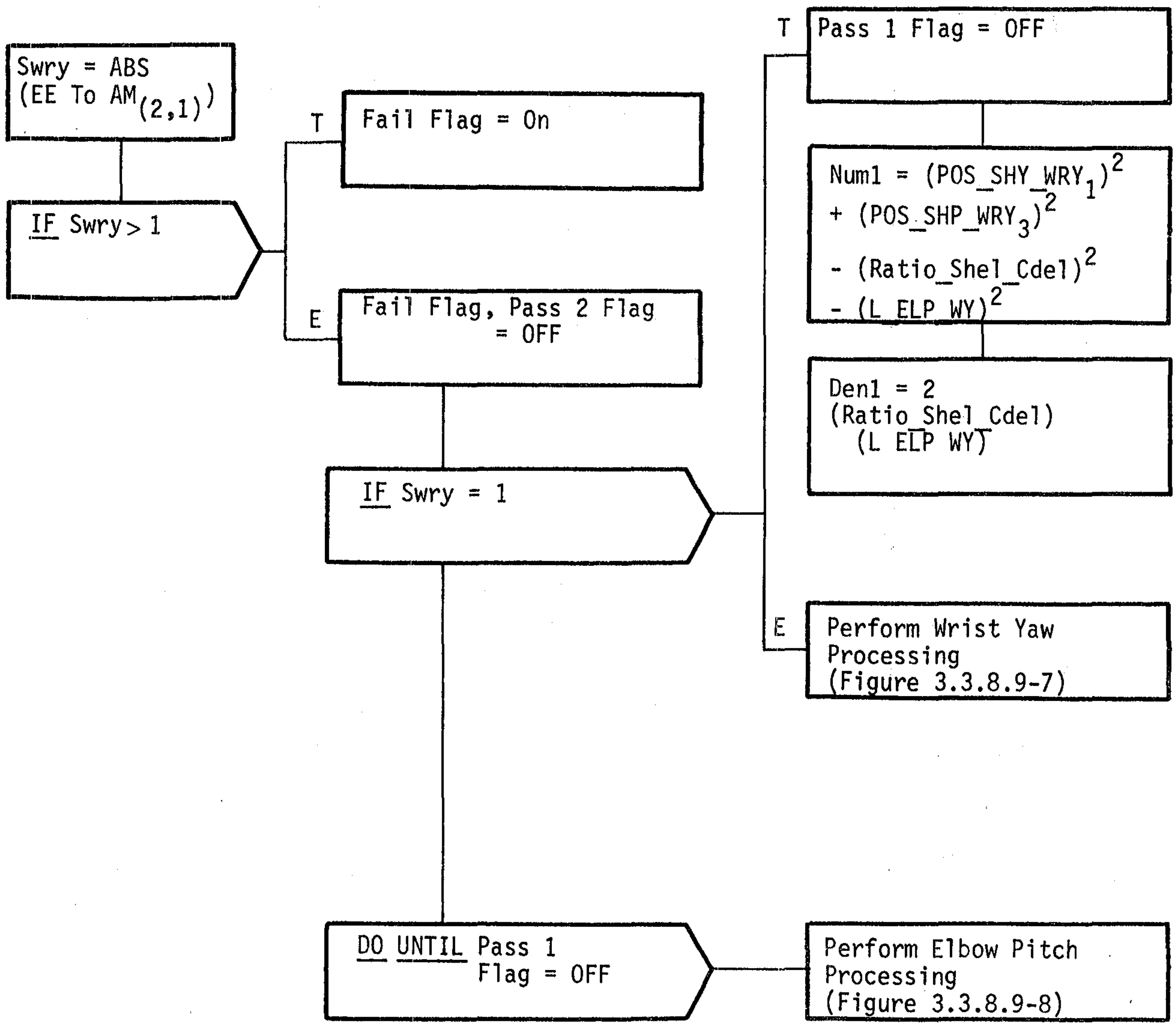

Figure 3.3.8.9-6. Singularity Processing

Pass1 Flag = On

Sum_Pitch = RTD Arctan2 (EE To $AM_{(3,1)}$, EE To $AM_{(1,1)}$)

S234 = Sin (DTR (Sum_Pitch))

C234 = Cos (DTR (Sum-Pitch))

POS_SHP_WRP = POS_SHP_WRY - Vector ((C234)(L_WP_WY), 0, (-S234) (L_WP_WY))

Num1 = $(\text{POS\_SHP\_WRP}_1)^2$ + $(\text{POS\_SHP\_WRP}_3)^2$ - $(\text{Ratio\_Shel\_Cdel})^2$ - $(\text{Ratio\_Elw\_Ceps})^2$

Den1 = 2 (Ratio_Shel_Cdel) (Ratio_Elw_Ceps)

Figure 3.3.8.9-7. Wrist Yaw Processing

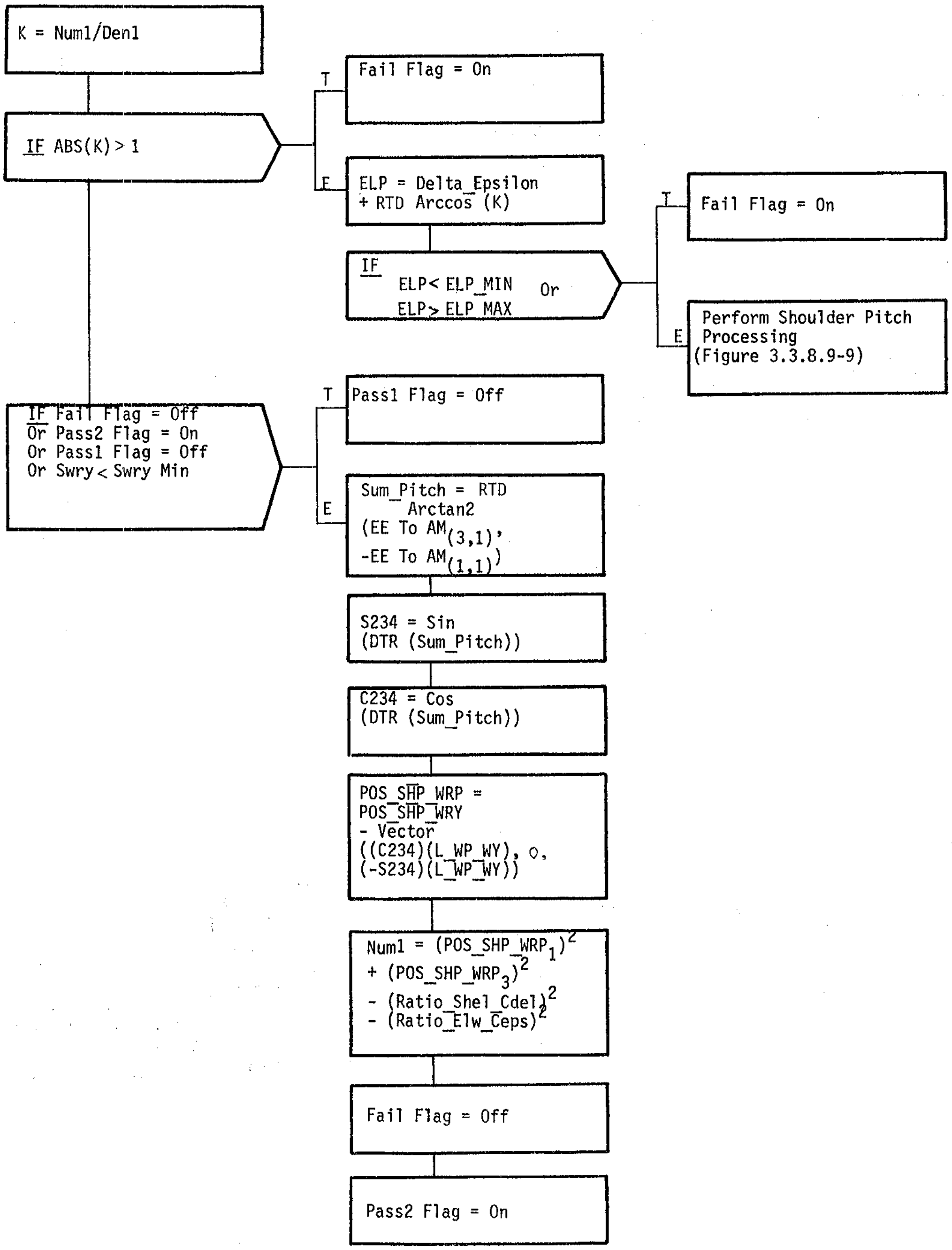

Figure 3.3.8.9-8. Elbow Pitch Processing

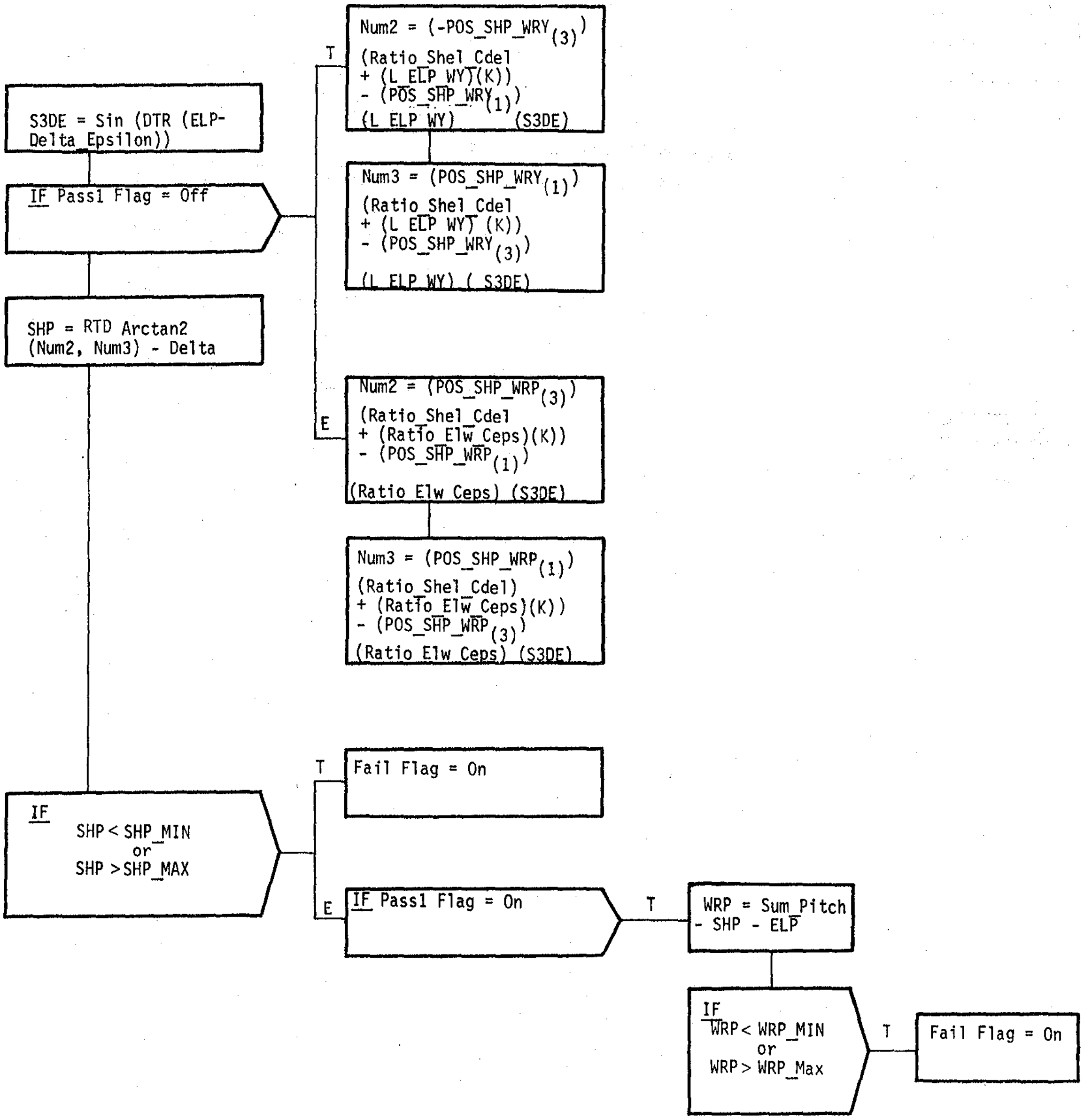

Figure 3.3.8.9-9. Shoulder Pitch Processing

3.3.8.10 Automatic Sequence Processor (RAS_AUTOSEQ)

The Automatic Sequence Processor (RAS) module validates and controls the operator commanded and pre-stored auto sequence processing.

a. Control Interface - RAS is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RAS_AUTOSEQ

b. Inputs - Inputs to this module are specified in Table 3.3.8.10-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.10-1 through 3.3.8.10-15.

   RAS processing on the first auto configuration cycle consists of validation checks for an operator commanded sequence or a pre-stored auto sequence and initialization for the sequence when valid.

   Operator commanded sequence validation consists of verifying that the Resolved Position Algorithm (RPO) declared the sequence 'GOOD' and that the arm and payload used by RPO are the ones currently in use by the RMS software. If all checks are successful, the Auto Sequence Ready light and Next Point Flag are turned ON.

   Pre-stored auto sequence validation consists of verifying that:

   1. The arm specified in the sequence matches the arm selected,

   2. The EE specified in the sequence matches the EE selected,

   3. If the automatic sequence is designed for an unloaded arm, then a payload is not captured,

   4. If a payload is specified in the sequence, it matches the selected payload,

   5. The current POR position and attitude meet the initial tolerance condition of the starting point in the sequence.

   If all checks are successful, the Auto Sequence Ready light is turned ON, the desired EE position and attitude vectors are initialized, and the transformation matrix (from orbiter structural frame to POR orientation) is computed.

   If this is not the first time that the auto sequence module (RAS) is to be executed and the Waiting Flag is ON, the waiting mode is processed. If the sequence is invalid, RAS remains in the position hold mode. But if the sequence is valid and the operator requests a continuation of the automatic sequence, the progressing mode is entered.

If a new trajectory point is to be acquired, vectors are computed for the desired position and attitude, translation and rotation rates for the point of resolution are computed, and checks for either stopping or continuing a trajectory are made.

If the operator requests the sequence to stop, the current mode is cancelled and the time mode is initialized. If a pause is requested, the position and attitude errors are checked to determine if the point of resolution is within the washout region. If the point of resolution is within the washout region, the point of resolution rates are decreased such that the desired sequence point is achieved. When the point of resolution is not to stop at the point it is moving toward, RAS determines if it is within the fly-by region. When the point of resolution is within the fly-by region, the point has been reached and RAS proceeds to acquire the next point. Whenever the arm is stopped at a point in the pre-stored auto sequence, the point number is output to the RMS control display. When the arm is moving, the most recently passed point number is output to the display.

When the arm has been stopped, the Auto Sequence in Progress light is turned OFF and if the last point in a pre-stored auto sequence has not been reached, then the Auto Sequence Ready light is turned ON to allow the operator to resume execution of that sequence.

There is no SPEC initialization or cleanup processing.

d. Output - Outputs from this module are specified in Table 3.3.8.10-1.

e. Module References - None

f. Module Type and Attributes -

   Type: External Procedure

   Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool
D INCLUDE TEMPLATE CRD_CIL	Constants Compool
D INCLUDE TEMPLATE CRC_COT	RMS Constants Table
D INCLUDE TEMPLATE CRF_ASC	Pre-stored Auto Sequence Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions -

- The final point in a pre-stored auto sequence is always a pause point.
- A valid pre-stored auto sequence will always have more than one point.
- There are no requirements for positive feedback to the crew on the following errors:

  1. Operator command mode requested and operator command check is "FAIL".
  2. Operator command mode requested and a different arm, PL or EE is selected than the one used by Resolved Position Algorithm (RPO).
  3. No pre-stored auto sequence has been initialized for the selected auto submode.
  4. Auto sequence is requested and the arm, EE, or payload does not match the ones specified in the pre-stored sequence.
  5. Auto sequence is requested and the initial tolerance conditions are not met.
  6. Auto sequence is requested and the auto sequence start point from RMS control is out of the valid range of point numbers.

- The position and attitude specified for non-pause points may not be achieved.
- There is a possibility of collision between payload and orbiter/obstructions unless simulations of the auto sequences are performed and validated for the payload(s) to be used prior to flights.
- A valid operator commanded sequence from RPO indicates that the point is attainable by the hardware, not that the point is desirable, safe, avoids collision nor avoids reach limits.
- The washout region is larger than the flyby region, which is larger than the position hold region.

Table 3.3.8.10-1 Automatic Sequence Processor

#	ITEM	DESCRIPTOR	ACT	SOURCE/ DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	First Pass Flag	A.2.32	I	RXY	CRAB_RAS_FIRST_TIME	V92X3149X	
2	Selected RMS Seq. ID	A.2.32	I	RXY	CRAV_AUTO_SEQ_ACT	V92U3105C	
3	Auto Seq. Proceed/Stop	A.2.32	I	RCD	CRAV_AUTO_GO_STOP		
4	Arm Select Index	A.2.32	I	RCD	CRAV_ARM_SEL		
5	Selected EE Index	A.2.32	I	RCD	CRAV_EE_ID_ACT		
6	Selected PYLD Index	A.2.32	I	RCD	CRAV_PYLD_ID_ACT		
7	PL Capture	A.2.32	I	RCD	CRAB_PYLD_CAP		
8	Auto Seq. Start Point Flag	A.2.32	I	RUD	CRAB_AUTO_SEQ_FLAG	V93X7551X	
9	Auto Seq. Start Point	A.2.32	I	RUD	CRAV_AUTO_SEQ_STR_PT	V93J7550C	
10	Transformation Matrices	A.2.32	I	RKG			
	(POR to OS)				CRAV_TRFM_MAT$(1)	V92U3390C-398C	
	(POR to AM)				CRAV_TRFM_MAT$(2)	V92U3400C-408C	
	(OS to AM)				CRAV_TRFM_MAT$(3)	V92U3380C-388C	
11	Position of POR in OS (POR_POS_OS)	A.2.32	I	RKG	CRAV_POR_POS_OS	V92H3330C-332C	
12	TD Ref ID	A.2.32	I	RXY	CRAV_TD_REF_ID	V92U3110C	
13	RD Ref ID	A.2.32	I	RXY	CRAV_RD_REF_ID	V92U3115C	
14	OPR CMD CK Index	D.57, A.2.32	I/R	RUD/RPO	CRAV_OPR_CMD_CK_INDEX	V92X3840X	
15	Good Arm Init	D.59, A.2.32	R	RPO	CRAV_GOOD_ARM_INIT	V92X3830X	
16	Good POR Pos Desired	D.61, A.2.32	R	RPO	CRAV_GOOD_POR_POS_DES	V93J7520C-522C	
17	Good POR Att Desired	D.62, A.2.32	R	RPO	CRAV_GOOD_POR_ATD_DES	V93J7523C-525C	

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Table 3.3.8.10-1 (Cont'd) Automatic Sequence Processor

#	ITEM	DESCRIPTOR	ACT	SOURCE/ DESTINATION	HAL NAME	MML	REQT. SYMBOL
18	Auto Seq. In Prog	A.2.34	I/W	RXY/MCIU	CREB_AUTO_SEQ_IN_PROG	V72X2942J	
19	Auto Seq. Last Point	A.2.32	O	CRT,DL	CRAV_AUTO_SEQ_LAST_POINT	V92J3241C	
20	Position Hold Flag	A.2.32	O	RWP, DL	CRAB_POSITION_HOLD	V92X3141X	
21	EE Trans Rate Cmd	A.2.32	O	RRP, DL	CRAV_EE_XLT_RATE_CMD_AM	V92R3175C-177C	
22	EE Rot Rate Cmd	A.2.32	O	RRP, DL	CRAV_EE_ROT_RATE_CMD_AM	V92R3180C-182C	
23	Auto Seq Ready	A.2.34	I/W	RXY/MCIU	CREB_AUTO_SEQ_READY	V72X2941J	
24	Auto Seq Length	A.2.35	Z		CRFS_SEQ_LENGTH		
25	Auto Seq Arm ID	A.2.35	Z		CRFS_SEQ_ARM_ID		
26	Auto Seq EE ID	A.2.35	Z		CRFS_SEQ_EE_ID		
27	Auto Seq PYLD ID	A.2.35	Z		CRFS_SEQ_PYLD_ID	V98U5563C -	
28	Point Table Index	A.2.35	Z		CRFS_POINT_INDEX	V98U5702C	
29	Auto Seq Trans IC Tol	A.2.35	Z		CRFS_TRANS_IC_TOL		
30	Auto Seq Rot IC Tol	A.2.35	Z		CRFS_ROT_IC_TOL		
31	Pause Table Flags	A.2.35	Z		CRFS_PAUSE_FLAG	V98U5363C-562C	
32	Sel PL Trans Rate Coarse	D.12 A.2.37	Z	STM	CRSS_TRNS_RATE_PYLD_SEL_ CRS	V93R7600C V93R7611C-615C	
33	Sel PL Rot Rate Coarse	D.12 A.2.37	Z	STM	CRSS_ROT_RATE_PYLD_SEL_ CRS	V93R7601C V93R7621C-625C	
34	Degrees to Radians Conversion Factor ($^{\pi}/180$)	A.2.33	Z		CRDK_DTR		DTR
35	Radians To Degrees Conversion Factor ($^{180}/\pi$)	A.2.33	Z		CRDK_RTD		RTD
36	Max Dist	A.2.33	Z		CRDK_MAX_DIST		

Table 3.3.8.10-1 (Cont'd) Automatic Sequence Processor

#	ITEM	DESCRIPTOR	ACT	SOURCE/ DESTINATION	HAL NAME	MML	REQT. SYMBOL
37	Max Phi	A.2.33	Z		CRDK_MAX_PHI		
38	Dist Washout	A.2.33	Z		CRDK_DIST_WASHOUT		
39	Phi Washout	A.2.33	Z		CRDK_PHI_WASHOUT		
40	Dist Flyby	A.2.33	Z		CRDK_DIST_FLYBY		
41	Phi Flyby	A.2.33	Z		CRDK_PHI_FLYBY		
42	Dist Hold	A.2.33	Z		CRDK_DIST_HOLD		
43	Phi Hold	A.2.33	Z		CRDK_PHI_HOLD		
44	Dist Exp	A.2.33	Z		CRDK_DIST_EXP		
45	Phi Exp	A.2.33	Z		CRDK_PHI_EXP		
46	XYZ	E	L		RAS_XYZ		
47	PYR	E	L		RAS_PYR		
48	Pause Flag	E	L		RAS_PAUSE_FLAG		
49	SP	E	L		RAS_SP		
50	CP	E	L		RAS_CP		
51	SY	E	L		RAS_SY		
52	CY	E	L		RAS_CY		
53	SR	E	L		RAS_SR		
54	CR	E	L		RAS_CR		
55	Str to Des	E	L		RAS_STR_TO_DES		
56	Pointer	E	L		RAS_POINTER		
57	Dist	E	L		RAS_DIST		
58	Phi	E	L		RAS_PHI		
59	Err Mat	E	L		RAS_ERR_MAT		

Table 3.3.8.10-1 (Cont'd) Automatic Sequence Processor

#	ITEM	DESCRIPTOR	ACT	SOURCE/ DESTINATION	HAL NAME	MML	REQT. SYMBOL
60	KFPS	E	L		RAS_KFPS		
61	KDPS	E	L		RAS_KDPS		
62	XYZ Dot	E	L		RAS_XYZ_DOT		
63	PYR Dot	E	L		RAS_PYR_DOT		
64	Dist Min	E	L		RAS_DIST_MIN		
65	Phi Min	E	L		RAS_PHI_MIN		
66	Gain	E	L		RAS_GAIN		
67	X	E	L		RAS_X		
68	Y	E	L		RAS_Y		
69	Z	E	L		RAS_Z		
70	Next Point Flag	E	L		RAS_NEXT_POINT_FLAG		
71	Good PL Init	A.2.32 D.63	R	RPO	CRAV_GOOD_PL_INIT	V92J3677C	
72	Selected Vector from EE to POR (V_EE_POR)	A.2.32	I	RKG	CRAV_V_EE_POR	V92H3421C-423C	
73	Max Trans	E	L		RAS_MAX_TRANS		
74	Joint Rates	A.2.32	I	RYE	CRAV_JAR_ATL	V92R3310C-315C	
75	Mode Change Thresh	A.2.33	Z		CRDK_MODE_CHG_THRESH		
76	Progressing Flag	E	L		RAS_PROGRESSING_FLAG		

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TABLE 3.3.8.10-1 (cont'd) Automatic Sequence Processor MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
77	Waiting Flag	E	L		RAS_WAITING_FLAG		
78	Distance Flag	E	L		RAS_DISTANCE_FLAG		
79	Time Flag	E	L		RAS_TIME_FLAG		
80	Arm ID	E	L		RAS_ARM_ID		
81	EE ID	E	L		RAS_EE_ID		
82	PL ID	E	L		RAS_PL_ID		
83	Pos Tol	E	L		RAS_POS_TOL		
84	Att Tol	E	L		RAS_ATT_TOL		
85	Seq Length	E	L		RAS_SEQ_LENGTH		
86	Seq_INIT_Fail	E	L		RAS_SEQ_INIT_FAIL		
87	Auto Seq Position X	A.2.35	Z		CRFS_POS_X		
88	Auto Seq Position Y	A.2.35	Z		CRFS_POS_Y		
89	Auto Seq Position Z	A.2.35	Z		CRFS_POS_Z		
90	Auto Seq Attitude P	A.2.35	Z		CRFS_ATD_P	V98U5703C-	
91	Auto Seq Attitude Y	A.2.35	Z		CRFS_ATD_Y	V98U6902C	
92	Auto Seq Attitude R	A.2.35	Z		CRFS_ATD_R		
93	Ft to IN	A.2.33	Z		CRDK_FT_TO_IN		
94	Submode	A.2.32	I	RQC	CRAV_SUBMODE_ID	V92J3135C	
95	Auto Seq last Point Blanking word	A.2.32	O	CRT	CRAV_AUTO_SEQ_LAST_PT_BM		
96	Trans Time	E	L		RAS_TRANS_TIME		
97	Rot Time	E	L		RAS_ROT_TIME		
98	Apzero	A.2.33	Z		CRDK_APZERO		
99	POR Index	A.2.32	I	RXY	CRAV_POR_INDEX	V92X3107X	

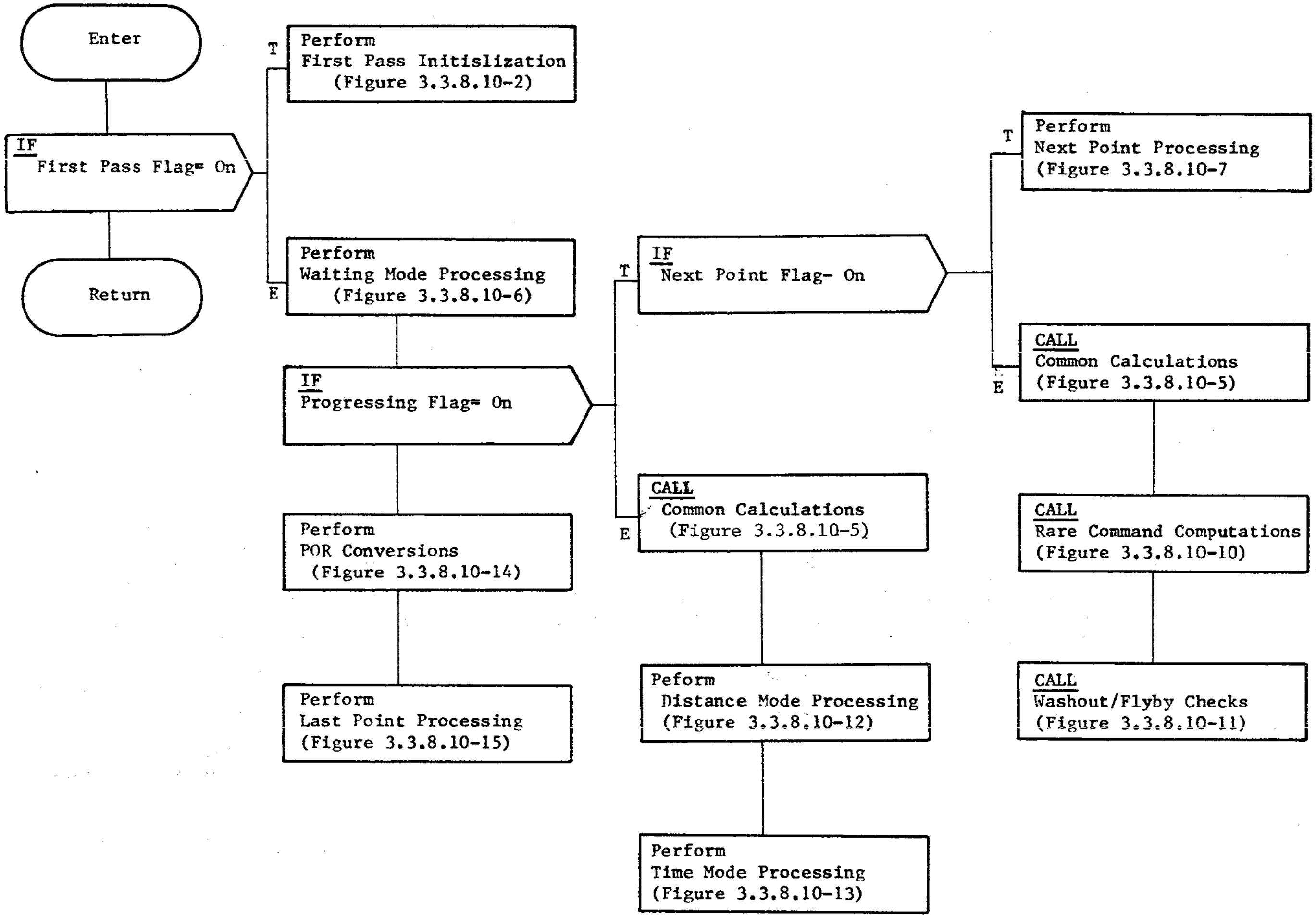

Figure 3.3.8.10-1. Automatic Sequence Processor

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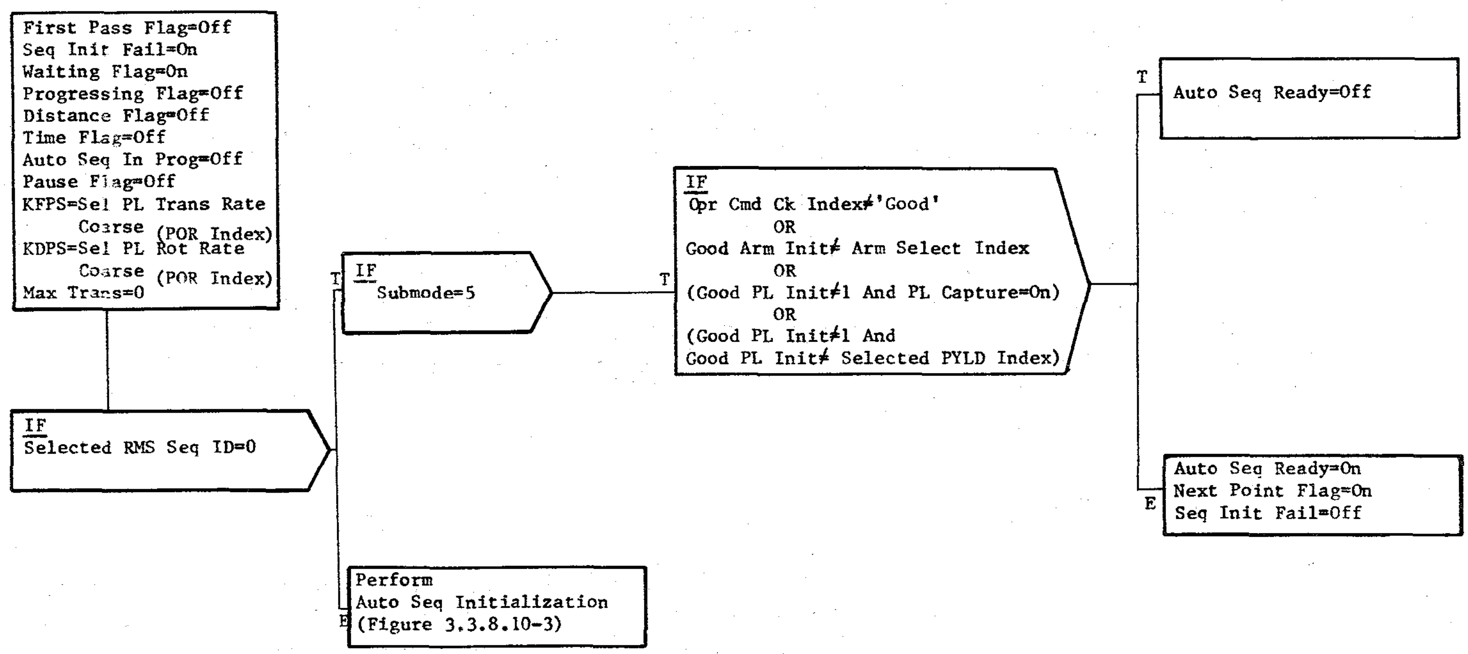

Figure 3.3.8.10-2. First Pass Initialization

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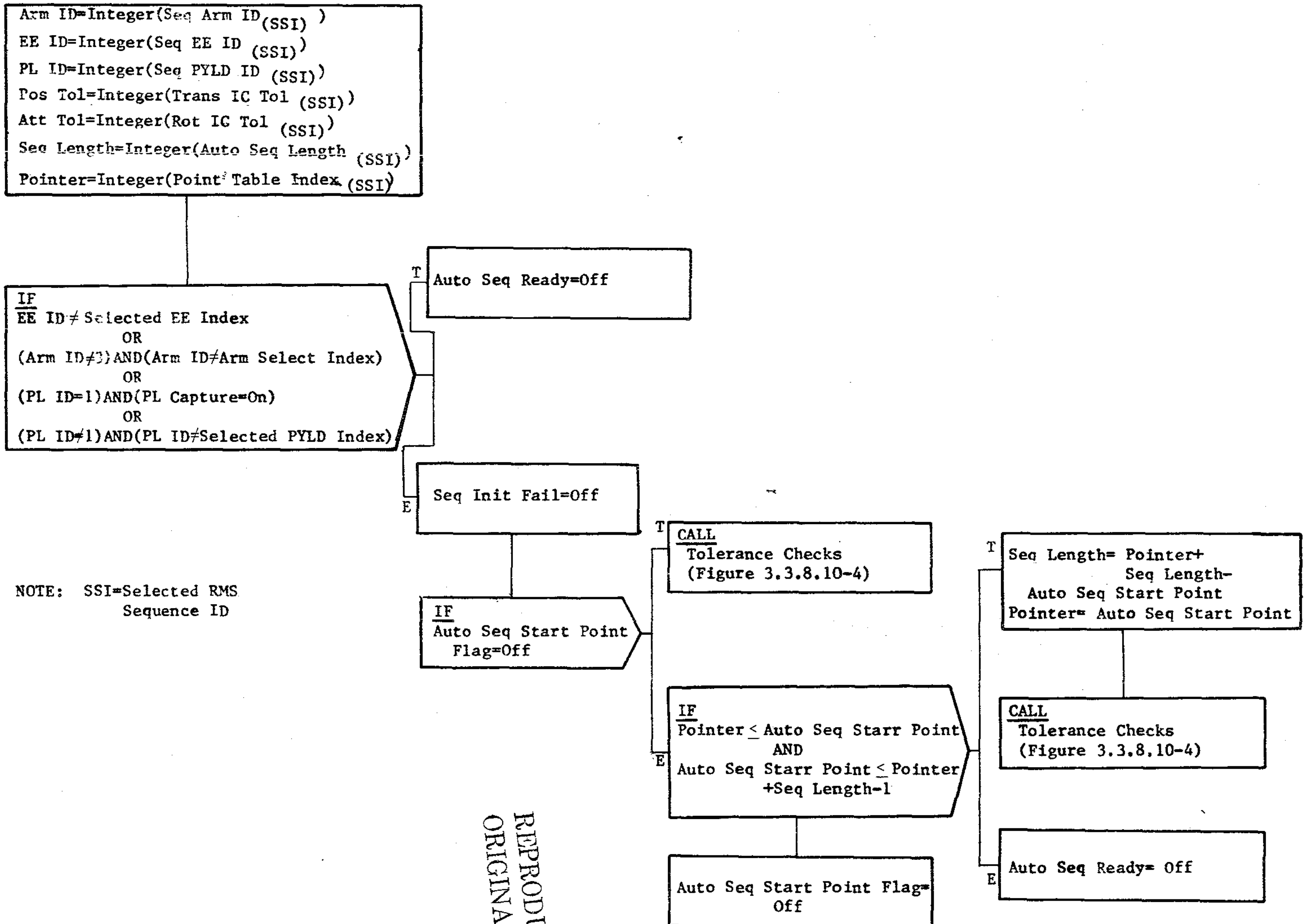

NOTE: SSI=Selected RMS Sequence ID

Figure 3.3.8.10-3. Auto Seq Initialization

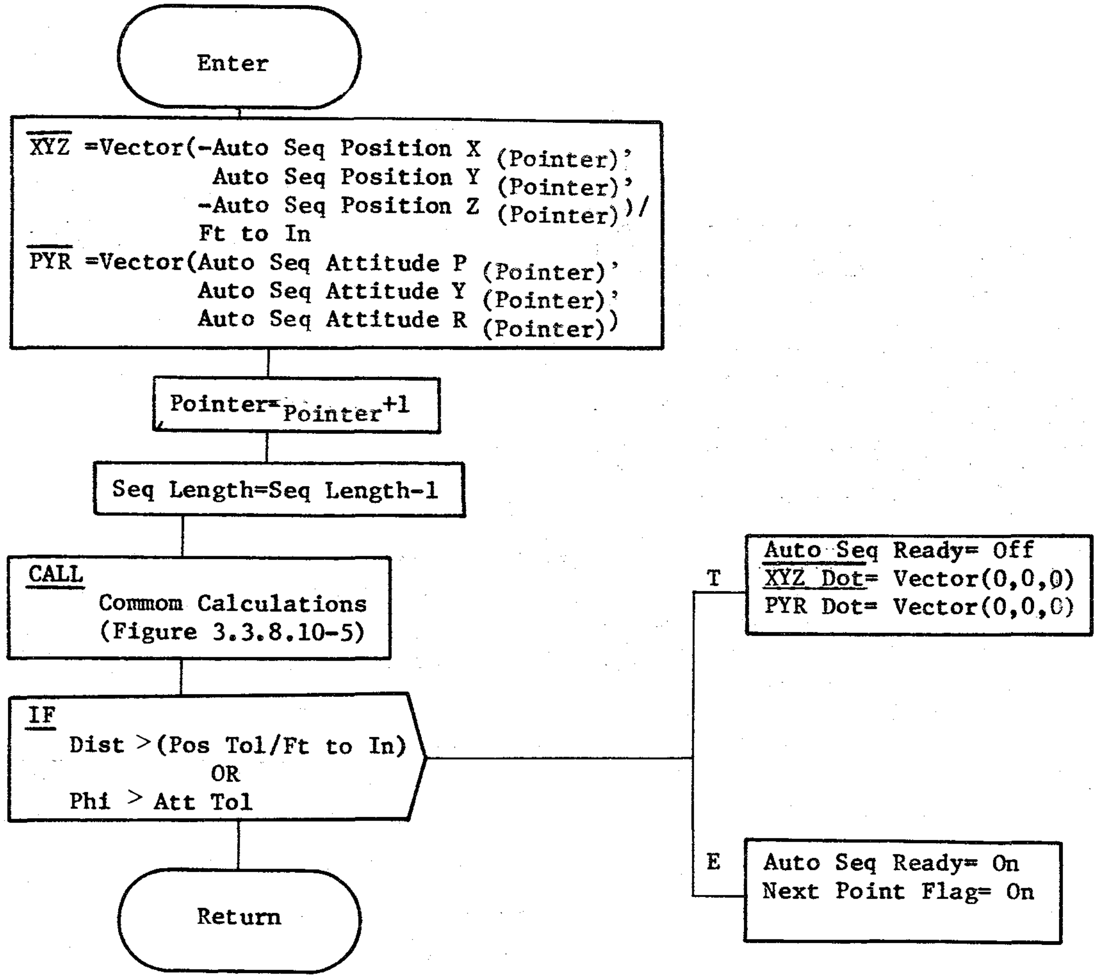

Figure 3.3.8.10-4. Tolerance Checks

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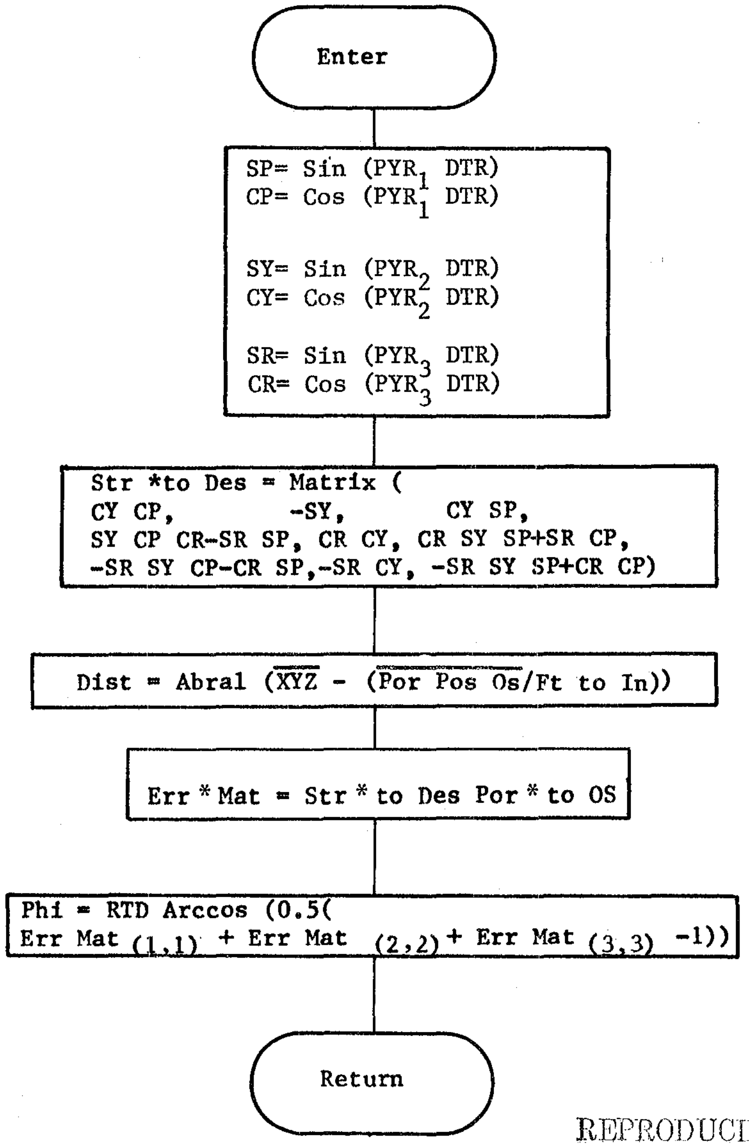

Figure 3.3.8.10-5. Common Calculations

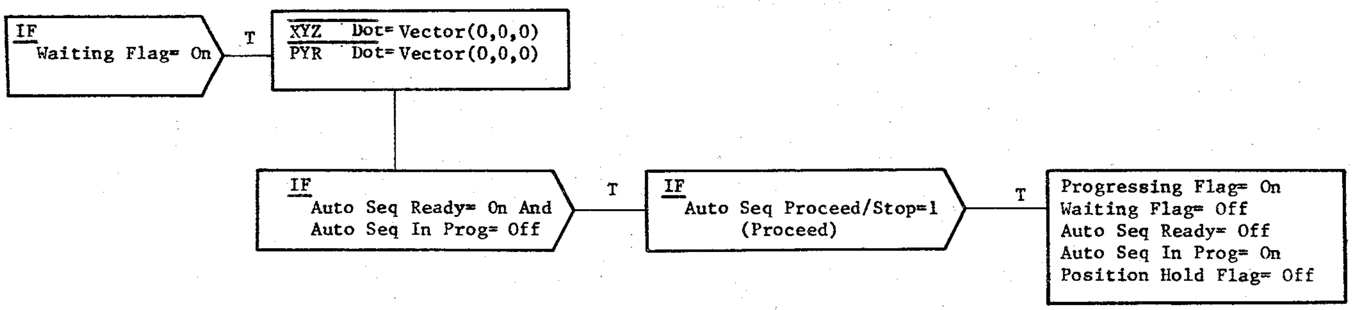

Figure 3.3.8.10-6. Waiting Mode Processing

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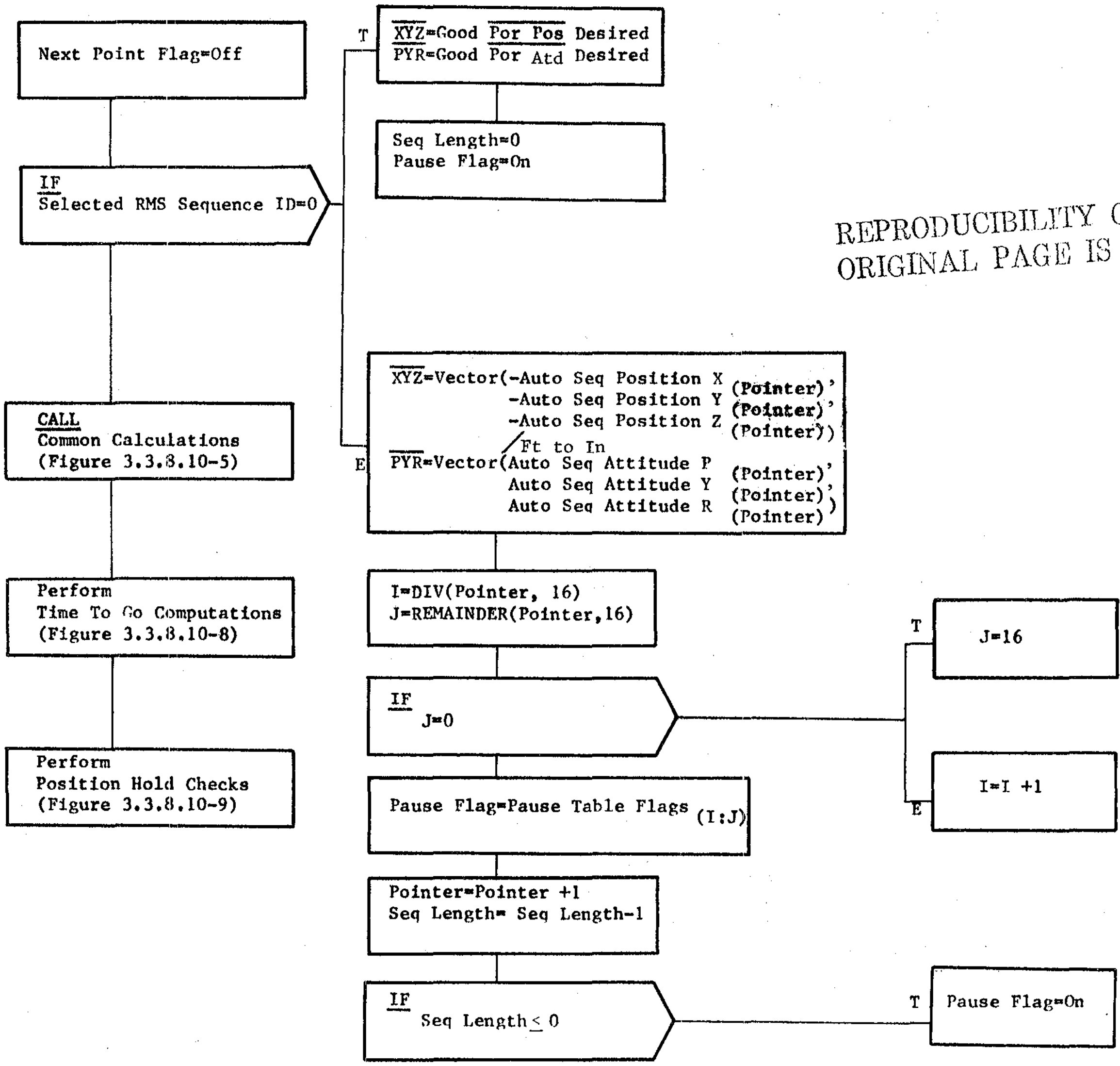

Figure 3.3.8.10-7. Next Point Processing

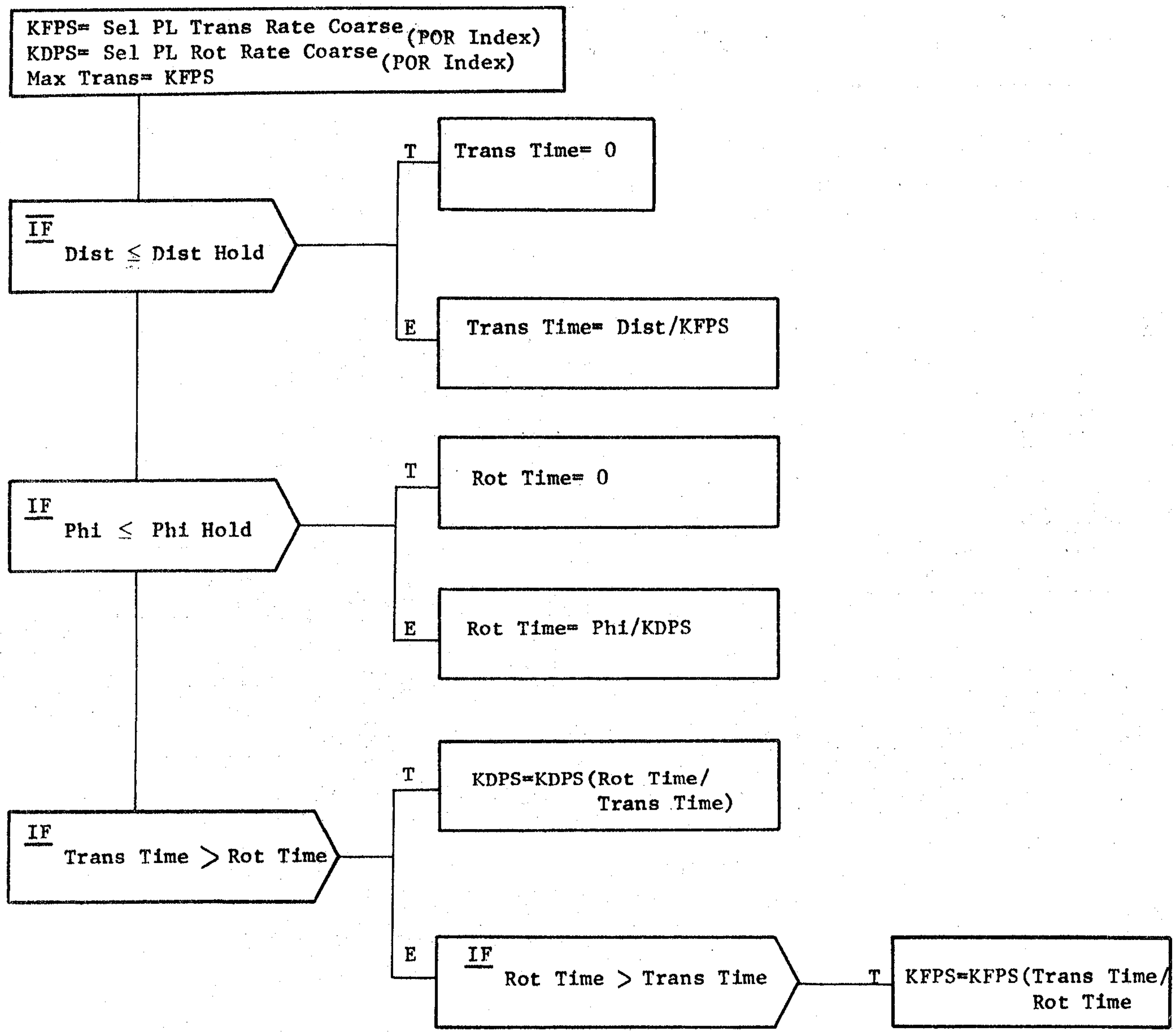

Figure 3.3.8.10-8. Time To Go Computations

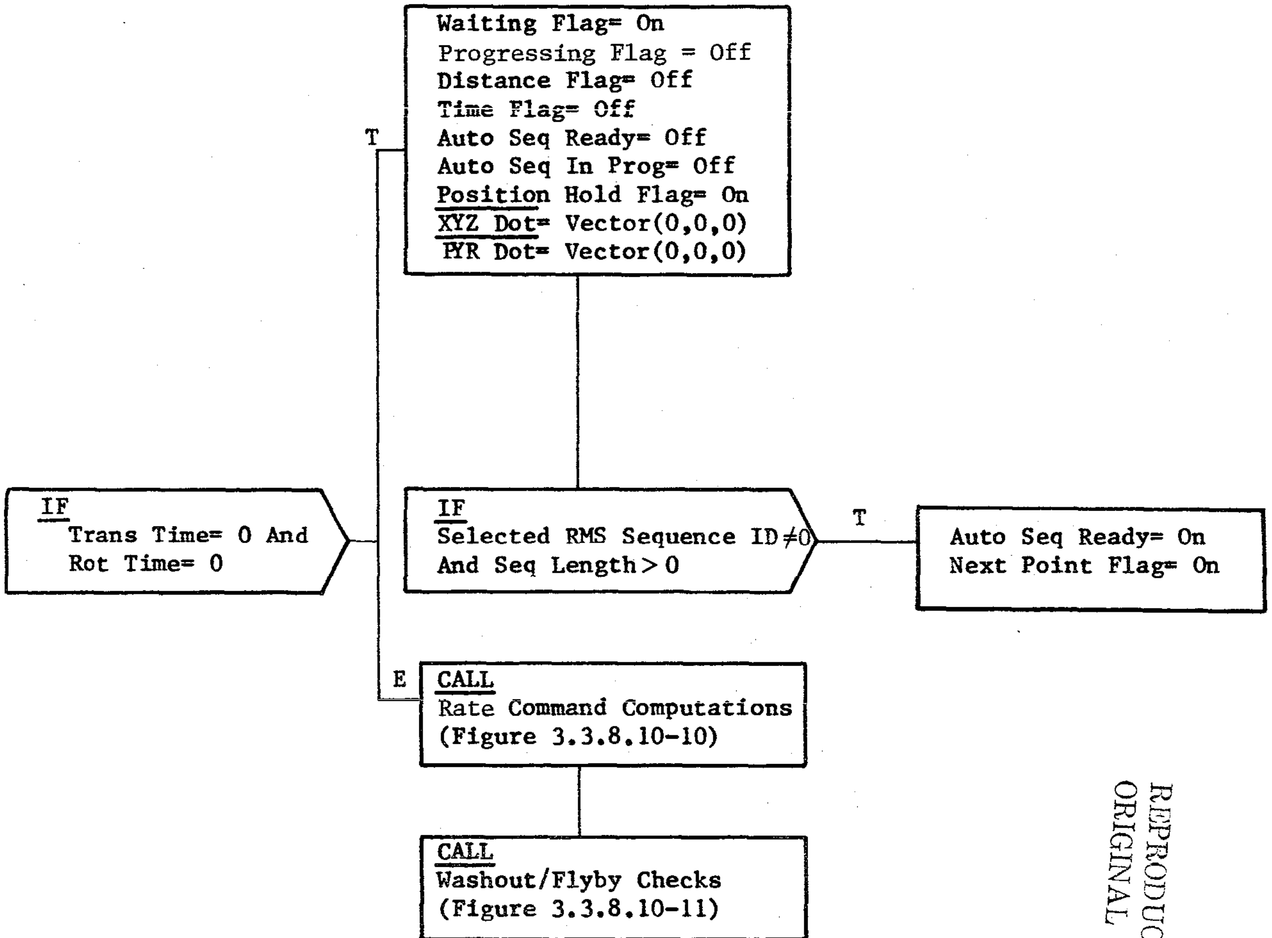

Figure 3.3.8.10-9. Position Hold Checks

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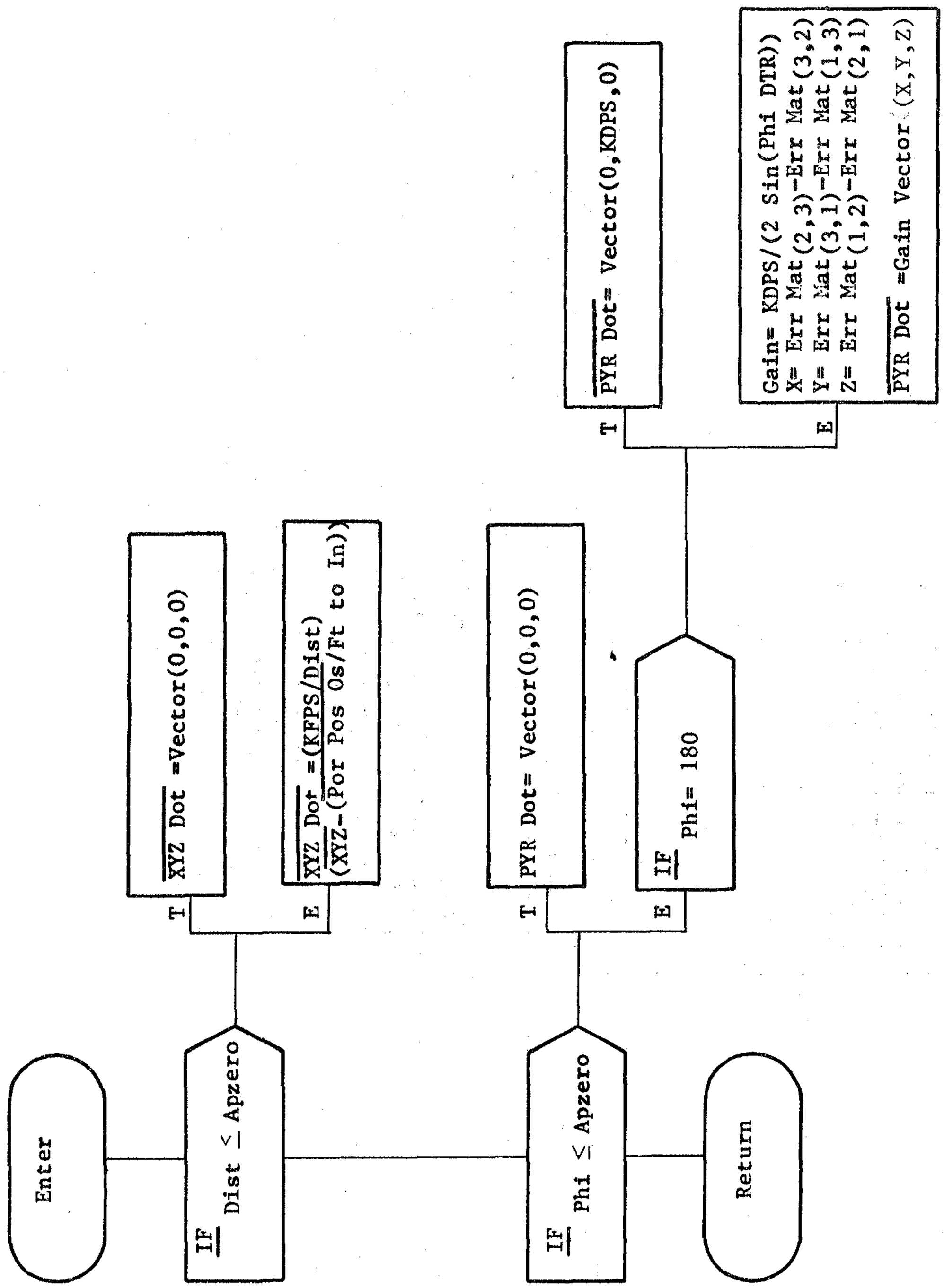

Figure 3.3.8.10-10. Rate Command Computations

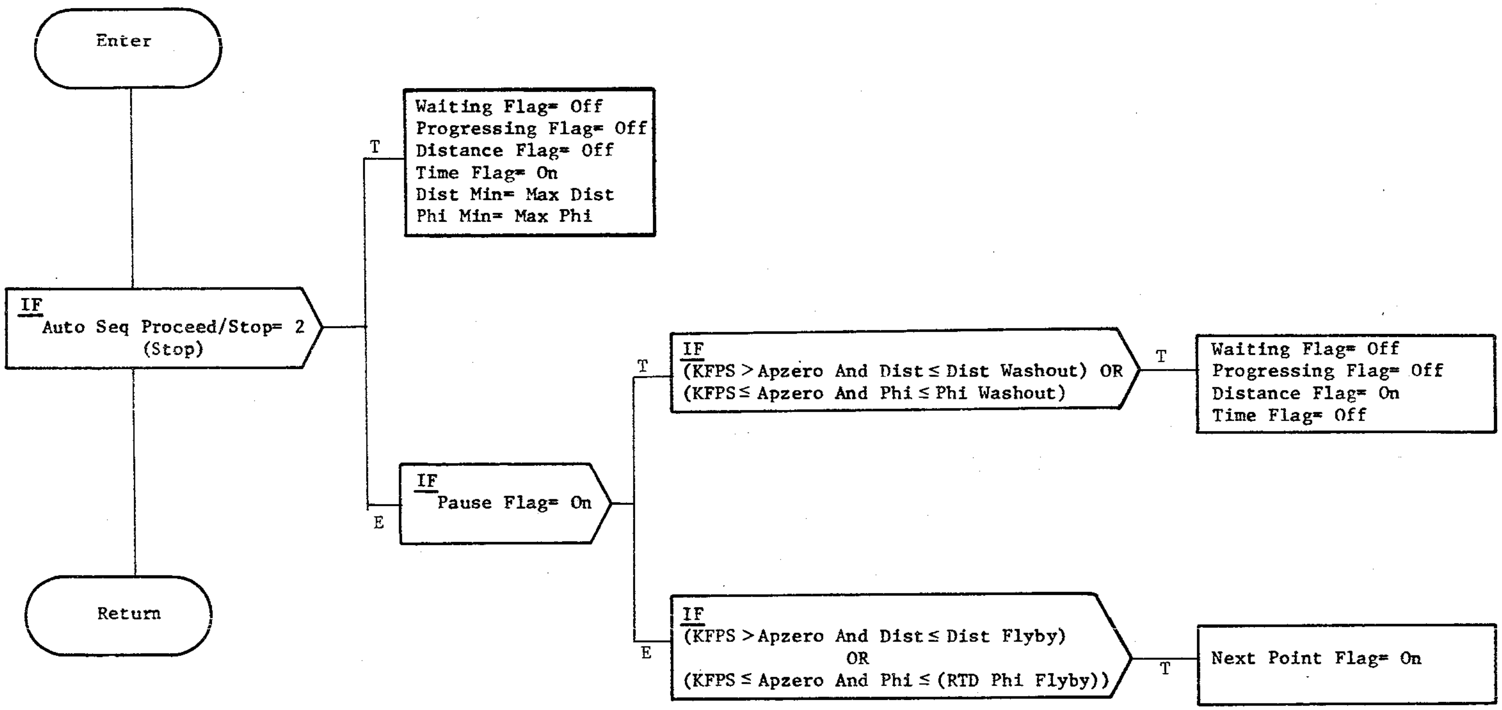

Figure 3.3.8.10-11. Washout/Flyby Checks

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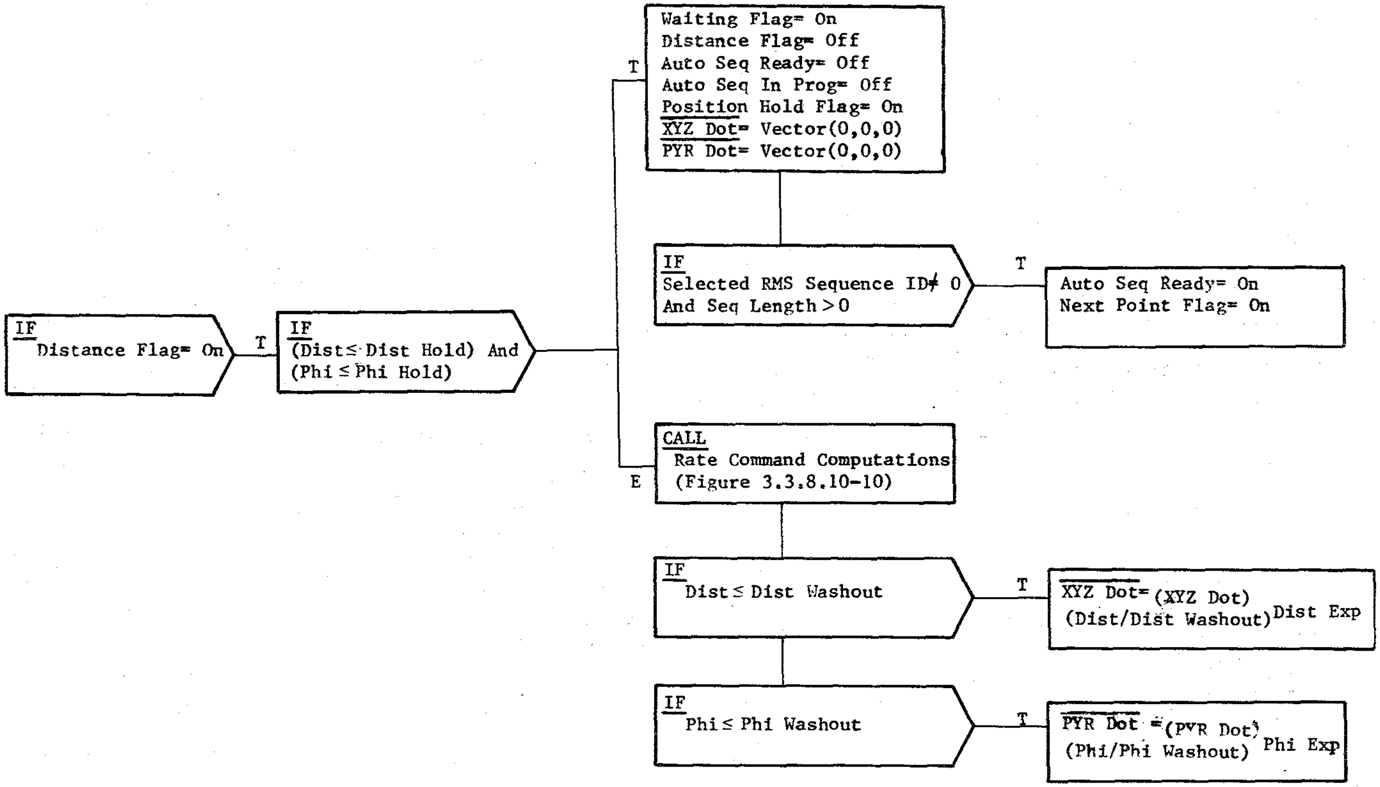

Figure 3.3.8.10-12. Distance Mode Processing

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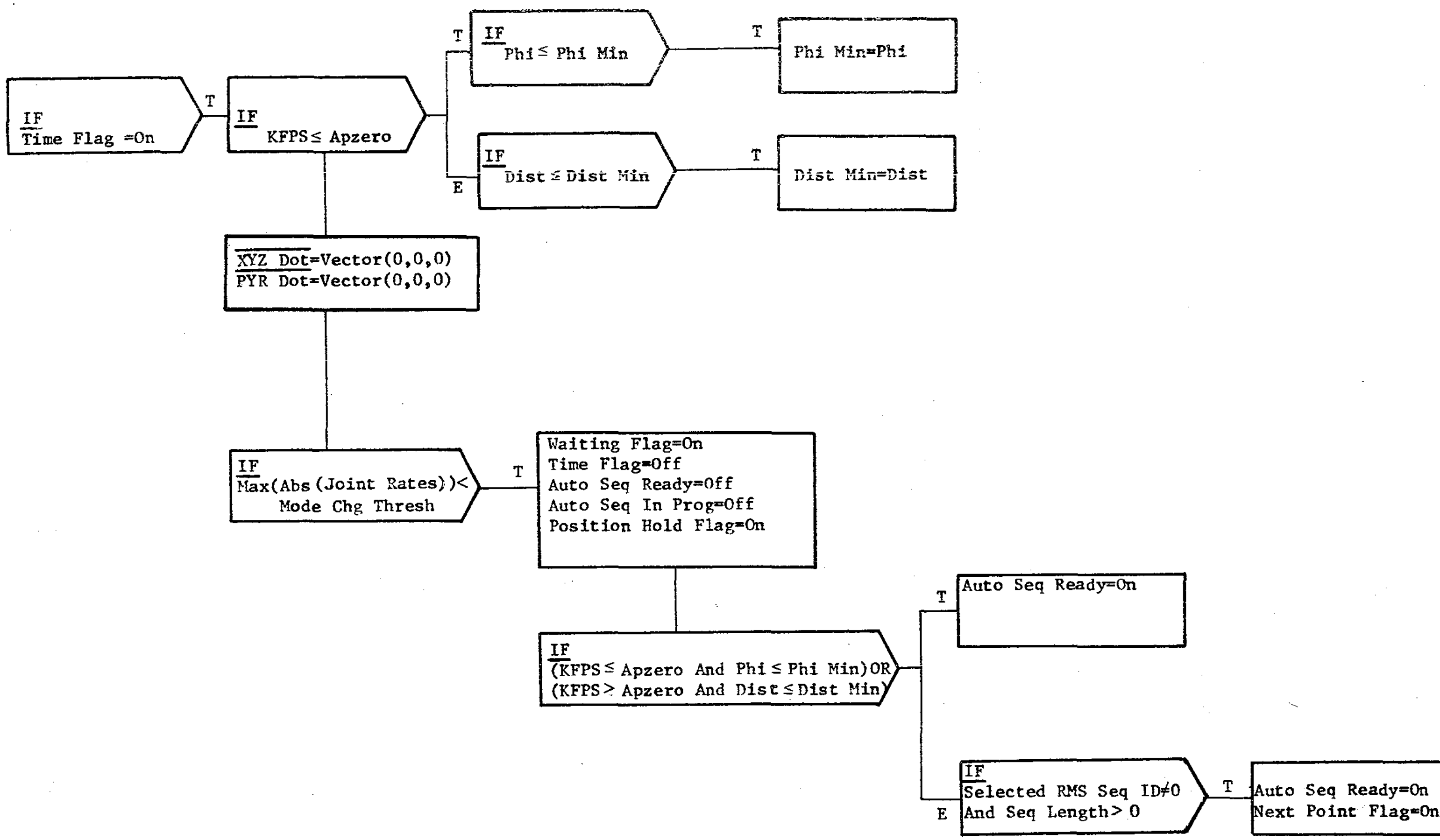

Figure 3.3.8.10-13. Time Mode Processing

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EE Trans Rate Cmd =
(Trfm Mat (TD Ref ID))
(XYZ Dot-DTR(PYR Dot*Por to AM V EE Por))

EE Rot Rate Cmd =
(Trfm Mat(RD Ref ID))(PYR Dot)

IF
ABVAL(EE Trans Rate Cmd) > Max Trans

T

EE Rot Rate Cmd =
(Max Trans ABVAL(EE Trans Rate Cmd))
EE Rot Rate Cmd

EE Trans Rate Cmd =
Max Trans(UNIT(EE Trans Rate Cmd))

Figure 3.3.8.10-14. POR Conversions

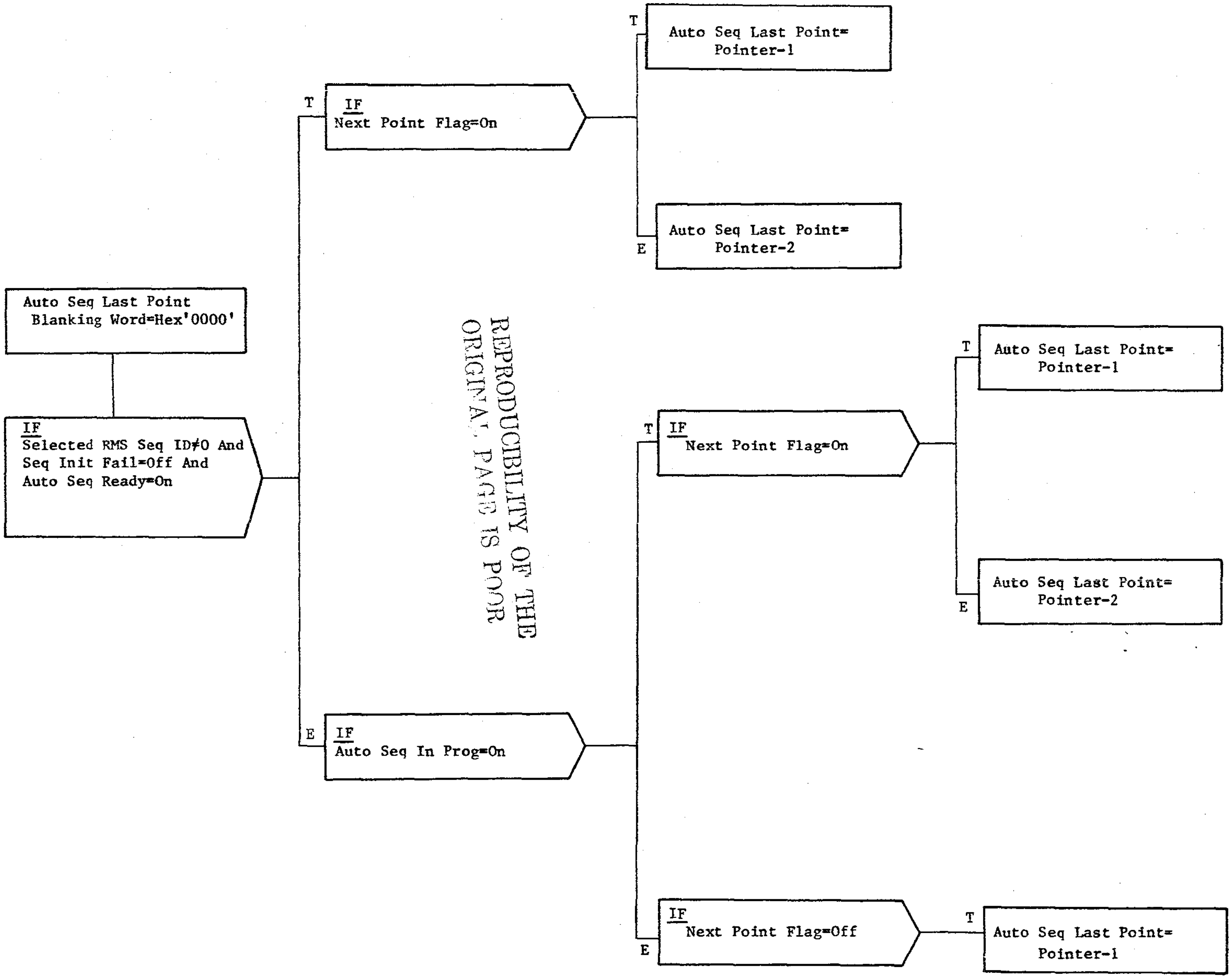

Figure 3.3.8.10-15. Last Point Processing

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3.3.8.11 Resolved Rate Processor (RRP_RRATE)

RRP transforms end effector translation and rotation rate commands (in the arm-reference system) into joint angle rate commands. RRP monitors for and resolves arm control law singularities and excessive joint rate commands.

a. Control Interface - RRP is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation - CALL RRP_RRATE

b. Inputs - Inputs to this module are specified in Table 3.3.8.11-1.

c. Process Description - The control flows for this module are shown in Figures 3.3.8.11-1 through 3.3.8.11-7. The HAL variable names and other symbols taken directly from the Level/C FSSR are documented in the module data list under the Requirement Symbol heading.

   RRP first performs the shoulder yaw joint rate processing and singularity checking. If the magnitude of the "X" distance is less than 1×10^{-8} (approximately zero), the arm is in the shoulder singularity condition and is commanded away from the condition using a shoulder yaw joint rate command equal to the maximum joint rate or zero, dependent on the computed value of the y-component of the wrist yaw velocity. Otherwise, the shoulder yaw joint rate command is computed for the non-singularity condition.

   RRP next performs wrist yaw and roll rate command processing and wrist singularity checking. If the absolute value of the cosine of the wrist yaw joint angle is less than the sine of the proximity tolerance angle, then the arm is approaching the wrist singularity condition and the wrist singularity flag in turned ON. If the absolute value of the cosine of the wrist yaw joint angle computed value is less than 1×10^{-8}, the arm is in the singularity condition. The arm is driven out of this condition by determining the command which yields the largest rate independent of the rotation direction. The command is limited such that it does not exceed the maximum limit for the wrist yaw. The wrist roll rate is zero in the singularity condition. If the arm is not in this singularity condition, the wrist yaw and roll joint rate commands are computed.

   RRP then performs the end effector velocity value computations, pitch joint rate command processing and elbow singularity checking. If the absolute value of the difference of the elbow pitch angle and elbow offset angles is less than the proximity tolerance, the arm is approaching the elbow singularity condition and the elbow singularity flag is turned ON. If the value is less than 1×10^{-8}, the arm is in the elbow singularity condition. The arm is driven from the condition with the shoulder yaw joint rate command equal to the computed value of the linear velocity along the arm segment from the elbow pitch joint to the wrist pitch joint. The elbow pitch and wrist pitch rate commands are then computed.

After all the joint rate commands are computed, the values are compared to the maximum allowable joint rates. If any values are out of limits, the value that is out of limits by the greatest percentage is used to reduce all joint rate commands proportionally.

There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.11-1.

e. Module References - None

f. Module Type and Attributes -

Type: External Procedure

Attributes: Default (serially reusable with no protective mechanism).

g. Template References

D INCLUDE TEMPLATE CRA_TE   Working Compool
D INCLUDE TEMPLATE CRD_CIL   Constants and I-Load Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exist for this module.

i. Constraints and Assumptions - None.

TABLE 3.3.8.11-1. Resolved Rate Processor MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Commanded EE Translational Rate (AM)	A.2.32	I	RJS, RAS	CRAV_EE_XLT_RATE_CMD_AM	V92R3175C_177C	EE-TRANS_ RATE_CMD
2	Commanded EE Rotational Rate (AM)	A.2.32	I	RJS, RAS	CRAV_EE_ROT_RATE_CMD_AM	V92R3180C-182C	EE_ROT_RATE_ CMD
3	Cosine of WRY Angle	A.2.32	I	RKG	CRAV_JA_COS$(5)	V92H3354C	JOINT_ ANGLE_SIN$_5$
4	Sine of WRY Angle	A.2.32	I	RKG	CRAV_JA_SIN$(5)	V92H3344C	JOINT- ANGLE_SIN$_5$
5	Elbow Pitch Angle	A.2.32	I	RYE	CRAV_JA_ATL$(3)	V92H3302C	JOINT- ANGLES$_3$
6	Wrist Pitch Angle	A.2.32	I	RYE	CRAV_JA_ATL$(4)	V92H3303C	JOINT_ ANGLES$_4$
7	Wrist Yaw Angle	A.2.32	I	RYE	CRAV_JA_ATL$(5)	V92H3304C	JOINT_ ANGLES$_5$
8	Sine of Sum of Shp Angle, ELP Angle, and WRP Angle	A.2.32	I	RKG	CRAV_JA_SIN234	V92H3348C	S234
9	Cosine of Sum of SHP Angle, ELP Angle, and WRP Angle	A.2.32	I	RKG	CRAV_JA_COS234	V92H3358C	C234
10	X-component of Arm Reference Vector from SHY to WRY	A.2.32	I	RKG	CRAV_X_SHY_WY	V92H3338C	X_SHY_WY
11	Distance from WRY to EE Tip	A.2.32	I	RKG	CRAV_L_WY_EET	V92H3337C	L_WY_EET
12	Distance from WRP to EET Projected onto X-Z Plane of AM	A.2.32	I	RKG	CRAV_L_WP_EET_IP	V92H3336C	L_WP_EET_ IP
13	Joint Rate Limits	A.2.32	I	RYE	CRAV_JNT_RATE_LIM		JRL_MAX

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TABLE 3.3.8.11-1. Resolved Rate Processor (cont'd.) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
14	Shoulder Singularity Proximity Tolerance	A.2.33	Z		CRDK_SH_PROX_TOL		SH_PROX_TOL
15	Elbow Singularity Proximity Tolerance	A.2.33	Z		CRDK_EL_PROX_TOL		EL_PROX_TOL
16	SINE of Wrist Singularity Proximity Tolerance	A.2.33	Z		CRDK_SIN_WR_PROX_TOL		SIN(W_PROX_TOL)
17	APZERO	A.2.33	Z		CRDK_APZERO		
18	Arctangent of (Elbow Offset/length from ELP to WRP)	A.2.33	Z		CRDK_RRP_EPSILON		EPSILON
19	Sum of DELTA and EPSILON	A.2.33	Z		CRDK_DELTA_EPSILON		DELTA_EPSILON
20	Ratio of (L_SHP_ELP/Cosine DELTA)	A.2.33	Z		CRDK_RATIO_SHEL_CDEL		RATIO_SHEL_CDEL
21	Ratio of (length from ELP to WRP/Cosine DELTA)	A.2.33	Z		CRDK_RATIO_ELW_CEPS		RATIO_ELW_CEPS
22	Radians to Degrees Conversion Factor	A.2.33	Z		CRDK_RTD		RTD
23	Degrees to Radians Conversion Factor	A.2.33	Z		CRDK_DTR		DTR
24	Joint Angle Rate Commands	A.2.32	O	RHM, RNC, RTV, DL	CRAV_JAR_CMD	V92R3205C-210C	JOINT_RATE_CMD
25	SHY Singularity Flag	A.2.32	O	RHM, DL,	CRAB_SING_SHY	V92X3200X	SHY_SING_FLAG
26	WRY Singularity Flag	A.2.32	O	RHM, DL,	CRAB_SING_WRY	V92X3201X	WY_SING_FLAG
27	ELP Singularity Flag	A.2.32	O	RHM, DL,	CRAB_SING_ELP	V92X3202X	ELP_SING_FLAG

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TABLE 3.3.8.11-1. Resolved Rate Processor (cont'd.) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
28	Y-component of WRY Velocity	E	L		RRP_V_WY_Y		V_WY_Y
29	EE Rotation Rate about Y-axis of AM	E	L		RRP_OMEGA_Y		OMEGA_Y
30	EE Translation Rate in X-axis of AM	E	L		RRP_V234_X		V234_X
31	EE Translation Rate in Z-axis of AM	E	L		RRP_V234-Z		V234_Z
32	In-plane Linear Velocity of Arm Segment from WRP to EE tip	E	L		RRP_IP_WP_EE		IP_WP_EE
33	Normal Linear Velocity of Arm Segment from WRP to EE Tip	E	L		RRP_IP_NORM		IP_NORM
34	Sine of Sum of WRP Angle and EPSILON	E	L		RRP_SE4		SE4
35	Cosine of Sum of WRP Angle and EPSILON	E	L		RRP_CE4		CE4
36	Linear Velocity of Arm Segment from ELP to WRP	E	L		RRP_V_ELP_WP		V_ELP_WP
37	Cosine of Difference of ELP Angle and DELTA-EPSILON	E	L		RRP_CDE3		CDE3
38	Ratio of the absolute value of commanded rate to maximum allowable joint rate	E	L		RRP_KDOT		K_DOT
39	Inverse of maximum KDOT	E	L		RRP_MAX_KDOT		MAX_K_DOT
40	Sine of Difference of ELP Angle and DELTA_EPSILON	E	L		RRP_SDE3		

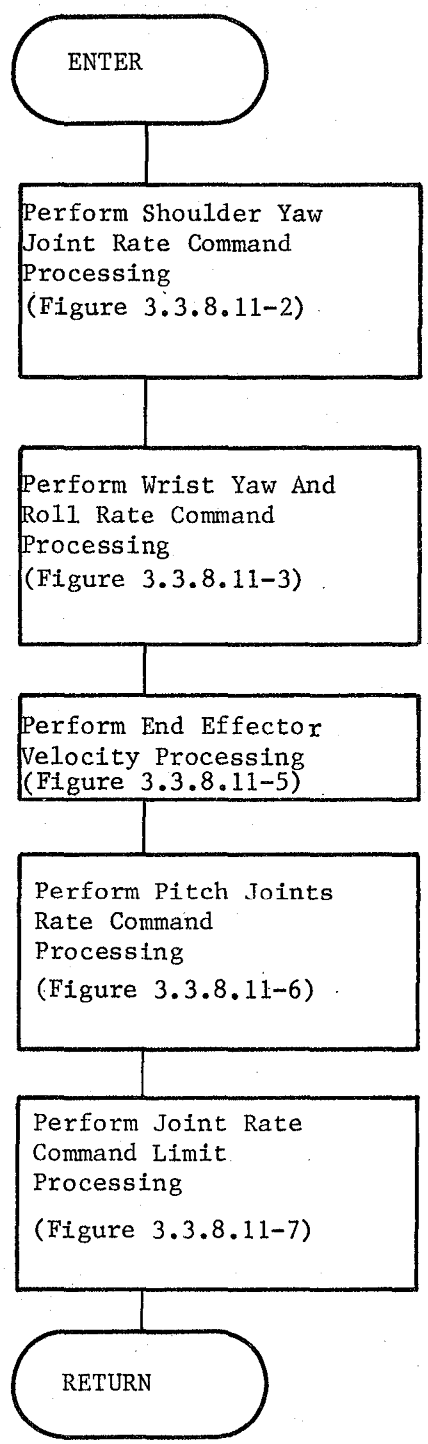

Figure 3.3.8.11-1. Resolved Rate Processor

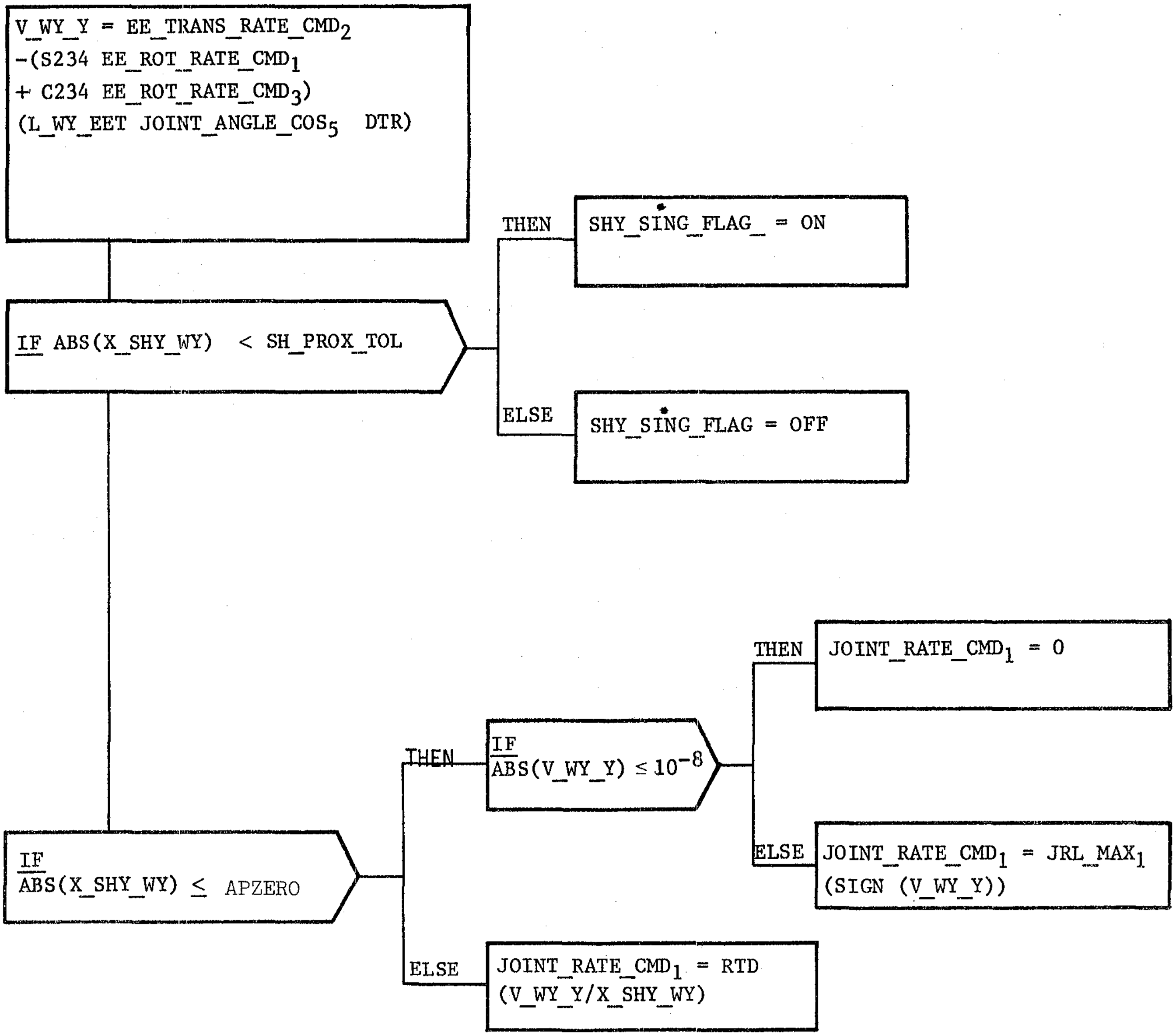

Figure 3.3.8.11-2. Shoulder Yaw Rate Command Processing

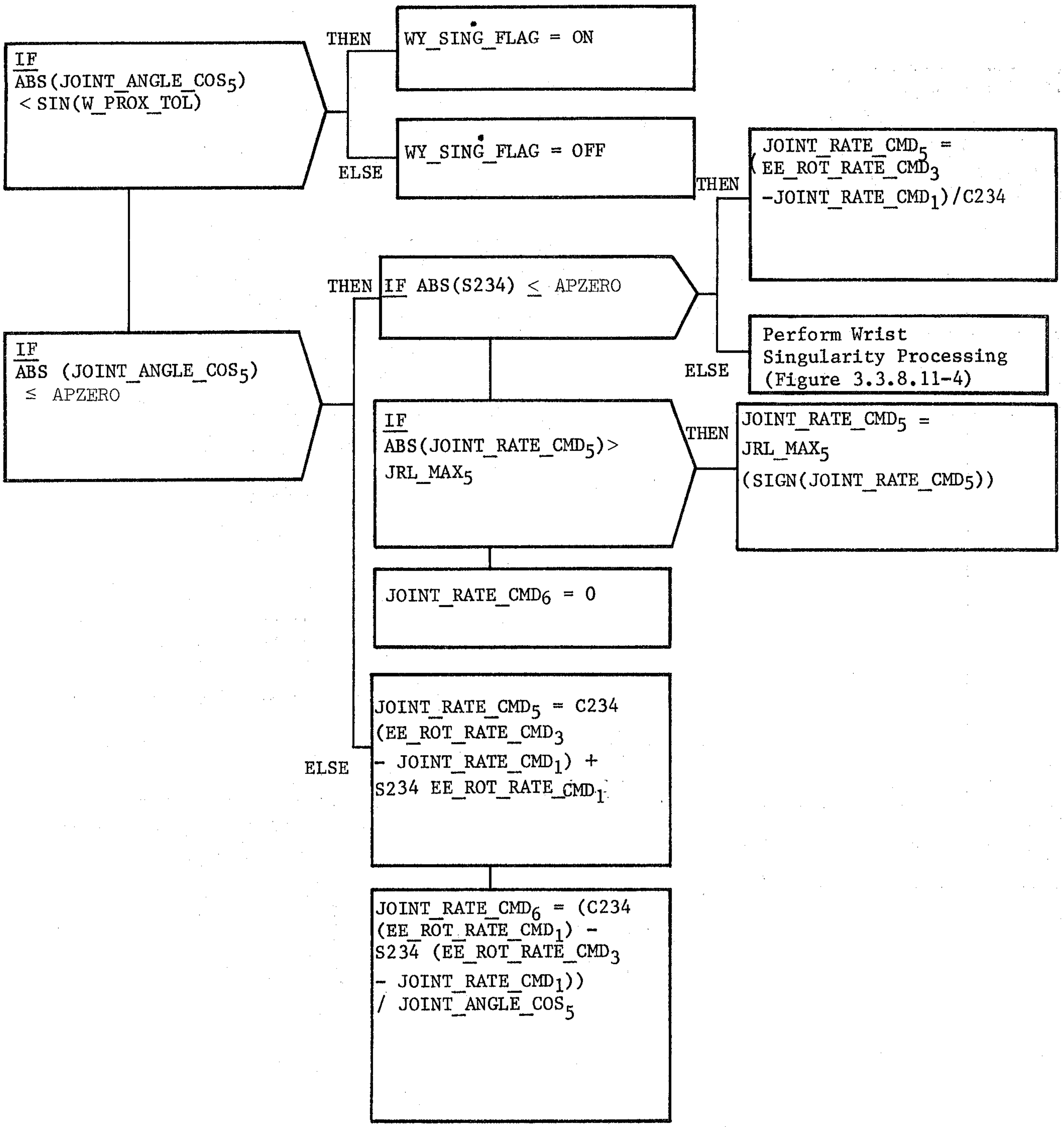

Figure 3.3.8.11-3. Wrist Yaw And Roll Command Processing

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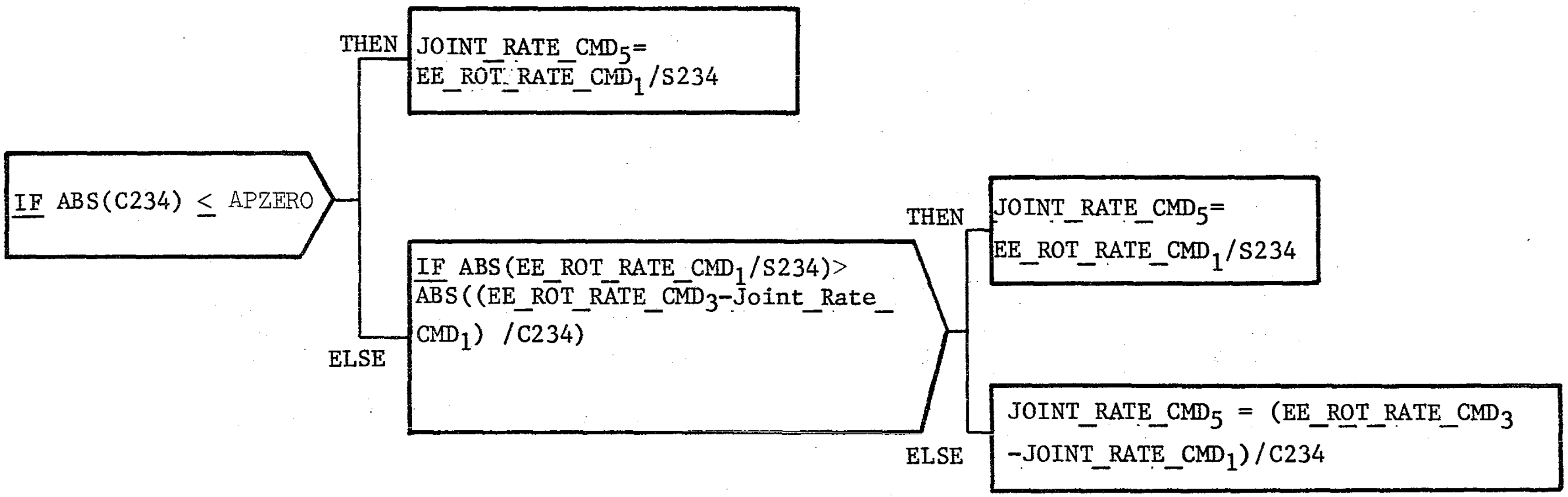

Figure 3.3.8.11-4. Wrist Singularity Processing

OMEGA_Y = EE_ROT_RATE_CMD$_2$
- (JOINT_RATE_CMD$_6$)
(JOINT_ANGLE_SIN$_5$)

V234_X = EE_TRANS_RATE_CMD$_1$
+(L_WY_EET) (JOINT_ANGLE_SIN$_5$)
((JOINT_RATE_CMD$_1$ + (C234)
(JOINT_RATE_CMD$_5$)) (DTR))

V234_Z = EE_TRANS_RATE_CMD$_3$
- (S234) (L_WY_EET)
(JOINT_RATE_CMD$_5$ DTR)
(JOINT_ANGLE_SIN$_5$)

IP_WP_EE = V234_X C234
- V234_Z S234

IP_NORM = V234_X S234
+ V234_Z C234
+ (OMEGA_Y L_WP_EET_IP) DTR

Figure 3.3.8.11-5. End Effector Velocity Processing

CE4 = COS((EPSILON + JOINT_ANGLES$_4$) DTR)

SE4 = SIN((EPSILON + JOINT_ANGLES$_4$) DTR)

V_ELP_WP = IP_Norm SE4
+ IP_WP_EE CE4

CD3 = COS((JOINT_ANGLES$_3$-DELTA EPSILON) DTR)

SDE3 = SIN((JOINT_ANGLES$_3$-DELTA EPSILON) DTR)

IF ABS(JOINT_ANGLES$_3$
- DELTA_EPSILON)
< EL_PROX_TOL

THEN ELP_SING_FLAG = ON

ELSE ELP_SING_FLAG = OFF

IF ABS (SDE3) ≤ APZERO

THEN IF ABS(V_ELP_WP) ≤ APZERO

THEN JOINT_RATE_CMD$_2$ = 0

ELSE JOINT_RATE_CMD$_2$ =
JRL_MAX$_2$ (SIGN(V_ELP_WP))

ELSE JOINT_RATE_CMD$_2$ = RTD (V_ELP_WP)/
(RATIO_SHEL_CDEL SDE3)

JOINT_RATE_CMD$_3$ = RTD (IP_WP_EE SE4
- IP_NORM CE4-(JOINT_RATE_CMD$_2$ DTR)
(RATIO_SHEL_CDEL CDE3 + RATIO_ELW_CEPS))
/RATIO_ELW_CEPS

JOINT_RATE_CMD$_4$ =
OMEGA_Y - JOINT_RATE_CMD$_2$
- JOINT_RATE_CMD$_3$

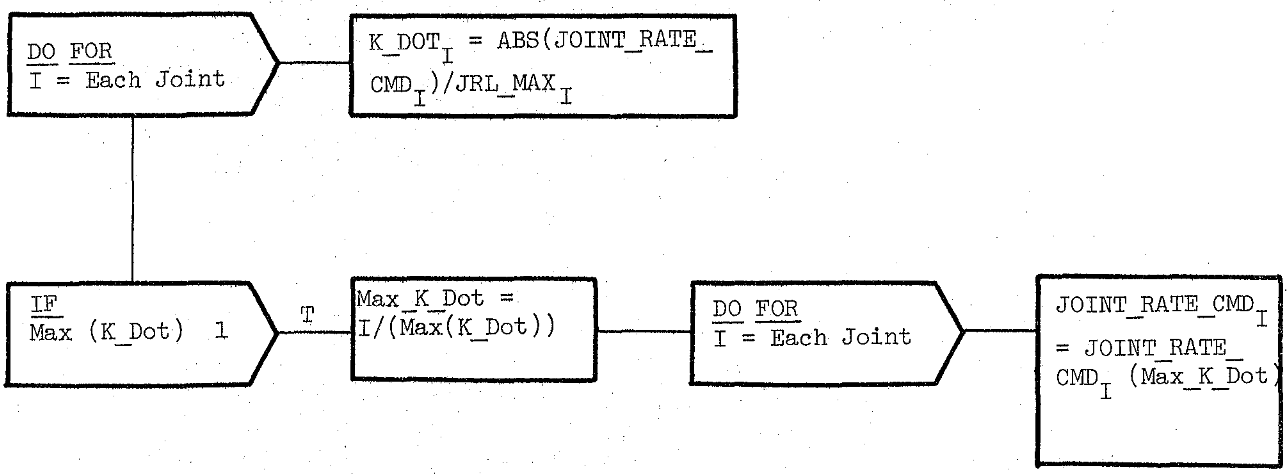

Figure 3.3.8.11-7. Joint Rate Command Limit Processing

3.3.8.12 Total Velocity (RTV_TOTVEL)

The Total Velocity (RTV)module computes the instantaneous components of the actual and commanded point of resolution (POR) rotation and translation rates in the appropriate reference systems for display. It also computes the resultant of the actual and commanded POR translation rate components.

a. Control Interface - RTV is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RTV_TOTVEL

b. Inputs - Inputs to this module are specified in Table 3.3.8.12-1

c. Process Description - The control flow for this module is shown in Figures 3.3.8.12-1 through 3.3.8.12-3. The HAL variable names and other symbols taken directly from the Level C FSSR are documented in the module data list under the Requirement Symbol heading.

   RTV performs Translational and Rotational Rate Processing twice; once each for actual and commanded rates. Translational and Rotational Rate Processing calculate the point of resolution rate components in the AM reference frame, the resultant point of resolution translation rate, the point of resolution translation rate components in the selected reference frame, and the point of resolution rotation rate components in the selected reference frame. The reference frames for the translation and rotation vectors are determined by the selected translation index and the selected rotation index which are used to subscript an array of transformation matrices. After both the actual and commanded rates have been processed, RTV returns. There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.12-1.

e. Module References - None

f. Module Type and Attributes -

   Type: External Procedure
   Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

D INCLUDE TEMPLATE CRD_CIL	Constants and I-Load Compool
D INCLUDE TEMPLATE CRA_TE	Working Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - None

TABLE 3.3.8.12-1 Total Velocity

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Joint angle rates	A.2.32	I	RYE	CRAV_JAR_ATL	V92R3310C-315C	JOINT_RATES
2	Joint angle rate commands	A.2.32	I	RXY ,RRP,RFP,RSC	CRAV_JAR_CMD	V92R3205C-210C	JOINT_RATE_CMD
3	Sine of shoulder pitch angle	A.2.32	I	RKG	CRAV_JA_SIN$(2)	V92H3341C	S2
4	Sine of wrist yaw angle	A.2.32	I	RKG	CRAV_JA_SIN$(5)	V92H3344C	S5
5	Cosine of shoulder pitch angle	A.2.32	I	RKG	CRAV_JA_COS$(2)	V92H3351C	C2
6	Cosine of wrist yaw angle	A.2.32	I	RKG	CRAV_JA_COS$(5)	V92H3354C	C5
7	Sine of the sum of the shoulder pitch and elbow pitch angles	A.2.32	I	RKG	CRAV_JA_SIN23	V98U3347C	S23
8	Cosine of the sum of the shoulder pitch and elbow pitch angles	A.2.32	I	RKG	CRAV_JA_COS23	V98U3356C	C23
9	Sine of the sum of the shoulder pitch, elbow pitch, and wrist pitch angles	A.2.32	I	RKG	CRAV_JA_SIN234	V92H3348C	S234
10	Cosine of the sum of the shoulder pitch, elbow pitch, and wrist pitch angles	A.2.32	I	RKG	CRAV_JA_COS234	V92H3358C	C234
11	Distance from the wrist yaw joint to the end-effector tip	A.2.32	I	RKG	CRAV_L_WY_EET	V92H3337C	L_WY_EET
12	Distance from the wrist pitch joint to the end-effector tip projected into the arm ref. X-Z plane	A.2.32	I	RKG	CRAV_L_WP_EET_IP	V92H3336C	L_WP_EET_IP

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TABLE 3.3.8.12-1 Total Velocity (Cont'd) **MODULE DATA LIST**

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
13	X-component of the arm ref. from the shoulder yaw joint to the wrist yaw joint	A.2.32	I	RKG	CRAV_X_SHY_WY	V92H3338C	X_SHY_WY
14	Arm reference to display reference transformation matrix	A.2.32	I	RKG			
	POR to OS				CRAV_TRFM_MAT$(1)	V92U3390C-398C	
	POR to AM				CRAV_TRFM_MAT$(2)	V92U3400C-408C	
	OS to AM				CRAV_TRFM_MAT$(3)	V92U3380C-388C	
15	SL translation index	A.2.32	I	RXY	CRAV_TD_REF_ID	V92U3110C	
16	SL rotation index	A.2.32	I	RXY	CRAV_RD_REF_ID	V92U3115C	
17	Actual point of resolution translation rate in the "selected" ref. frame (X,Y,Z)	A.2.32	O	RDD,DL,CRT	CRAV_POR_XLT_ATL_TD	V92R3320C -322C	ACT_POR TRANS_RATE_ SEL
18	Actual point of resolution rotation rate in the "selected" ref. frame (R,P,Y)	A.2.32	O	RDD,DL,CRT	CRAV_POR_ROT_ATL_RD	V92R3325C V92R3323C V92R3324C	ACT_POR_ROT_ RATE_SEL
19	Actual resultant point of resolution translation rate	A.2.32	O	RDD,DL	CRAV_POR_XLT_RSLT_ATL	V92R3326C	ACT_RESUL- TANT_POR TRANS_RATE
20	Commanded point or reso- lution translation rates in the "selected" ref. frame (X,Y,Z)	A.2.32	O	CRT,DL	CRAV_POR_XLT_CMD_TD	V92R3250C -252C	POR_TRANS_ RATE_CMD_ DISP
21	Commanded point of reso- lution rotation rate in the "selected" ref. frame (R,P,Y)	A.2.32	O	CRT,DL	CRAV_POR_ROT_CMD_RD	V92R3262C V92R3260C V92R3261C	POR_ROT_RATE _CMD_DISP

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TABLE 3.3.8.12-1 Total Velocity (Cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
22	Commanded resultant point of resolution (POR) translation rate	A.2.32	O	RDD,DL	CRAV_POR_XLT_RSLT_CMD	V92R3270C	CMD_RESUL-TANT_POR TRANS_RATE
23	RATE	E	L		RTV_RATE		
24	V (Translation vector)		L		RTV_V		
25	W (Rotation vector)		L		RTV_W		
26	Resultant	E	L		RTV_POR_XLT_RSLT		
27	Length from elbow pitch joint to wrist pitch joint	A.2.33	Z		CRDK_L_ELP_WP		L_ELP_WP
28	Elbow offset	A.2.33	Z		CRDK_EL_OFFSET		EL_OFFSET
29	Length from shoulder pitch joint to elbow pitch joint	A.2.33	Z		CRDK_L_SHP_ELP		L_SHP_ELP
30	Degrees to radians conversion factor (π/180)	A.2.33	Z		CRDK_DTR		DTR
31	Selected vector from EE to POR	A.2.32	I	RKG	CRAV_V_EE_POR	V92H3421C-423C	V_EE_POR
32	Translation inversion flag	A.2.32	I	RXY	CRAB_TRANS_FLAG	V92X2425X	TRANS_FLAG

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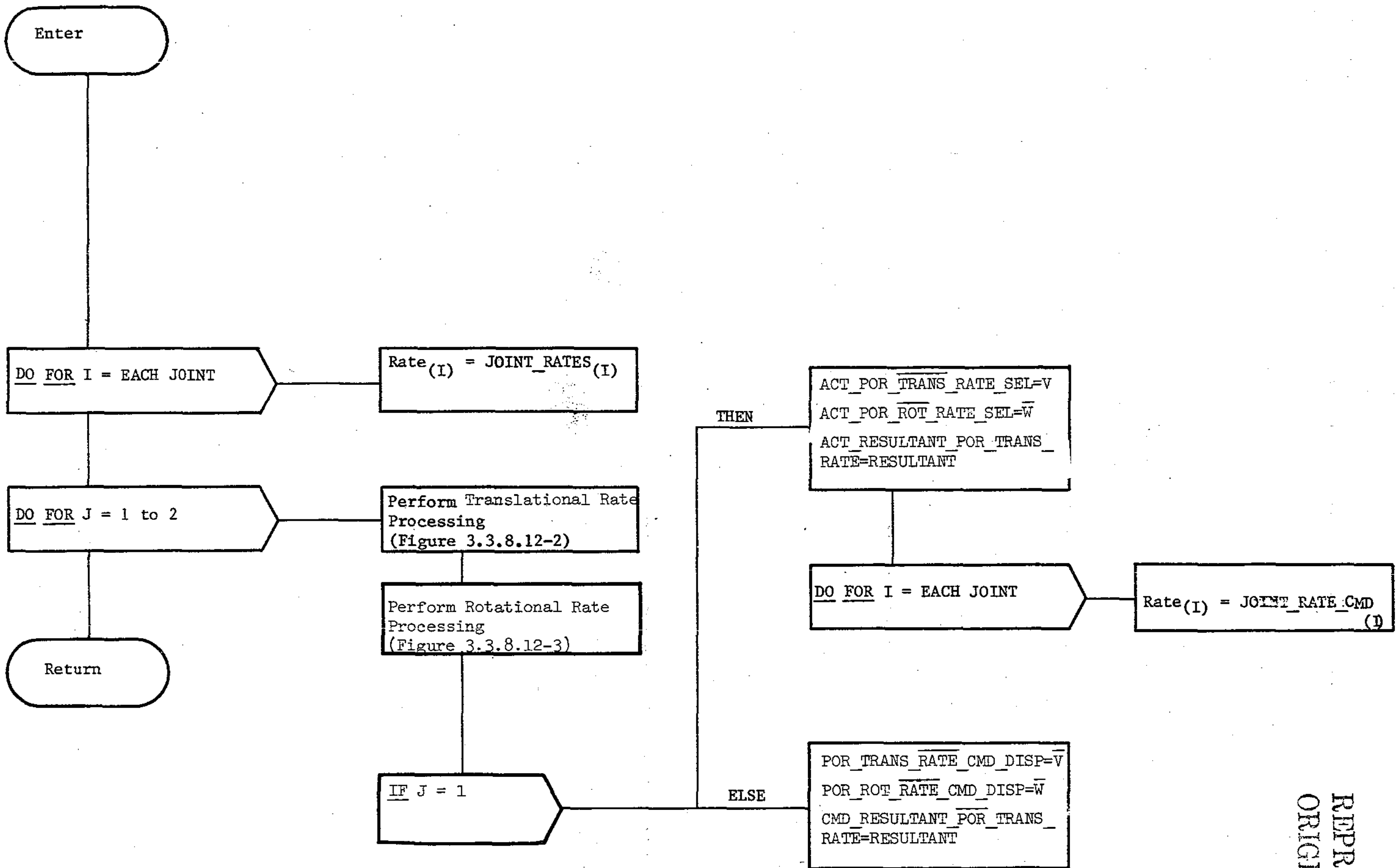

Figure 3.3.8.12-1. Total Velocity

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```
V_1 = DTR
 (-Rate_1 (L_WY_EET) (S5)
  +Rate_2 ((EL_OFFSET) (C23-C2)
          -(L_SHP_ELP) (S2)
          -(L_WP_EET_IP) (S234)
          -(L_ELP_WP) (S23)      )

  +Rate_3 ((EL_OFFSET) (C23)
          -(L_WP_EET_IP) (S234)
          -(L_ELP_WP) (S23)      )

  -Rate_4  (L_WP_EET_IP) (S234)
  -Rate_5  (L_WY_EET) (C234) (S5) )
```

```
V_2 = DTR
 ( Rate_1 ((X_SHY_WY)
          +(L_WY_EET) (C234) (C5))
 + Rate_5 (L_WY_EET) (C5)          )
```

```
V_3 = DTR
 ( -Rate_2 ((X_SHY_WY)
           +(L_WY_EET) (C234) (C5))

   -Rate_3 ((L_WP_EET_IP) (C234)
           +(EL_OFFSET) (S23)
           +(L_ELP_WP) (C23)       )

   -Rate_4  (L_WP_EET_IP) (C234)

   +Rate_5  (L_WY_EET) (S234) (S5) )
```

Figure 3.3.8.12-2. Translational Rate Processing

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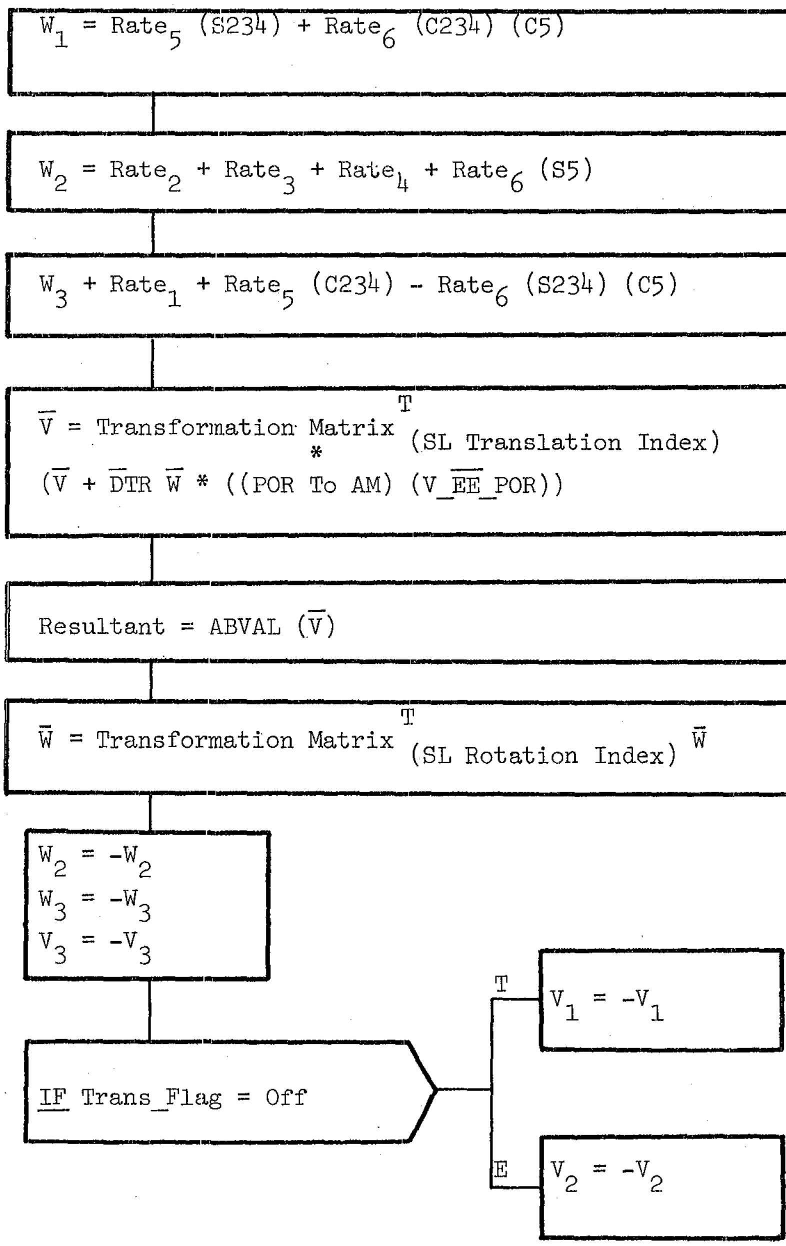

Figure 3.3.8.12-3. Rotational Rate Processing

3.3.8.13 Position Hold (RFP_POS_HOLD)

The Position Hold module (RFP) processes joint angle commands to produce the joint rate commands necessary to hold the commanded position of the arm.

a. Control Interface - RFP is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation - CALL RFP_POS_HOLD

b. Inputs - Inputs to this module are specified in Table 3.3.8.13-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.8.13-1. RFP calculates the joint angle errors by subtracting the actual joint angles from the joint angle commands. The joint angle errors are then converted to joint angle rate commands by multiplying the joint angle errors by their corresponding conversion factors. If any of the computed joint angle rate commands exceeds its respective limits, it is reduced to its maximum limit. There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.13-1.

e. Module Reference - None

f. Module Type and Attributes -

   Type: External Procedure

   Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

   D INCLUDE TEMPLATE CRA_TE Working Compool
   D INCLUDE TEMPLATE CRD_CIL Constants and I-Load Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - None

TABLE 3.3.8.13-1. Position Hold

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
1	Joint Angles	A.2.32	I	RYE	CRAV_JA_ATL	V92H3300C-305C	
2	Commanded Joint Angles	A.2.32	I	RWP	CRAV_JA_CMD	V92H3235C-240C	
3	Maximum Joint Rate Limits	A.2.32	I	RYE	CRAV_JNT_RATE_LIM		
4	Joint Angle Conversion Factor	A.2.33	Z		CRDK_RFP_JNT_CF		
5	Joint Rate Commands	A.2.32	O	RNC, RHM, DL, RTV	CRAV_JAR_CMD	V92R3205C-210C	
6	Joint Angle Error	E	L		RFP_DELTA_JA		

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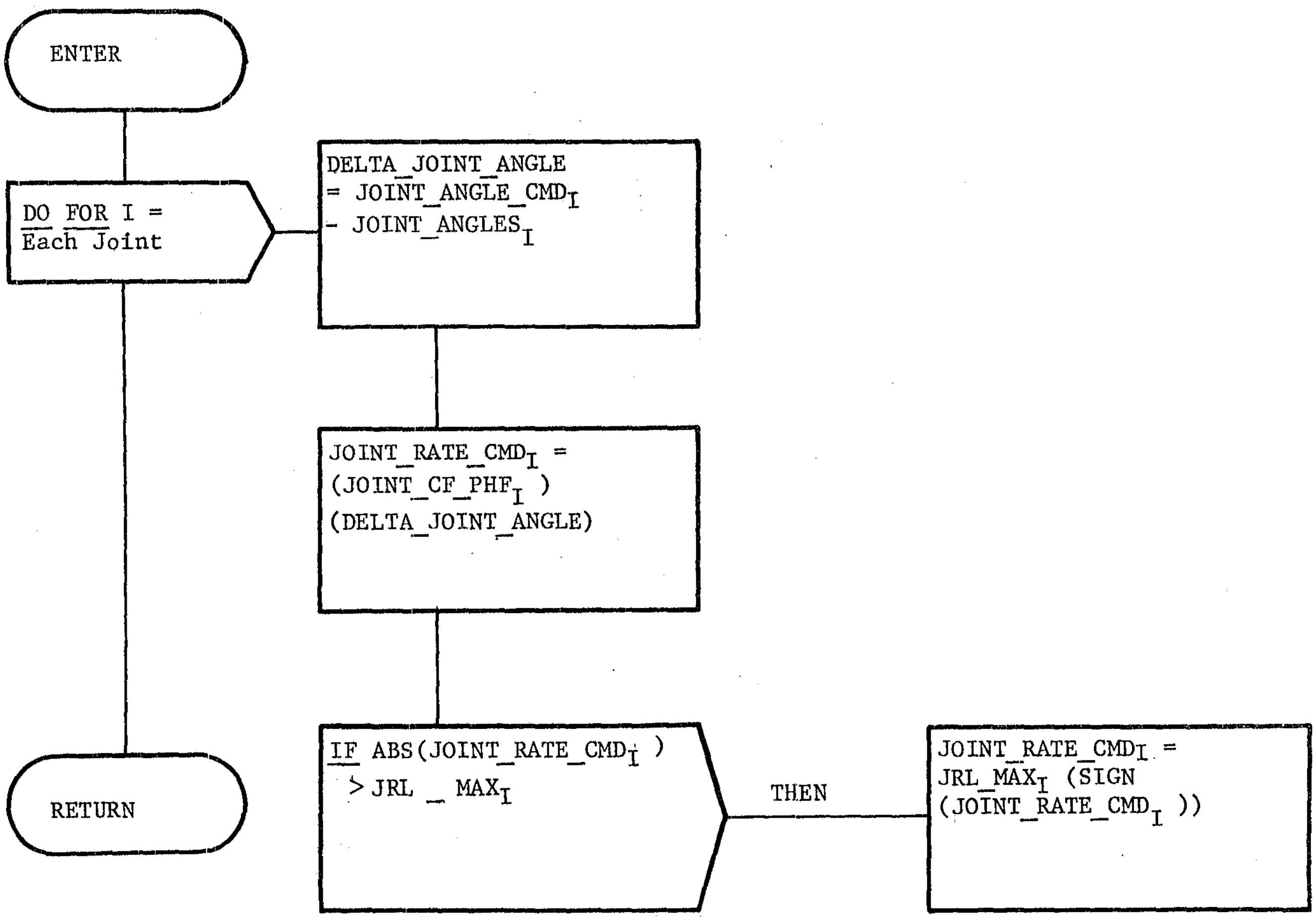

Figure 3.3.8.13-1. Position Hold

3.3.8.14 Health Monitor (RHM_HLTH_MON)

The Health Monitor audits the state of various hardware discretes and software flags in order to determine inconsistencies or problems in the hardware based on these inputs. Should a discrepency be found, RHM sets the appropriate flag or discrete required for annunciation. Annunciation of faults to the operator is done via the caution and warning lights on the RMS dedicated display panel.

a. Control Interface - RHM is CALL'ed by the RMS Executive (REX) t 12.5 Hz.

   Invocation: CALL RHM_HLTH_MON

b. Input - Inputs to this module are specified in Table 3.3.8.14-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.14-1 through 3.3.8.14-8. This module is a series of software checks designed to detect irregularities in the arm hardware.

   The derigidize check monitors for an inadvertant (uncommanded) derigidization of the EE. Warning discretes are turned on after a given number of cycles to annunciate the condition to the operator and the check is not performed again until the warning discrete is turned OFF.

   The release check monitors for an uncommanded release of the payload. Warning discretes are turned ON after a given number of cycles to annunciate the condition to the operator and the check is not performed again until the warning discrete is turned OFF.

   The joint angle (JA) limit processing monitors each JA to detect the joint's approach to its limits. When a joint exceeds one of its caution limits for a given number of cycles, in either the positive or negative directions, a reach limit flag is turned ON. The reach limit caution discrete is OFF when all joints are within their caution limits.

   If the soft-stop limits are enabled then it is determined if a soft-stop condition exists. If a JA is outside its reach limit, then the joint angle is checked to see if it is outside its software limit. When the JA is detected outside its respective software limits, the software stop condition is annunciated and the joint rate commands are zeroed.

The singularity caution discrete is turned on when any of the three singularity conditions has been detected for a given number of cycles.

The RHM alarm flag is OFF except when a fault condition is being annunciated for the first time. There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs for this module are specified in Table 3.3.8.14-1.

e. Module Type and Attributes -

Type: External procedure
Attributes: Default (serially reusable with no protective mechanism).

f. Template References -

D INCLUDE TEMPLATE RVM_CONEN	Consistency and Encoder check (RVM)
D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRD_CIL	Constants and I-load Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool

g. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

h. Constraints and Assumptions - It is assumed that the software stop limits for each joint are outside the reach limits for the joints.

TABLE 3.3.8.14-1 Health Monitor

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
1	JNT Angles	A.2.32	I	RYE	CRAV_JA_ATL	V92H3300C-305C	
2	Payload Captured	A.2.32	I	RCD	CRAB_PYLD_CAP		
3	PL Capture Past	A.2.32	I	RVM	CRAB_PL_CAPTURE_PAST	V92X3112X	
4.	Capture/Release CMD	A.2.32	I	RCD	CRAV_CAP_REL_CMD		
5	Rigidize/Derigidize CMD	A.2.32	I	RCD	CRAV_RIG_DERIG_CMD		
6	EEEU Bite Flag	A.2.32	I	RCD	CRAB_EEEU_BITE_FLAG		
7	Stop Limits Flag	A.2.32	I	RUD, RXY	CRAB_SOFT_STOP_ENABLE	V92X3120X	
8	SHY Sing Flag	A.2.32	I	RRP, RXY	CRAB_SING_SHY	V92X3200X	
9	WRY Sing Flag	A.2.32	I	RRP, RXY	CRAB_SING_WRY	V93X3201X	
10	ELP Sing Flag	A.2.32	I	RRP, RXY	CRAB_SING_ELP	V92X3202X	
11	First Pass	A.2.32	I	RXY	CRAB_RHM_FIRST_PASS		
12	EE rigidized/derigidized flag	A.2.32	I	RCD	CRAV_EE_RIG_DERIG		
13	EE fail Bite Flag	A.2.32	I	RCD	CRAB_EE_FAIL		
14	Encod ck flag	A.2.32	I	RVM	CRAB_ENCOD_CK	V92X3530X-535X	
15	JNT Rate CMD	A.2.32	I	RRP, RFP, RSC, RXY	CRAV_JAR_CMD	V92R3205C-210C	
16	Reach Lim Pos Flag	A.2.32	O	CRT,DL	CRAB_REACH_LIM_POS	V92X3550X-555X	
17	Reach Lim Neg Flag	A.2.32	O	CRT,DL	CRAB_REACH_LIM_NEG	V92X3560X-565X	
18	EE Derigid Annun	A.2.32	O	RDD	CRAB_EE_DERIG_ANNUN		
19	EE Reld Annun	A.2.32	O	RDD	CRAB_EE_REL_ANNUN		
20	Sing Annun	A.2.32	O	RDD	CRAB_SING_ANNUN	V72X2923J	
21	Reach Lim Annun	A.2.32	O	RDD	CRAB_REACH_LIM_ANNUN		
22	RHM alarm Flag	A.2.32	O	RDD	CRAB_RHM_ALARM		
23	Software Stop-Flag	A.2.32	W	MCIU, RNC	CREB_SOFTWARE_STOP	V72X2937J	

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TABLE MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
24	EE Derigid Warn	A.2.34	W	MCIU	CREB_EE_DERIG_WARN	V72X2926J	
25	EE Reld Warn	A.2.34	W	MCIU	CREB_EE_REL_WARN	V72X2927J	
26	Reach Limit Caution Flag	A.2.34	W	MCIU	CREB_REACH_LIM_CAUT	V72X2930J	
27	Sing Caution Flag	A.2.34	W	MCIU	CREB_SING_CAUT	V72X2923J	
28	Up JNT LIM	A.2.33	Z		CRDK_UP_JNT_LIM		
29	Low JNT LIM	A.2.33	Z		CRDK_LO_JNT_LIM		
30	Upper Software LIM	A.2.33	Z		CRDK_UP_SW_STOP_LIM		
31	Low Software LIM	A.2.33	Z		CRDK_LOW_SW_STOP_LIM		
32	EE Rigidized Past	E	L		RHM_EE_RIG_PAST		
33	Derigidize CMD Flag	E	L		RHM_EE_DERIG_CMD_FLAG		
34	Release CMD Flag	E	L		RHM_REL_CMD_FLAG		
35	SHY Sing Ctr	E	L		RHM_SING_SHY_CTR		
36	WRY Sing Ctr	E	L		RHM_SING_WRY_CTR		
37	ELP Sing Ctr	E	L		RHM_SING_ELP_CTR		
38	Reach LIM POS CTR	E	L		RHM_REACH_LIM_POS_CTR		
39	Reach LIM NEG CTR	E	L		RHM_REACH_LIM_NEG_CTR		
40	Released Past	E	L		RHM_RELD_FLAG_PAST		
41	Derigidized Past	E	L		RHM_DERIG_PAST		
42	EE Count	E	L		RHM_EE_COUNT		
43	MCIU EE FLAG	E	L		RHM_MCIU_EE_FLAG		
44	Reach LIM P Flag	E	L		RHM_REACH_LIM_P_FLAG		
45	Reach LIM M Flag	E	L		RHM_REACH_LIM_M_FLAG		

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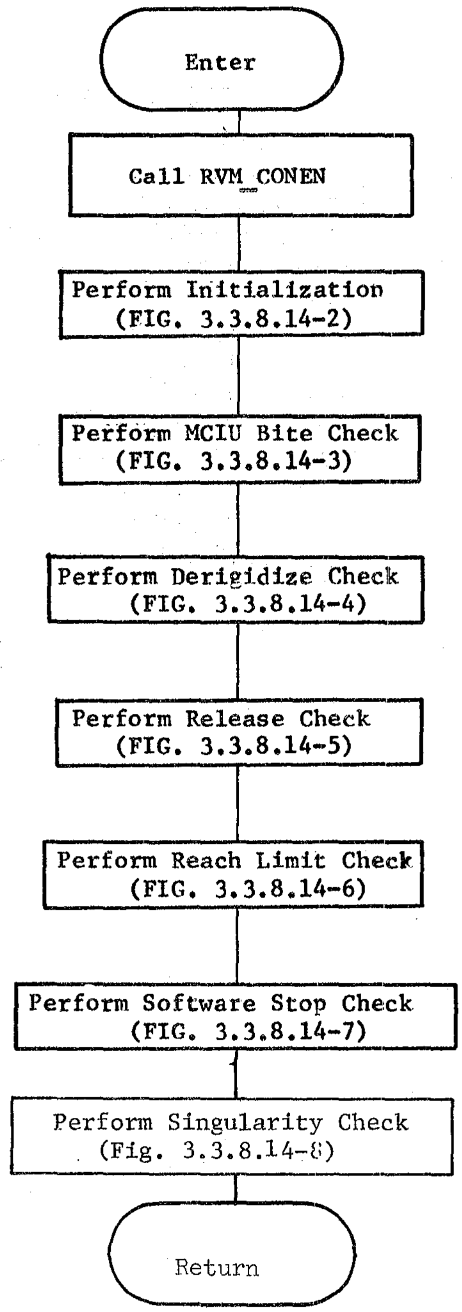

Figure 3.3.8.14-1. Health Monitor

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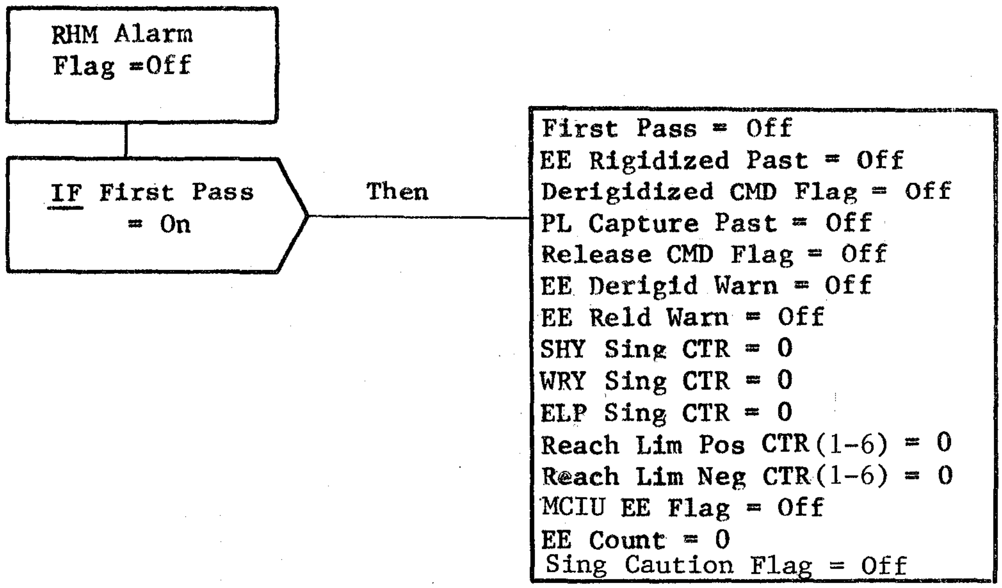

Figure 3.3.8.14-2. Initialization

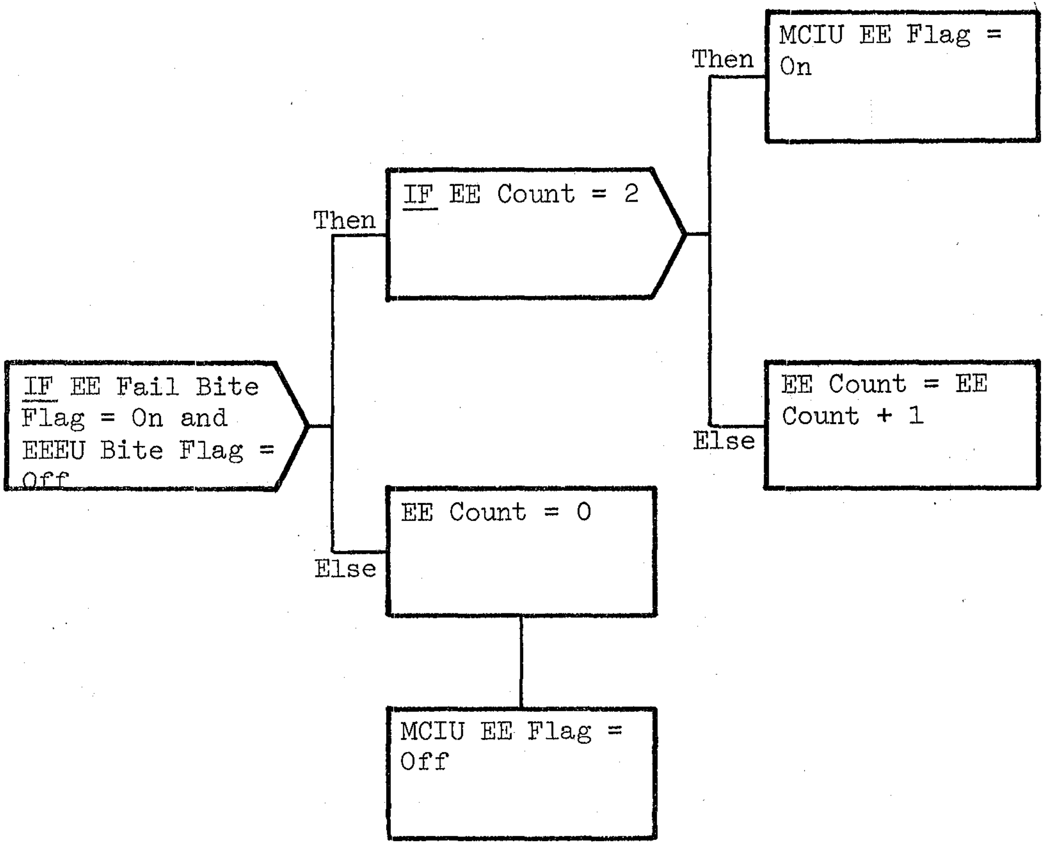

Figure 3.3.8.14-3. MCIU Bite Check

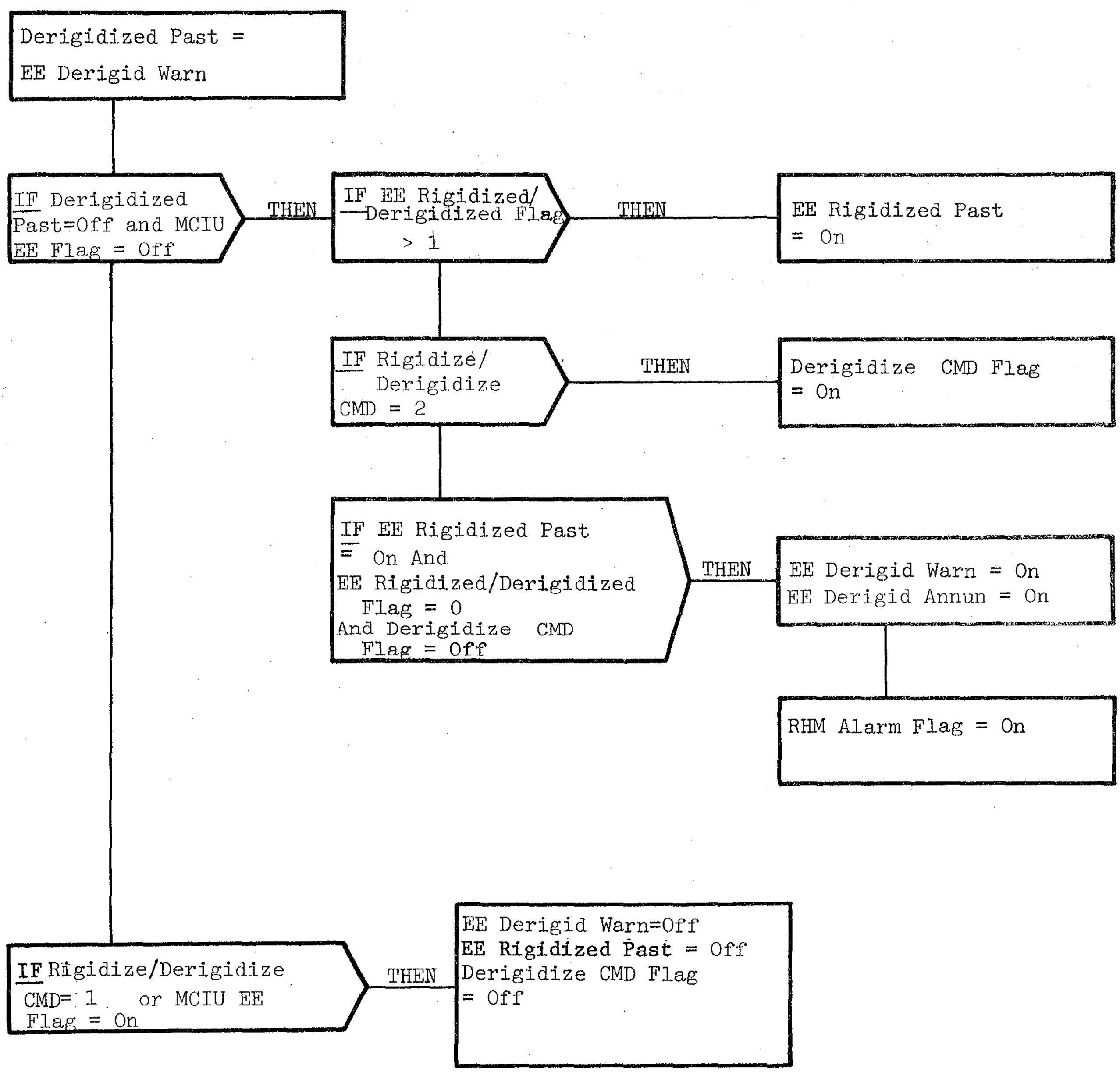

Figure 3.3.8.14-4. Derigidize Check

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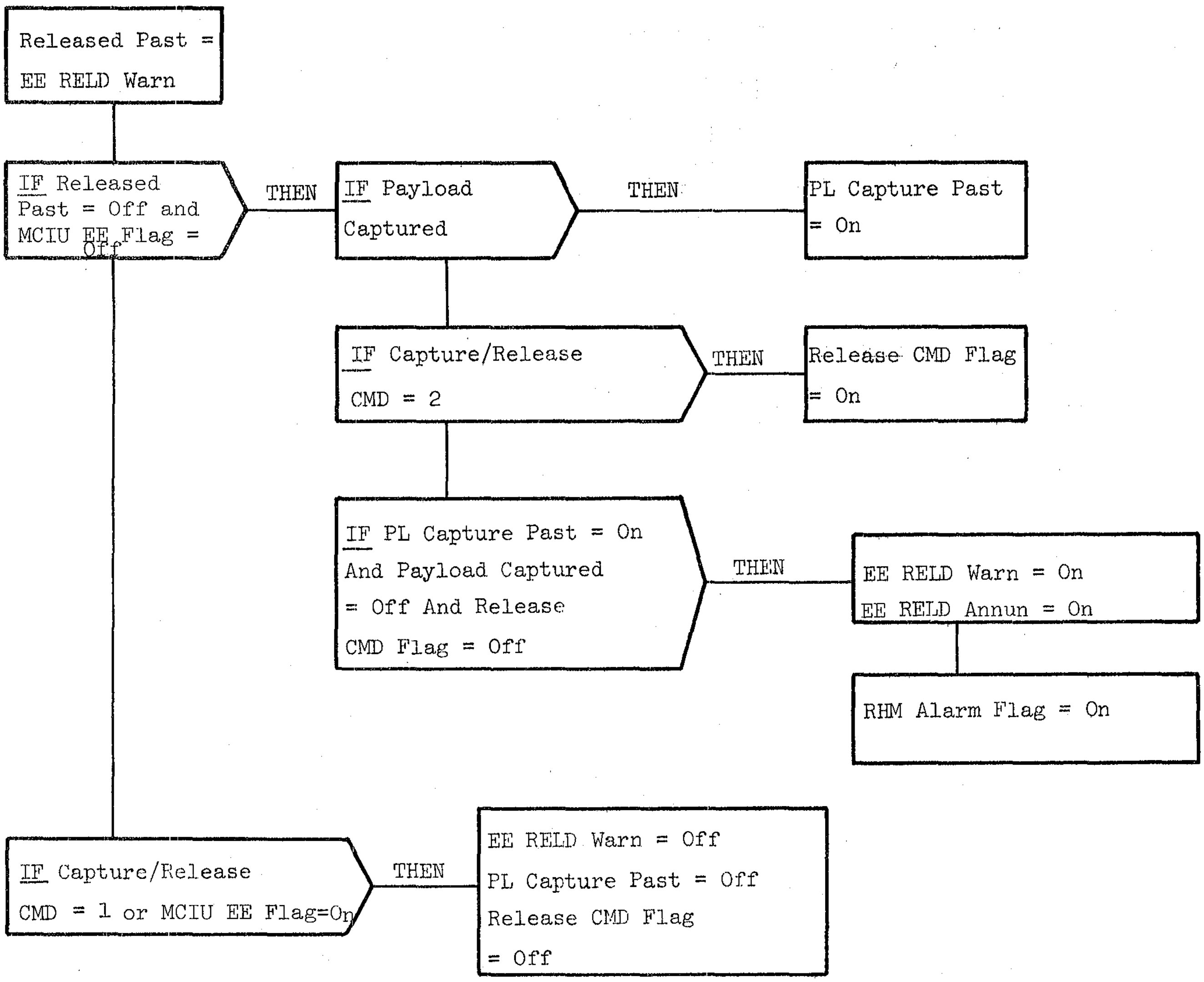

Figure 3.3.8.14-5. Release Check

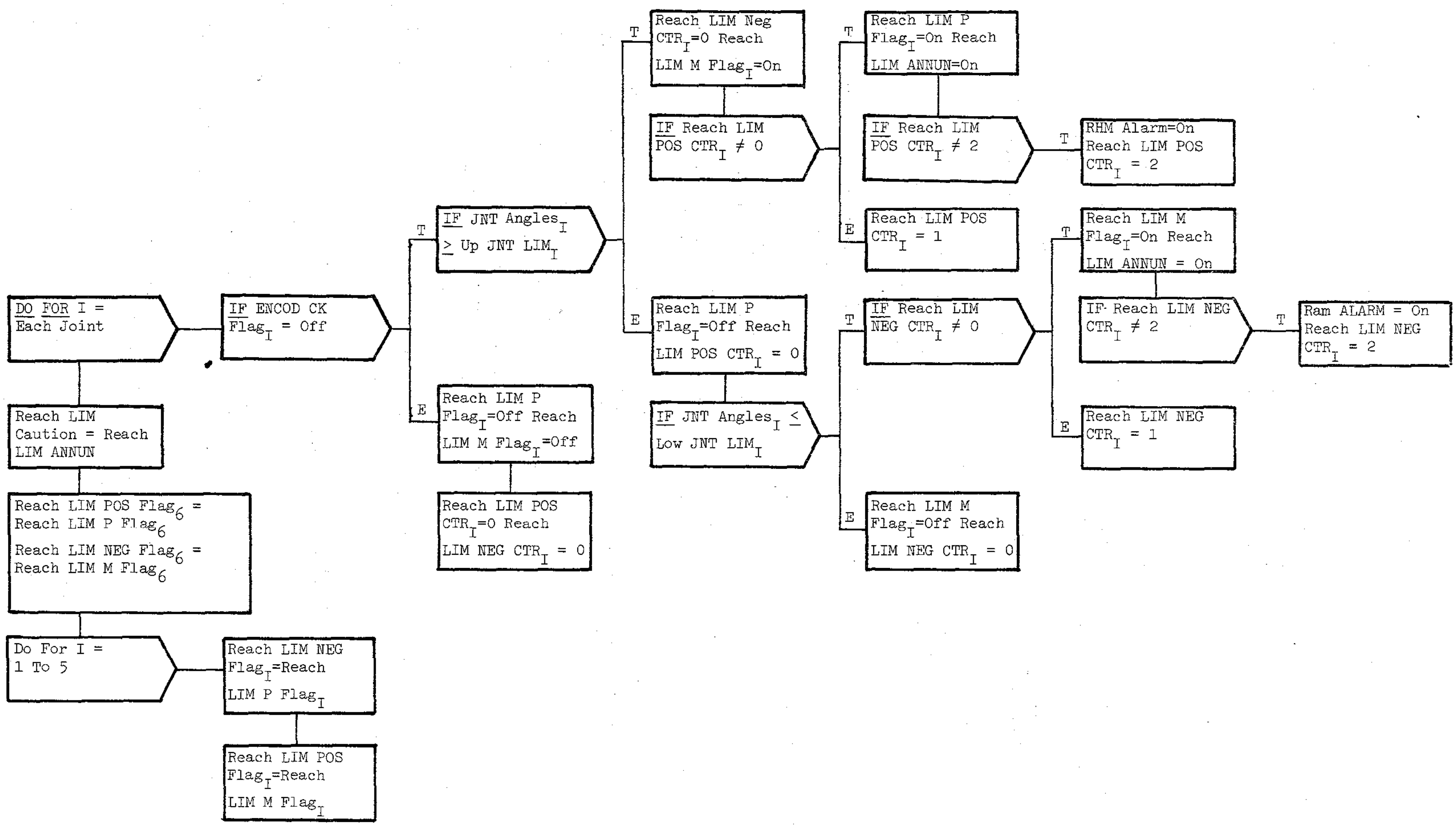

Figure 3.3.8.14-6. Reach Limit Check

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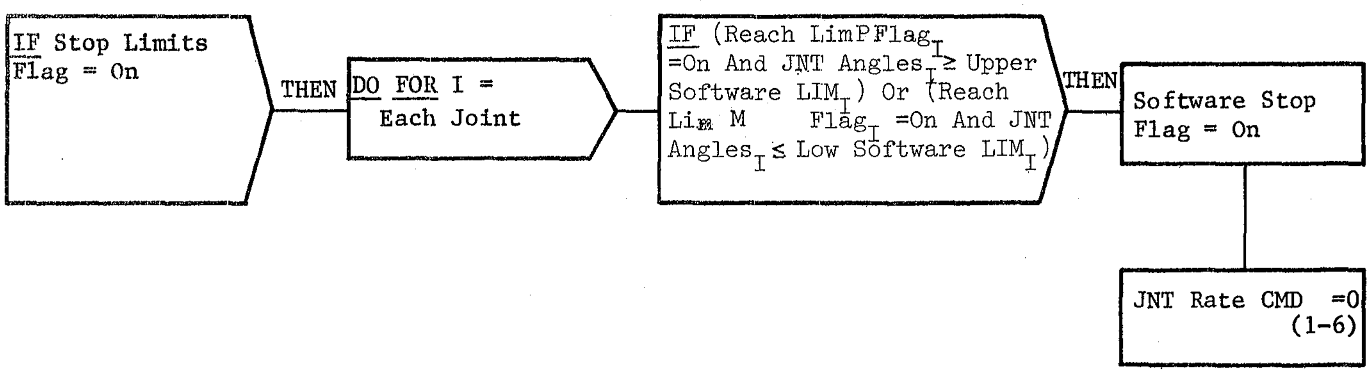

Figure 3.3.8.14-7 Software Stop Check

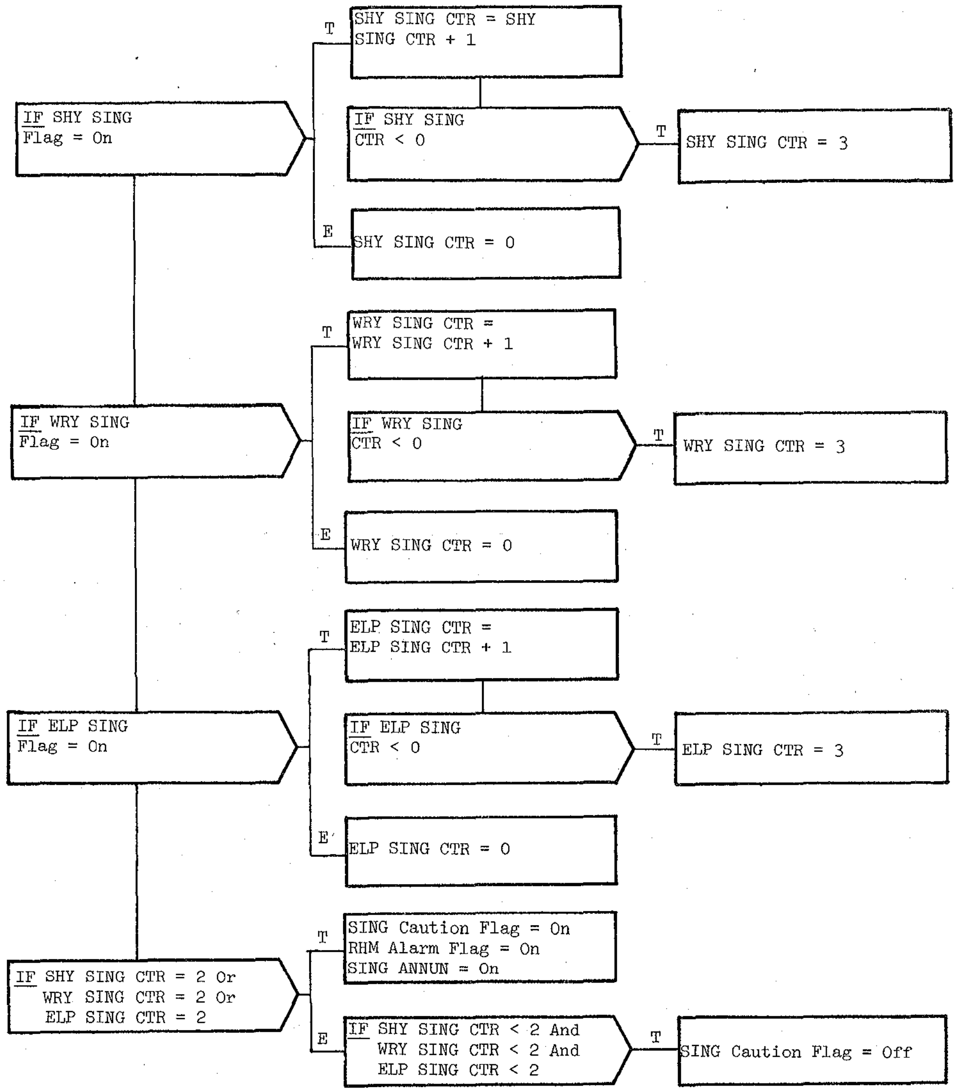

Figure 3.3.8.14-8. Singularity Check

3.3.8.15 Temperature Processor (RIT_TEMP)

The Temperature Processor monitors temperature data derived from sensors located in the RMS arm components to detect and annunciate out-of-limit conditions and determines the temperature which is out-of-limits by the largest amount (critical temperature).

a. Control Interface - RIT is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RIT_TEMP

b. Inputs - Inputs to this module are specified in Table 3.3.8.15-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.15-1 through 3.3.8.15-3. RIT begins processing by initializing the RIT Alarm Flag. Arm index is next initialized, and High/Low Limits set to LED or ABE limits. The out-of-limits delta value for a given temperature is also initialized.

   A check is then made to determine whether the temperature value is out-of-limits. If the temperature is out-of-limits, the delta out-of-limits amount is saved. If the same temperature ID value is out of limits on two consecutive checks (not two consecutive cycles), the following parameters are turned on: RIT alarm flag; temperature caution flag; temperature caution discrete; arm temperature annunciation. If the current delta out-of-limits temperature value is greater than the worst case delta temperature value for a given arm, the new value is saved and the critical temperature index is set to the proper temperature value in the RDD temperature buffer.

   There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.15-1.

e. Module References - None

f. Module Type and Attributes -

   Type: External Procedure

   Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool
D INCLUDE TEMPLATE CRC_COT	RMS Constants Table

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module

i. Constraints and Assumptions -

- When RIT has processed 24 temperatures, they are assumed to be 24 unique temperatures (i.e., no temperature is processed more than once and no temperature is missed).

- The upper and lower temp limits do not overlap.

TABLE 3.3.8.15-1 Temperature Processor MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Worst Case Delta Temperature	E	L		RIT_WORST_CASE_DELT_TEMP		
2	Sensor ID	A.2.32	I	RCD	CRAV_SENSOR_ID		
3	Hi Limit	E	L		RIT_HI_LIM		
4	Lo limit	E	L		RIT_LO_LIM		
5	Delta Temp	E	L		RIT_DELTA_TEMP		
6	Arm Index	E	L		RIT_ARM_INDEX		
7	RIT Temp Counter	A.2.32	I	RCD	CRAV_RIT_TEMP_CTR		
8	Hi Temp Limit	A.2.37	R	STM	CRSS_HI_TEMP_LIM	V96T6790C - 796C V96T6800C - 804C, V96T6824C - 830C, V96T6834C - 838C	
9	Lo Temp Limit	A.2.37	R	STM	CRSS_LO_TEMP_LIM	V96T6808C - 814C, V96T6817C - 821C, V96T6841C - 847C, V96T6850C - 854C	
10	Temp Caution (PORT/STBD)	A.2.34	W	MCIU	CREB_PS_TEMP_CAUT_ACT	V72X2931J, V72X2925J	
11	RIT Alarm Flag	A.2.32	O	RDD	CRAB_RIT_ALARM		
12	Critical Temp Index	A.2.32	O	RDD,DL	CRAV_CRIT_TEMP_INDEX	V92U3700C-701C	
13	Therm Temp	A.2.32	I	RYE	CRAV_THERM_TEMP	V92T3710C-716C V92T3720C-724C V92T3730C-736C V92T3740C-744C	

TABLE 3.3.8.15-1 Temperature Processor (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
14	THERM COUNTER	E	L		RIT_THERM_COUNTER		
15	J	E	L		RIT_J		
16	ANNUN THERM COUNTER	E	L		RIT_ANNUN_THERM_COUNTER		
17	ARM TEMP ANNUN	A.2.32	O	RDD	CRAB_ARM_TEMP_ANNUN	V72X2931J & V72X2925J	
18	TEMP INDEX	E	L		RIT_TEMP_INDEX		

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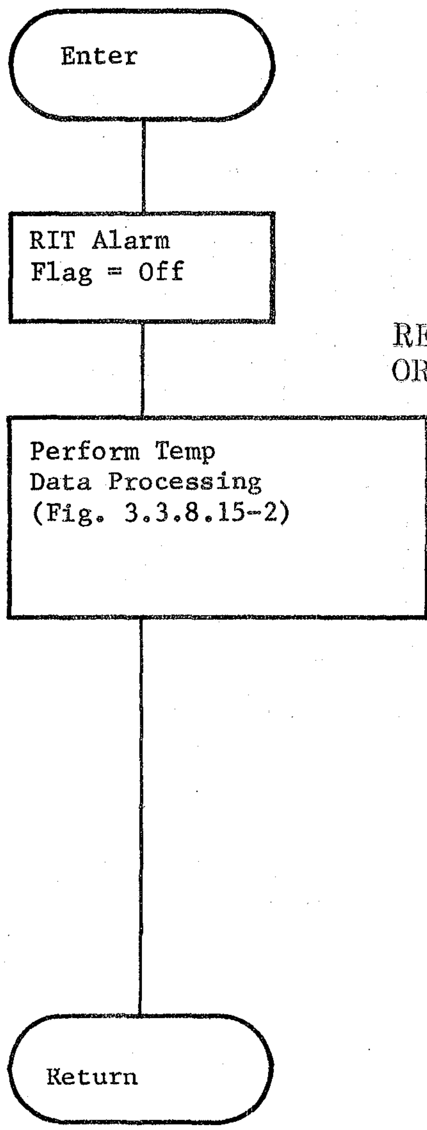

Figure 3.3.8.15-1. Temperature Processor C-8

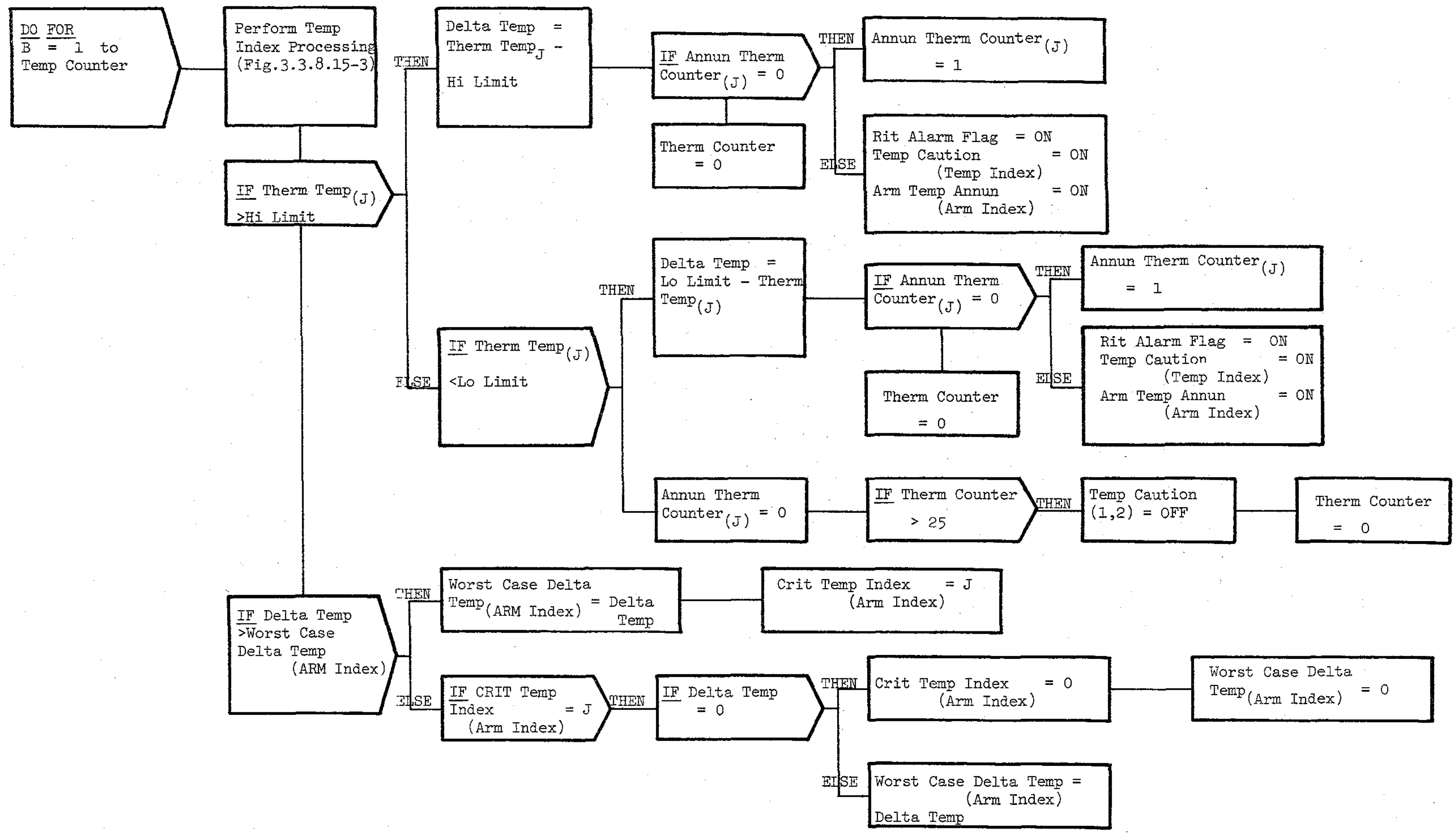

Figure 3 3.8.15-2. Temp Data Processing

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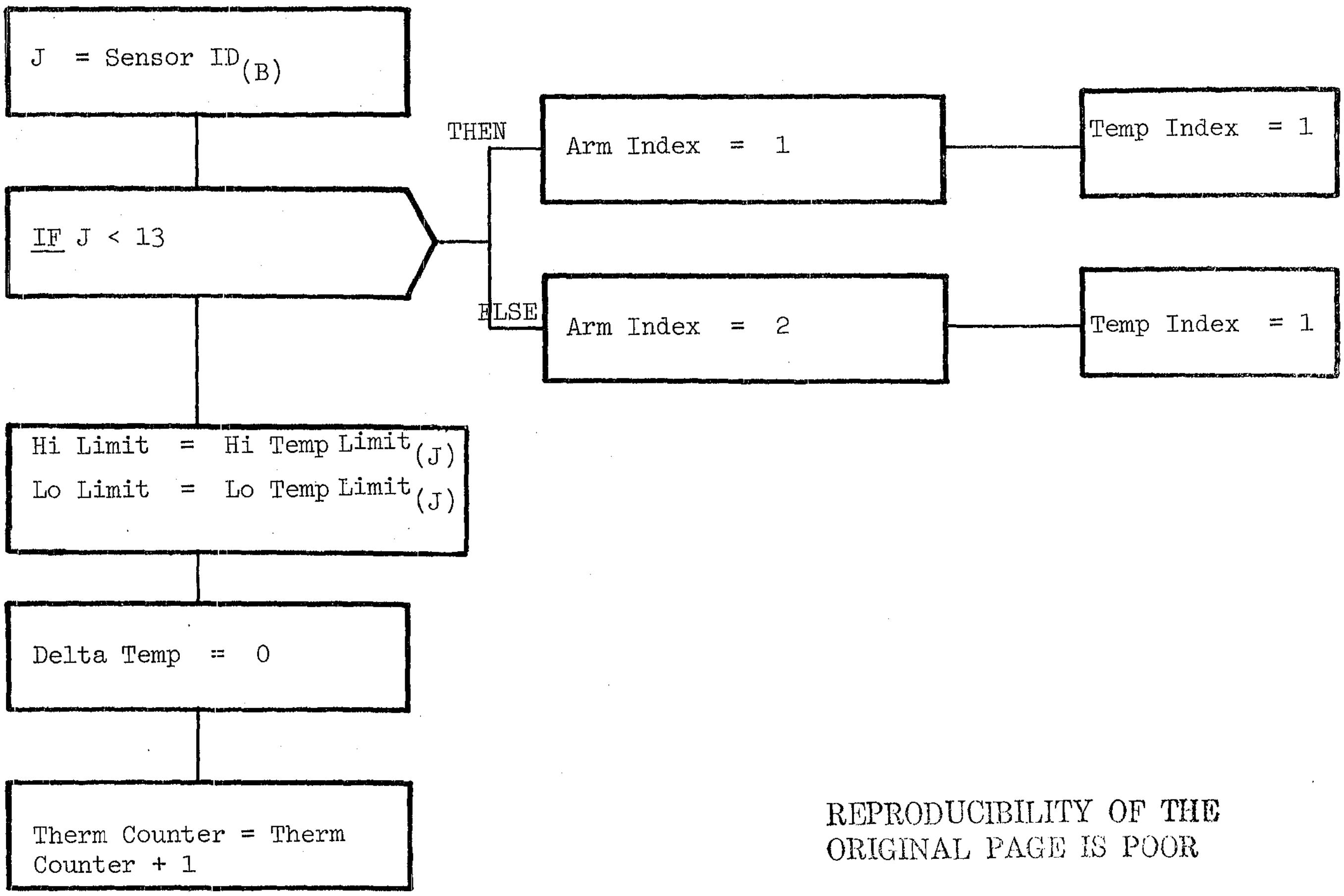

Figure 3 3.8.15-3. Temp Index Processing

3.3.16 MCIU Encoder (RNC_ENCODE)

The MCIU Encoder (RNC) module sets the joint currents in order to drive the selected arm joint motors; calculates, scales, and biases the selected arm joint motor speeds relative to the motor speed threshold; converts scalar quantities to various fixed point formats for output to the MCIU; performs test word processing; and packs the fault word for downlist.

a. Control Interfaces - RNC is CALL'ed by the RMS Executive (REX) at 12.5Hz.

   Invocation: CALL RNC_ENCODE

b. Inputs - Inputs to this module are specified in Table 3.3.8.16-1.

c. Process Description - The control flow for this module is shown in Figure 3.3.8.16-1 through 3.3.8.16-10.

   The MCIU Encoder performs the following seven (7) basic functions:

   - Initialization
   - Joint motor speed calculations
   - Maximum current attenuation
   - Rate demand identification
   - Format conversions
   - Test word processing
   - Test word packing

   Two items are initialized upon entry into RNC. ASI, used to subscript arm dependent arrays, is set equal to the arm select index when either the port or starboard arm is selected. Port is the default when no arm is selected. The second initialization sets each joint current to its respective arm joint attenuation limit for the selected arm.

   Next, each old joint motor speed is calculated for the selected arm using the joint rate commands and the constants for the joint gear ratios. Next, the old motor speed and two previous motor speeds are saved. RNC then compares the absolute value of these calculated speeds against an arm dependent threshold speed. Inside the threshold region, a constant scale factor is applied. However, outside this region, arm dependent scaling and biasing factors are applied to the calculated joint motor speeds.

   RNC next monitors conditions requiring maximum current attenuation. As long as maximum torque is not required and there is no software stop condition, then when payload capture has been commanded or when the arm has been commanded rigidized and the end-effector is not rigidized, RNC resets the joint currents for all joints to the maximum current attenuation (i.e., minimum current).

Then RNC saves the two previous rate demand identifiers and increments the current rate demand identifier. If the current identifier is greater than 127, it is set to one (1).

Five fixed point formats are used to output data for use by the MCIU. The scaled motor speed is rounded up in magnitude and converted to a signed, twelve (12) bit, fixed point word. The range of these words in two's complement notation is from -2048 to 2047. A second format is used to convert the joint current limits (range from 0 to 15) into an unsigned, four (4) bit, fixed point word. The first and second formats are used for each joint of the selected arm.

The third format converts two outputs from RDD, the actual and commanded end-effector resultant translation rates (range from 0 to 255÷256), for output on the two-element analog meter. Both of these outputs are converted to unsigned, eight (8) bit, fixed point words. The fourth format converts three data fields into four decimal digits for output on the D & C panel. Each data field is rounded, leading zeroes are suppressed and packed into three four (4) bit and two two (2) bit words as unsigned, fixed point words. The decimal field is converted to a two (2) bit, unsigned, fixed point word. The fifth format converts the current rate demand identifier into a seven (7) bit, unsigned fixed word. Next, RNC sends to the MCIU, for two consecutive cycles, one of two alternating bit patterns. Finally, the fault word is packed for downlist. At this point, RNC exits. There is no SPEC initialization or cleanup processing.

d. Outputs - Outputs from this module are specified in Table 3.3.8.16-1.

e. Module References - None

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

D INCLUDE TEMPLATE CRD_CIL	Constants Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool
D INCLUDE TEMPLATE CRA_TE	Working Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - The use of the word "round" in this module means the addition of 0.5 to the quantity to be rounded and the subsequent truncation of any franctional quantity, yielding a rounded integer. On the other hand, "rounded up in magnitude" is used in this module to mean the following:

N rounded up in magnitude = the integer portion of
(N + SIGNUM (N) 0.5)

By this means positive numbers become more positive and negative numbers become more negative.

TABLE 3.3.8.16-1 MCIU Encoder

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Maximum torque flag	A.2.32	I	RXY	CRAB_MAX_TORQUE		
2	Software stop flag	A.2.34	I	RXY,RHM	CREB_SOFTWARE_STOP	V72X2937J	
3	Capture/release command	A.2.32	I	RCD	CRAV_CAP_REL_CMD		
4	Rigidize/derigidize command	A.2.32	I	RCD	CRAV_RIG_DERIG_CMD		
5	Arm select index	A.2.32	I	RCD	CRAV_ARM_SEL		
6	EE rigidized/derigidized	A.2.32	I	RCD	CRAV_EE_RIG_DERIG		
7	Commanded joint angle rates	A.2.32	I	RRP,RSC,RFP, RXY	CRAV_JAR_CMD	V92R3205C-210C	
8	Scaled actual POR rate	A.2.32	I	RDD	CRAV_SCALED_POR_RSLT_ATL	V72L2933J	
9	Scaled commanded POR rate	A.2.32	I	RDD	CRAV_SCALED_POR_RSLT_CMD	V72L2934J	
10	Input Data fields	A.2.32	I	RDD	CRAV_DIG_DSP_DATA		
11	Input Decimal fields	A.2.32	I	RDD	CRAV_DEC_DSP_DATA		
	Joint current limits (Items 12-17)						
12	Shoulder yaw	A.2.34	W	MCIU	CREV_JNT_CRNT_LIM$(6;)	V54K2210J	
13	Shoulder pitch	A.2.34	W	MCIU	CREV_JNT_CRNT_LIM$(5;)	V54K2310J	
14	Elbow pitch	A.2.34	W	MCIU	CREV_JNT_CRNT_LIM$(4;)	V54K2410J	
15	Wrist pitch	A.2.34	W	MCIU	CREV_JNT_CRNT_LIM$(3;)	V54K2510J	
16	Wrist yaw	A.2.34	W	MCIU	CREV_JNT_CRNT_LIM$(2;)	V54K2610J	
17	Wrist roll	A.2.34	W	MCIU	CREV_JNT_CRNT_LIM$(1;)	V54K2710J	
18	Rate demand identifier	A.2.32	I/O	RXY/RVM	CRAV_RATE_DMD_ID	V92J3801C-803C	RATE_DMD_ ID
19	Motor Speed Past	A.2.32	O	RVM	CRAV_MOTOR_SPEED_UP	V92R3805C- V92R3822C	MOTOR_ SPEED_PAST
20	Fixed point rate demand ID (commanded)	A.2.34	W	MCIU	CREV_RATE_DMD_ID_CMD$(1;)	V54K2800J	RATE_DE- MAND_ID_ CMD

TABLE 3.3.8.16-1 MCIU Encoder (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
	Fixed point joint rate commands (Items 21-26)						
21	Shoulder yaw	A.2.34	W	MCIU	CREV_JNT_RATE_DEMAND$(6;)	V54K2200J	
22	Shoulder pitch	A.2.34	W	MCIU	CREV_JNT_RATE_DEMAND$(5;)	V54K2300J	
23	Elbow pitch	A.2.34	W	MCIU	CREV_JNT_RATE_DEMAND$(4;)	V54K2400J	
24	Wrist pitch	A.2.34	W	MCIU	CREV_JNT_RATE_DEMAND$(3;)	V54K2500J	
25	Wrist yaw	A.2.34	W	MCIU	CREV_JNT_RATE_DEMAND$(2;)	V54K2600J	
26	Wrist roll	A.2.34	W	MCIU	CREV_JNT_RATE_DEMAND$(1;)	V54K2700J	
27	Actual POR resultant velocity	A.2.34	W	MCIU	CREV_POR_VEL_ATL	V72L2933J	
28	Commanded POR resultant velocity	A.2.34	W	MCIU	CREV_POR_VEL_CMD	V72L2934J	
	Output Data fields (Items 29-33)						
29	Digit 1	A.2.34	W	MCIU	CREV_DIG_DSP_D1	V72U2952J, 57J, 62J	
30	Half digit 2A	A.2.34	W	MCIU	CREV_DIG_DSP_D2A	V72U2952J, 57J, 62J	
31	Half digit 2B	A.2.34	W	MCIU	CREV_DIG_DSP_D2B	V72U2953J, 58J, 63J	
32	Digit 3	A.2.34	W	MCIU	CREV_DIG_DSP_D3	V72U2953J, 58J, 63J	
33	Digit 4	A.2.34	W	MCIU	CREV_DIG_DSP_D4	V72U2953J, 58J, 63J	
34	Output Decimal fields	A.2.34	W	MCIU	CREV_DIG_DSP_DEC	V72J2951J, V72J2956J, V72J2961J	
35	Old Motor Speed	E	L		RNC_OLD_MTR_SPD		
36	INCNT	A.2.32	I	RXY	CRAV_TEST_WD_INCNT		
37	Test Word	A.2.34	W	MCIU	CREV_TEST_WORD	V72U3050J	
38	Altpat 1	A.2.33	Z		CRDK_ALTPAT1		
39	Altpat 2	A.2.33	Z		CRDK_ALTPAT2		
40	Errjnt	A.2.32	I	RVM	CRAB_ERRJNT	V92X3540X-545X	
41	Encod Ck Flag	A.2.32	I	RVM	CRAB_ENCOD_CK	V92X3530X-535X	

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TABLE 3.3.8.16-1 MCIU Encoder (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
42	EE Derigid Warn	A.2.34	R	MCIU	CREB_EE_DERIG_WARN	V72X2926J	
43	EE Reld Warn	A.2.34	R	MCIU	CREB_EE_REL_WARN	V72X2927J	
44	ASI	E	L		RNC_ASI		
45	Joint current	E	L		RNC_JNT_CRNT		
46	Motor speed	E	L		RNC_MTR_SPD		
47	Attenuation limits	A.2.33	Z		CRDS_ARM_ATTN_LIM	V98U5101C-106C V98U5122C-127C	
48	Scale factor (Motor Speed)	A.2.33	Z		CRDS_SF_ARM	V98U5230C-235C, V98U5236C-241C	
49	Bias factor (Motor Speed)	A.2.33	Z		CRDS_BF_ARM	V98U5242C-253C	
50	Motor speed threshold	A.2.33	Z		CRDS_MTR_SPD_THRESH	V98U5296C-5307C	
51	Maximum current attenuation	A.2.33	Z		CRDK_MAX_CRNT_ATTN		
52	Degrees to radians conversion factor ($\pi/180$)	A.2.33	Z		CRDK_DTR		DTR
53	Joint gear ratios	A.2.33	Z		CRDK_JNT_GEAR_RATIO		

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TABLE 3.3.8.16-1 MCIU Encoder (Cont'd)

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
54	Below threshold factor (Motor Speed Scaling)	A.2.33	Z		CRDK_BLW_THRESH		
	Format Four Items (Items 55-61)						
55	A	E	L		RNC_A		
56	D1	E	L		RNC_D1		
57	D2	E	L		RNC_D2		
58	D3	E	L		RNC_D3		
59	D4	E	L		RNC_D4		
60	Z	E	L		RNC_Z		
61	Integer Motor Speed	E	L		RNC_INT_MTR_SPD		
62	Packed Faults	A.2.32	O	DL	CRAV_PACK_FAULT	V92X3040X	

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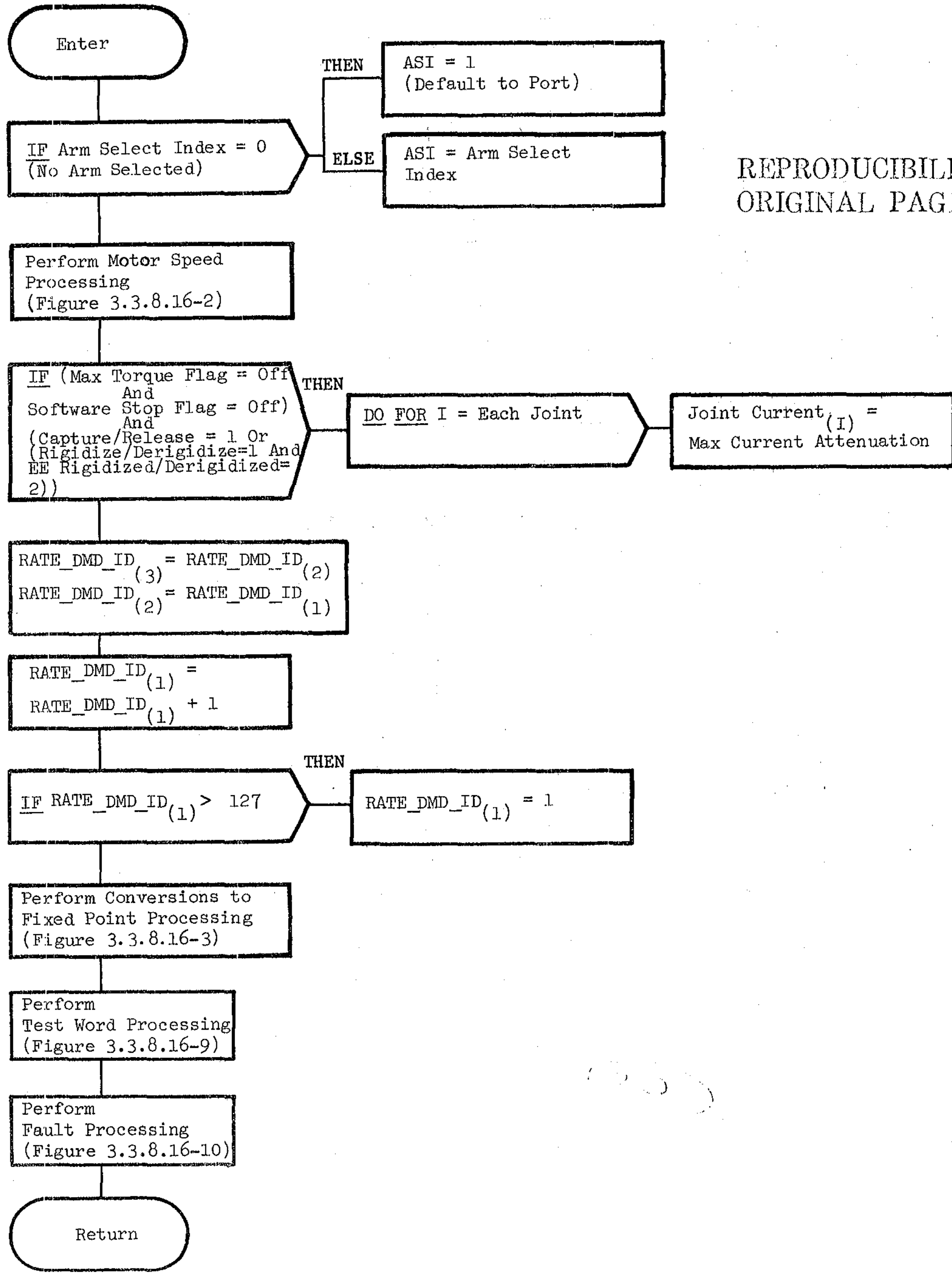

Figure 3.3.8.16-1 MCIU Encoder

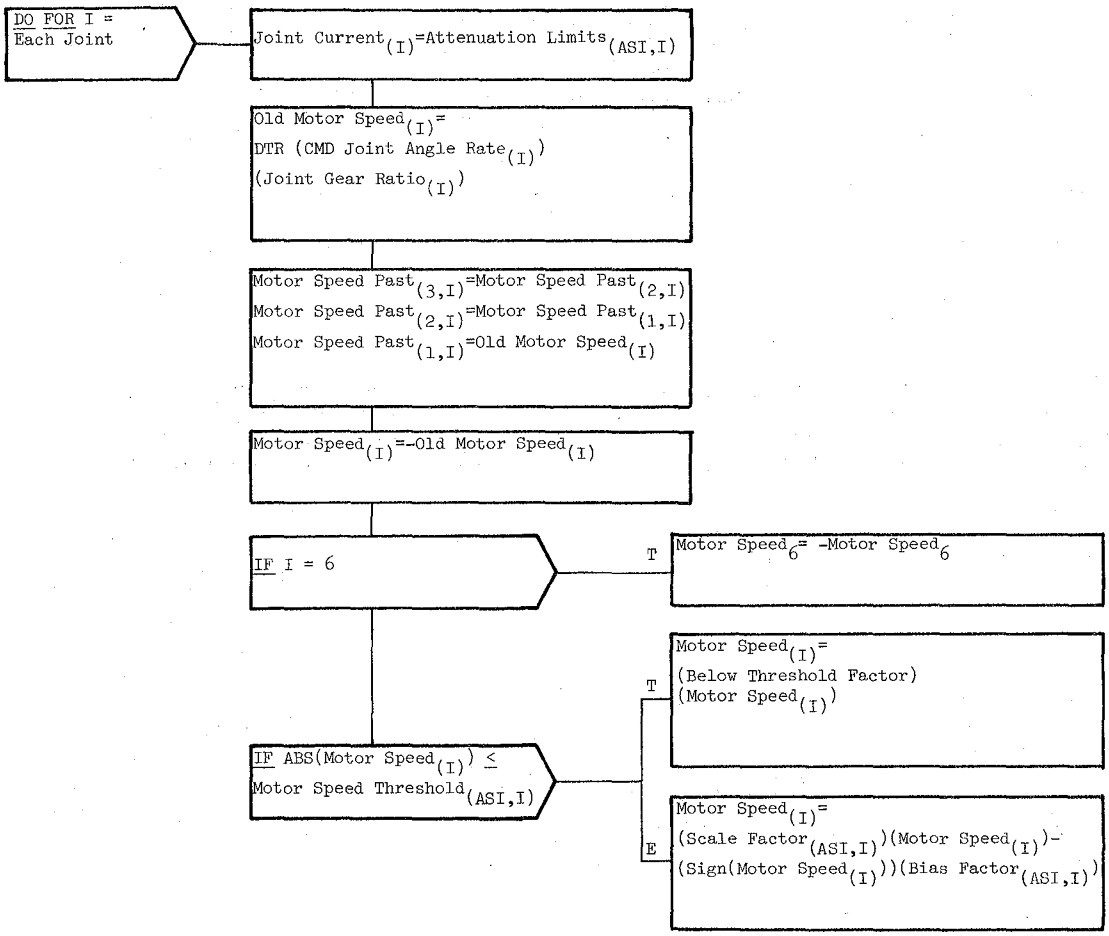

Figure 3.3.8.16-2. Motor Speed Processing

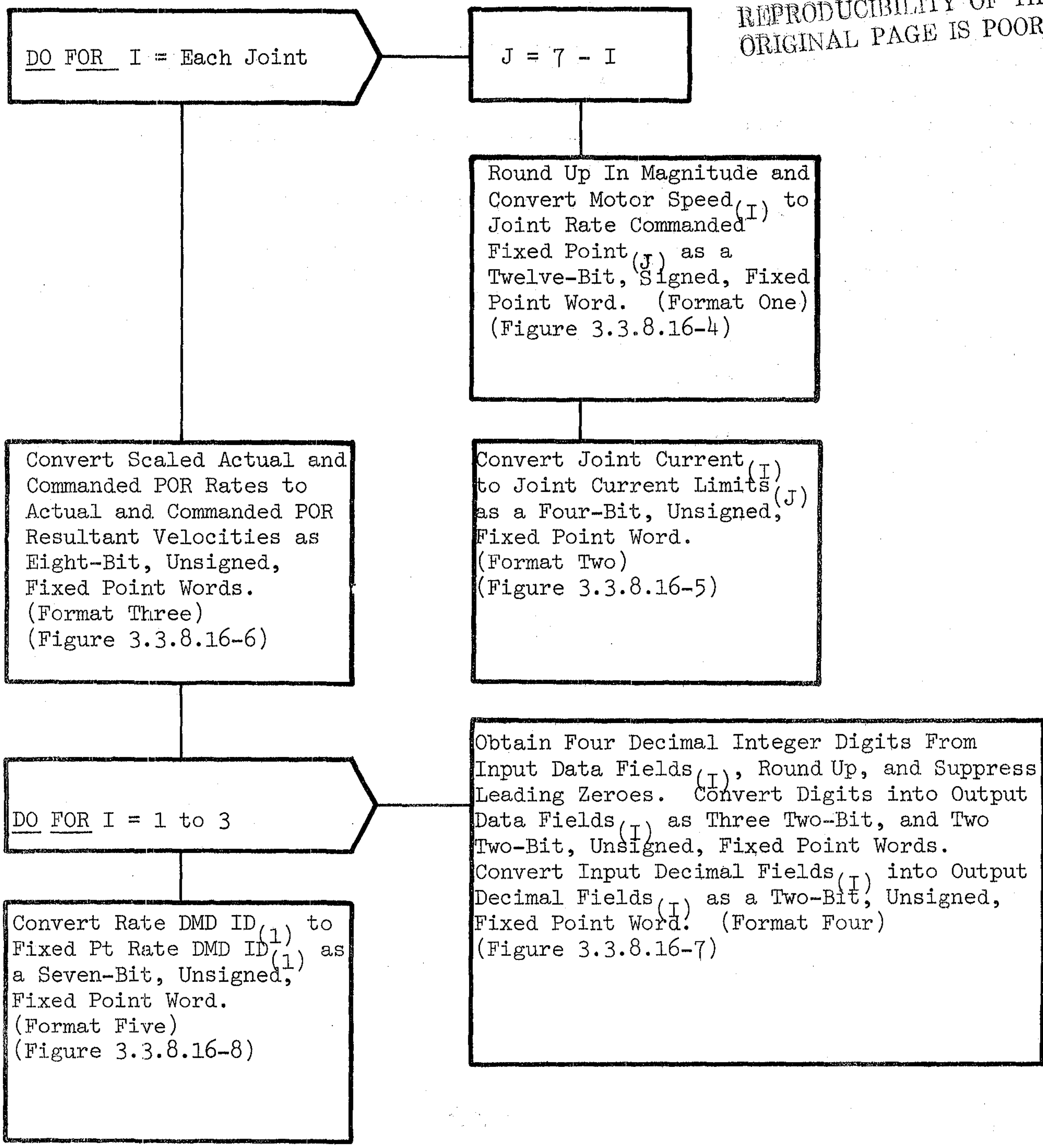

Figure 3.3.8.16-3. Conversion to Fixed Point Processing

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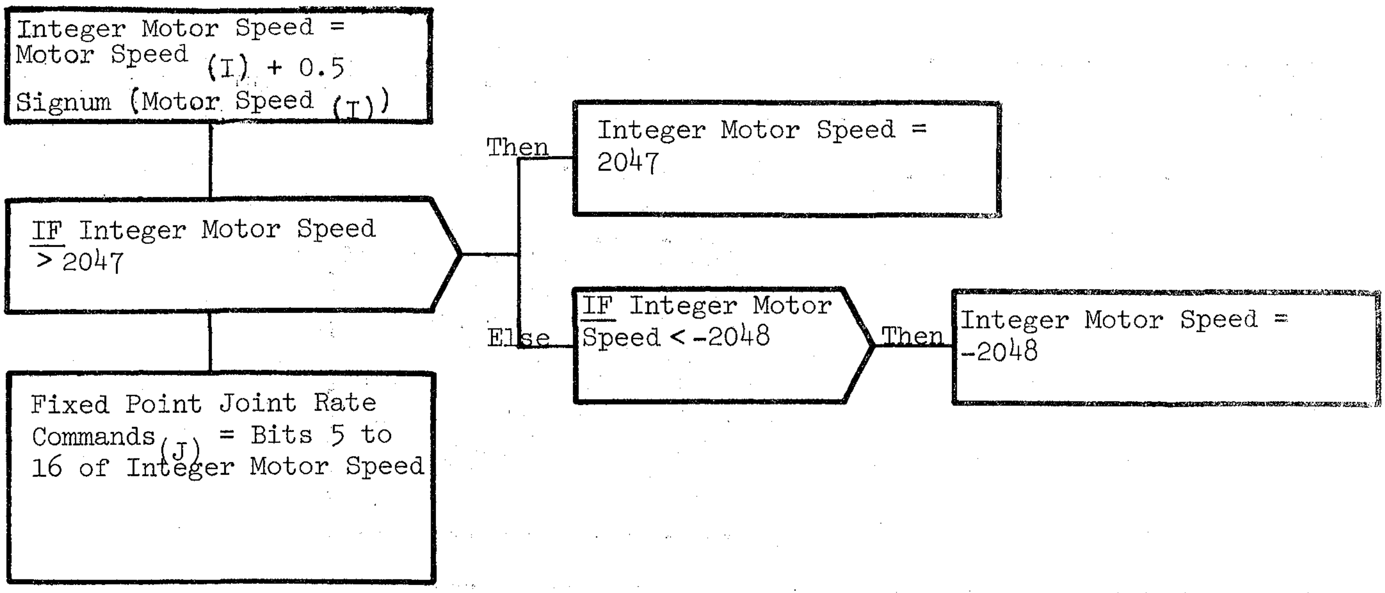

Figure 3.3.8.16-4 Format One

Joint Current Limits$_{(J)}$ = Bits 13 to 16 of the Integer Portion of Joint Current$_{(I)}$

Figure 3.3.8.16-5. Format Two

Actual POR Resultant Velocity Fixed Point = Bits 9 to 16 of the Integer Portion of ((Scaled Actual POR Rate 255) + 0.5)

Cmded POR Resultant Velocity Fixed Point = Bits 9 to 16 of the Integer Portion of ((Scaled Cmded POR Rate 255) + 0.5)

Figure 3.3.8.16-6. Format Three

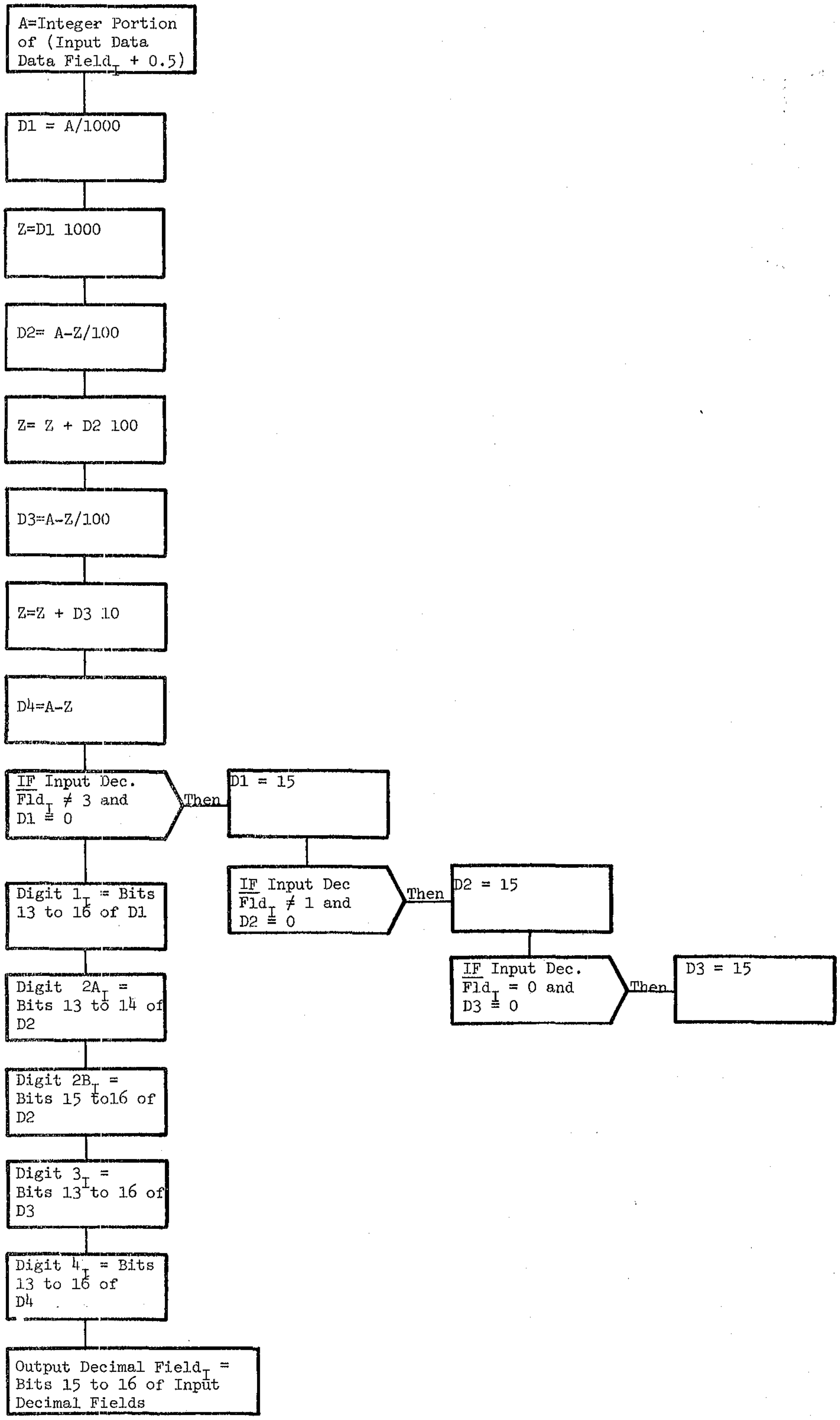

Figure 3.3.8.16-7. Format Four

$RATE\_DEMAND\_ID\_CMD_{(1)}$ =   Bits 10 to 16 of $RATE\_DMD\_ID_{(1)}$

Figure 3.3.8.16-8. Format Five

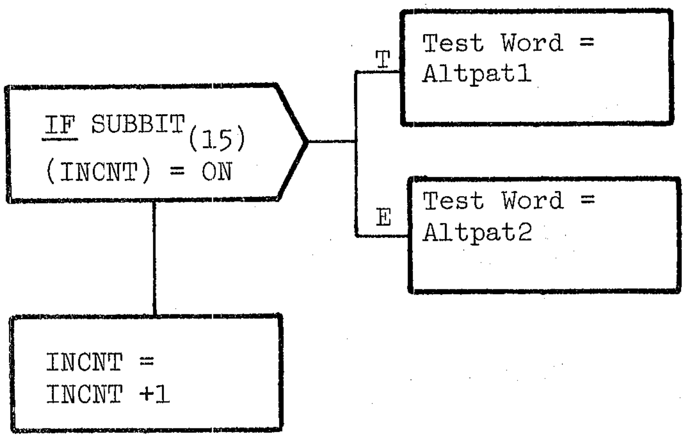

Figure 3.3.8.16-9. Test Word Processing

Packed Faults =
Errjnt CAT
Encod Ck Flag CAT
EE Derigid Warn CAT
EE Reld Warn

BIT	PARAMETER
1	0
2	0
3	Errjnt 1
4	Errjnt 2
5	Errjnt 3
6	Errjnt 4
7	Errjnt 5
8	Errjnt 6
9	Encod Ck Flag 1
10	Encod Ck Flag 2
11	Encod Ck Flag 3
12	Encod Ck Flag 4
13	Encod Ck Flag 5
14	Encod Ck Flag 6
15	EE Derigid Warn
16	EE Reld Warn

Figure 3.3.8.16-10. Fault Processing

3.3.8.17 Dedicated Display (RDD_DDISP)

The Dedicated Display module (RDD) obtains selected data from the working data compool and scales it into the proper units to drive the two EE translation rate meters and the three digital readout monitors on the RMS dedicated display panel.

a. Control Interface - RDD is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RDD_DDISP

b. Inputs - Inputs to this module are specified in Table 3.3.8.17-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.17-1 through 3.3.8.17-8. RDD processing consists of:

   - Alarm processing
   - Analog parameter processing
   - Digital parameter processing
   - Data field processing
   - Annunciation processing

   Alarm processing turns ON the master alarm discrete if either the RIT alarm flag, the RHM alarm flag, or the RVM alarm flag is ON; otherwise, RDD turns the master alarm discrete OFF.

   Analog processing determines the greater of the commanded and actual POR resultant translation rates and uses it to select the appropriate meter scale and to turn the X10 discrete ON or OFF. The resultant translation rates are then scaled and limited to the maximum value that can be displayed on the analog meters.

   If no arm has been selected and the parameter switch on the RMS panel is not set to PORT or STBD temperature, the three digital displays are blanked. Otherwise, digital parameter processing is performed. Based on the position of the parameter switch, the data values are obtained from the working data compool and the sign and decimal indicators are set. If critical temperature is selected on the parameter switch, a table is used to determine the ABE or LED temperature corresponding to the critical temperature. If no critical temperature exists for the selected arm, all three displays are blanked.

   Data field processing ensures that the sign of each display value is correct and scales each value depending on its decimal placement. There is no SPEC initialization or cleanup processing.

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Annunciation processing checks each annunciation flag. If it is ON on the current pass and was OFF on the last pass, a UI annunciation macro is issued. The annunciation flag is then saved for the next pass.

d. Outputs - Outputs from this module are specified in Table 3.3.8.17-1.

e. Module References - None

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism).

g. Template References -

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool
D INCLUDE TEMPLATE CRD_CIL	Constants and I-Load Compool
D INCLUDE TEMPLATE CRI_LVC	Level C Constants Compool
D INCLUDE TEMPLATE DMA_MAC	System Services Annunciation Routine
D INCLUDE TEMPLATE CDL_ANNUN	System Service Annunciation Compool
D INCLUDE DMA#MACS	System Services Error Annunciation Macro Replace Statements

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - None

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TABLE 3.3.8.17-1 Dedicated Display MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
1	RIT alarm flag	A.2.32	I	RIT	CRAB_RIT_ALARM		
2	RHM alarm flag	A.2.32	I	RHM,RXY	CRAB_RHM_ALARM		
3	Actual resultant POR translation rate	A.2.32	I	RTV,RXY	CRAV_POR_XLT_RSLT_ATL	V92R3326C	
4	CMDED resultant POR translation rate	A.2.32	I	RTV,RXY	CRAV_POR_XLT_RSLT_CMD	V92R3270C	
5	Parameter switch index	A.2.32	I	RCD	CRAV_PARM_SWITCH_INDEX		
6	Joint switch index	A.2.32	I	RCD	CRAV_JNT_SEL_ID		
7	Actual joint angles	A.2.32	I	RYE	CRAV_JA_ATL	V92H3300C-305C	
8	Therm temp data	A.2.32	I	RYE	CRAV_THERM_TEMP	V92T3710C-716C V92T3720C-724C V92T3730C-736C V92T3740C-744C	
9	POR tip position in OS	A.2.32	I	RKG	CRAV_POR_POS_DISP	V92H3417C-419C	
10	POR tip attitude in OS	A.2.32	I	RKG	CRAV_POR_ATD_OS	V92H3335C V92H3333C V92H3334C	
11	Actual POR translation rate in SL	A.2.32	I	RTV	CRAV_POR_XLT_ATL_TD	V92R3320C-322C	
12	Actual POR rotation rate in SL	A.2.32	I	RTV	CRAV_POR_ROT_ATL_RD	V92R3325C V92R3323C V92R3324C	
13	Annunciation Tables						
	MCIU warning	A.2.32	I	RCD	CRAB_MCIU_ANNUN	V54X2020J	
	ABE warning	A.2.32	I	RCD	CRAB_ABE_ANNUN	V54X2021J	
	GPC Data warning	A.2.32	I	RCD	CRAB_GPC_ANNUN	V54X2022J	
	EE derigidize warning	A.2.32	I	RHM	CRAB_EE_DERIG_ANNUN	V72X2926J	
	Singularity caution ind	A.2.32	I	RHM	CRAB_SING_ANNUN	V72X2923J	
	Control error caution	A.2.32	I	RVM	CRAB_CTL_ERR_ANNUN	V72X2924J	
	Check CRT caution	A.2.32	I	RVM	CRAB_CHK_CRT_ANNUN	V72X2929J	
	Reach Limit caution	A.2.32	I	RHM	CRAB_REACH_LIM_ANNUN	V72X2930J	
	Arm temp caution	A.2.32	I	RIT	CRAB_ARM_TEMP_ANNUN	V72X2931J, V72X2925J	
	EE Reld Annun	A.2.32	I	RHM	CRAB_EE_REL_ANNUN	V72X2927J	

TABLE 3.3.8.17-1 Dedicated Display (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
14	Critical temperature index (PORT/STBD)	A.2.32	I	RIT	CRAV_CRIT_TEMP_INDEX	V92U3700C-701C	
15	Arm select index	A.2.32	I	RCD	CRAV_ARM_SEL		
16	Master alarm discrete	A.2.34	W	MCIU	CREB_MASTER_ALARM	V72X2915J	
17	Check CRT caution discrete	A.2.34	W	MCIU	CREB_CK_CRT_CAUT	V72X2929J	
18	X10 discrete	A.2.34	W	MCIU	CREB_X10_SCALE_ACT	V72X2939J	
19	Sign fields	A.2.34	W	MCIU	CREV_DIG_DSP_SIGN	V72J2950J V72J2955J V72J2960J	
20	FMPT Index table	E	L		RDD_FMPT_INDEX		
21	Max value	E	L		RDD_MAX_VALUE		
22	Scale factor	E	L		RDD_SCALE_FACTOR		
23	Annunciation flags	E	L		RDD_ANNUN_FLAGS		
24	Index bias	E	L		RDD_INDEX_BIAS		
25	Arm ID	E	L		RDD_ARM_ID		
26	Last pass annunciation flags	E	L		RDD_ANNUN_FLAGS_LP		
27	ABE ID array	E	L		RDD_ABE_TEMP_ID		
28	Temperature ID base (PORT/STBD)	E	L		RDD_ARM_TEMP_ID_BASE		
29	LED ID Array	E	L		RDD_LED_TEMP_ID		
30	High scale min	A.2.33	Z		CRDK_X10_MIN		
31	Low scale max	A.2.33	Z		CRDK_X1_MAX		

TABLE 3.3.8.17-1 Dedicated Display (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
32	X1 scale factor	A.2.33	Z		CRDK_SF_X1		
33	X10 scale factor	A.2.33	Z		CRDK_SF_X10		
34	Max meter value	A.2.33	Z		CRDK_MAX_METER_SCALE		
35	Arm availability indicator	A.2.31	Z		CRIS_ARM_AVAIL	V98U5100C	
36	Scaled actual POR rate	A.2.32	O	RNC	CRAV_SCALED_POR_RSLT_ATL	V72L2933J	
37	Scaled CMDED POR rate	A.2.32	O	RNC	CRAV_SCALED_POR_RSLT_CMD	V72L2934J	
38	Data fields	A.2.32	O	RNC	CRAV_DIG_DSP_DATA		
39	Decimal fields	A.2.32	O	RNC	CRAV_DEC_DSP_DATA		
40	RVM Alarm Flag	A.2.32	I	RVM	CRAB_RVM_ALARM		

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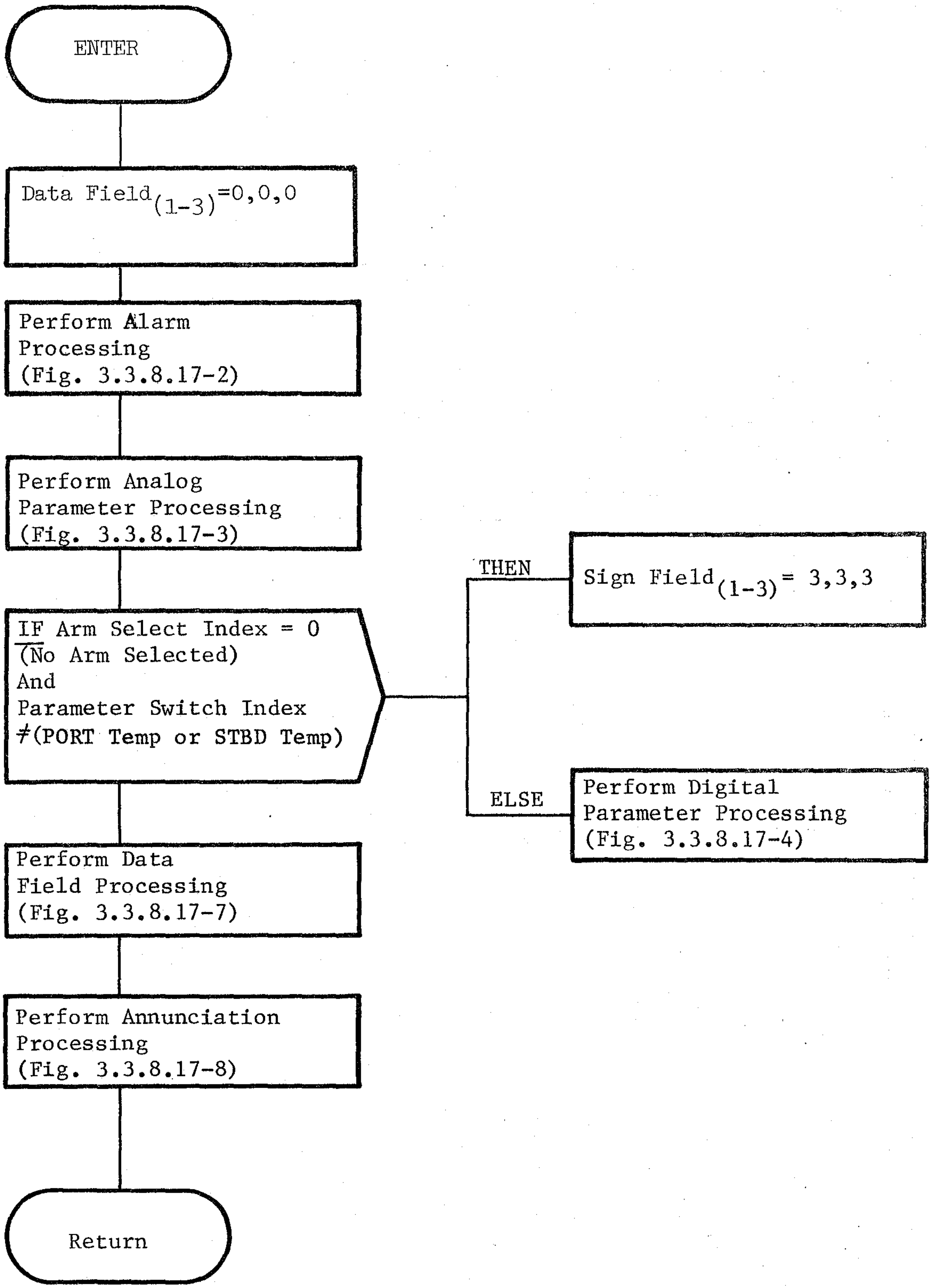

Figure 3.3.8.17-1. Dedicated Display

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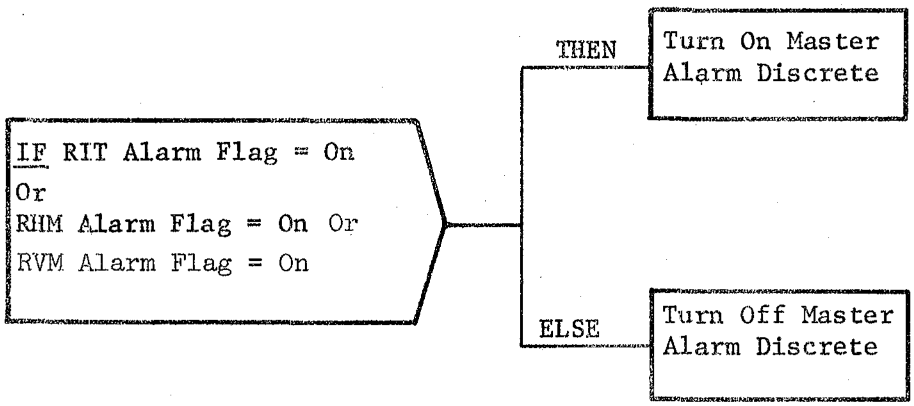


Figure 3.3.8.17-2. Alarm Processing

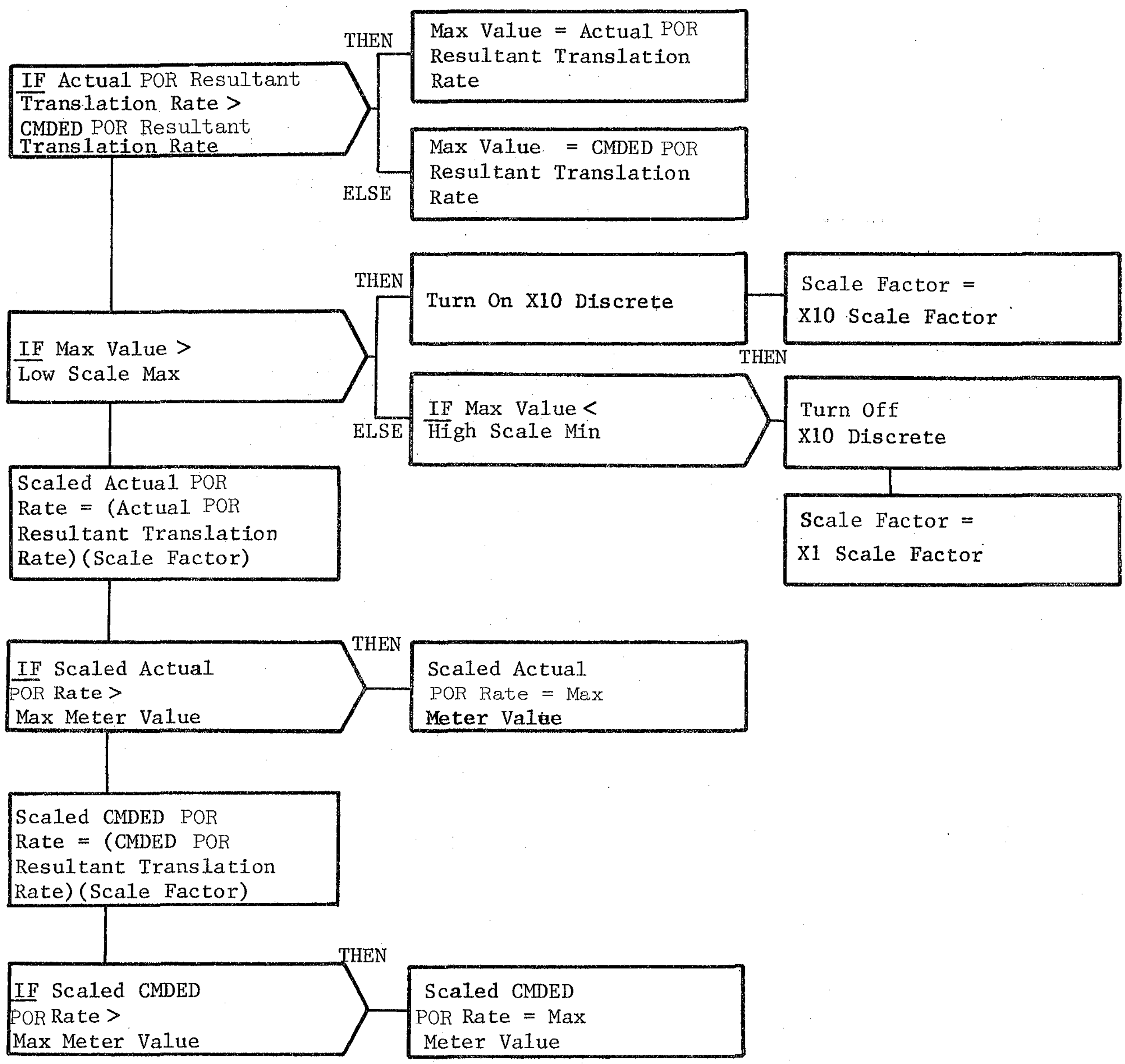
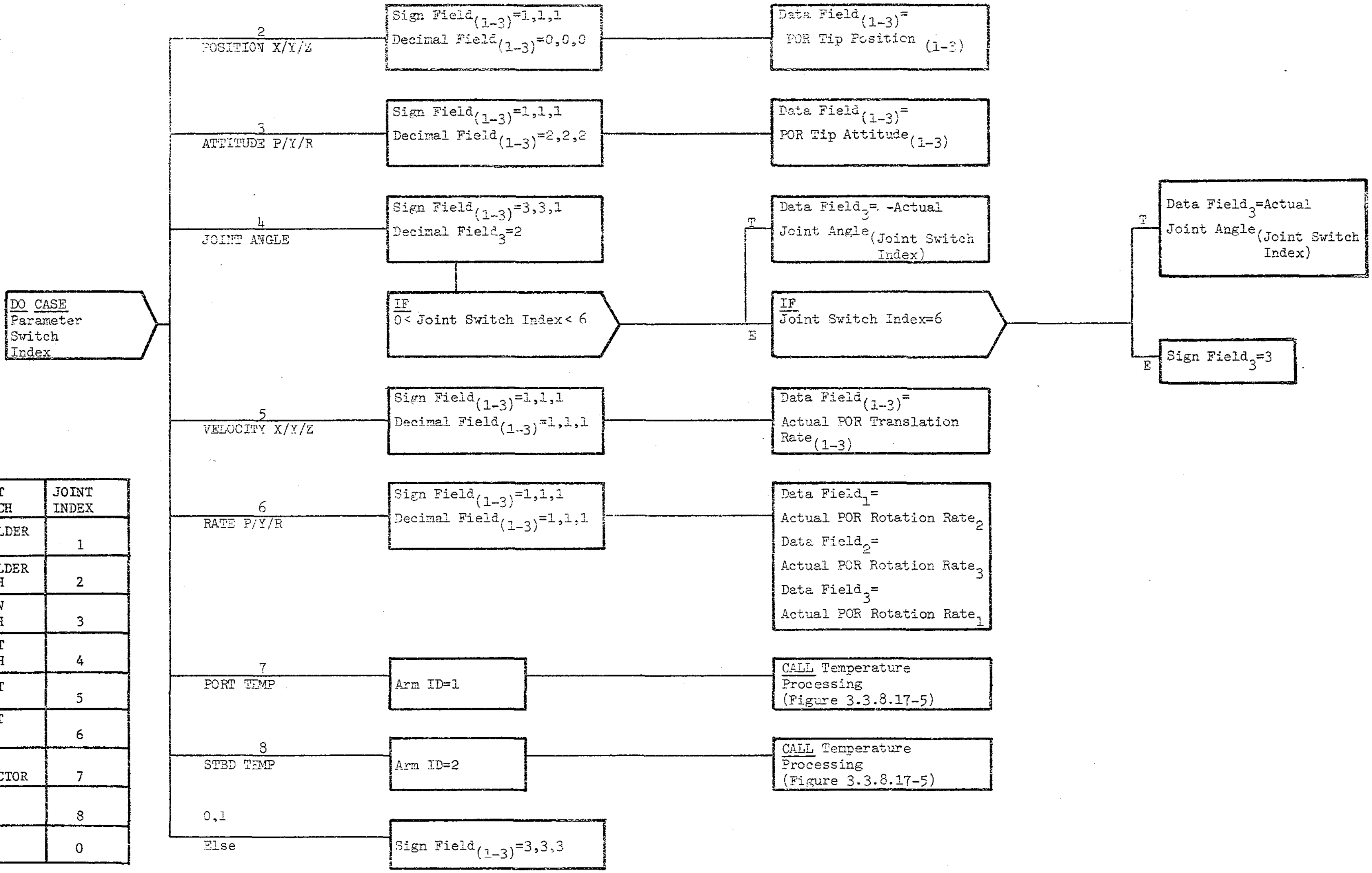


Figure 3.3.8.17-3. Analog Parameter Processing



JOINT SWITCH	JOINT INDEX
SHOULDER YAW	1
SHOULDER PITCH	2
ELBOW PITCH	3
WRIST PITCH	4
WRIST YAW	5
WRIST ROLL	6
END EFFECTOR	7
CRIT TEMP	8
NULL	0

Figure 3.3.8.17-4. Digital Parameter Processing

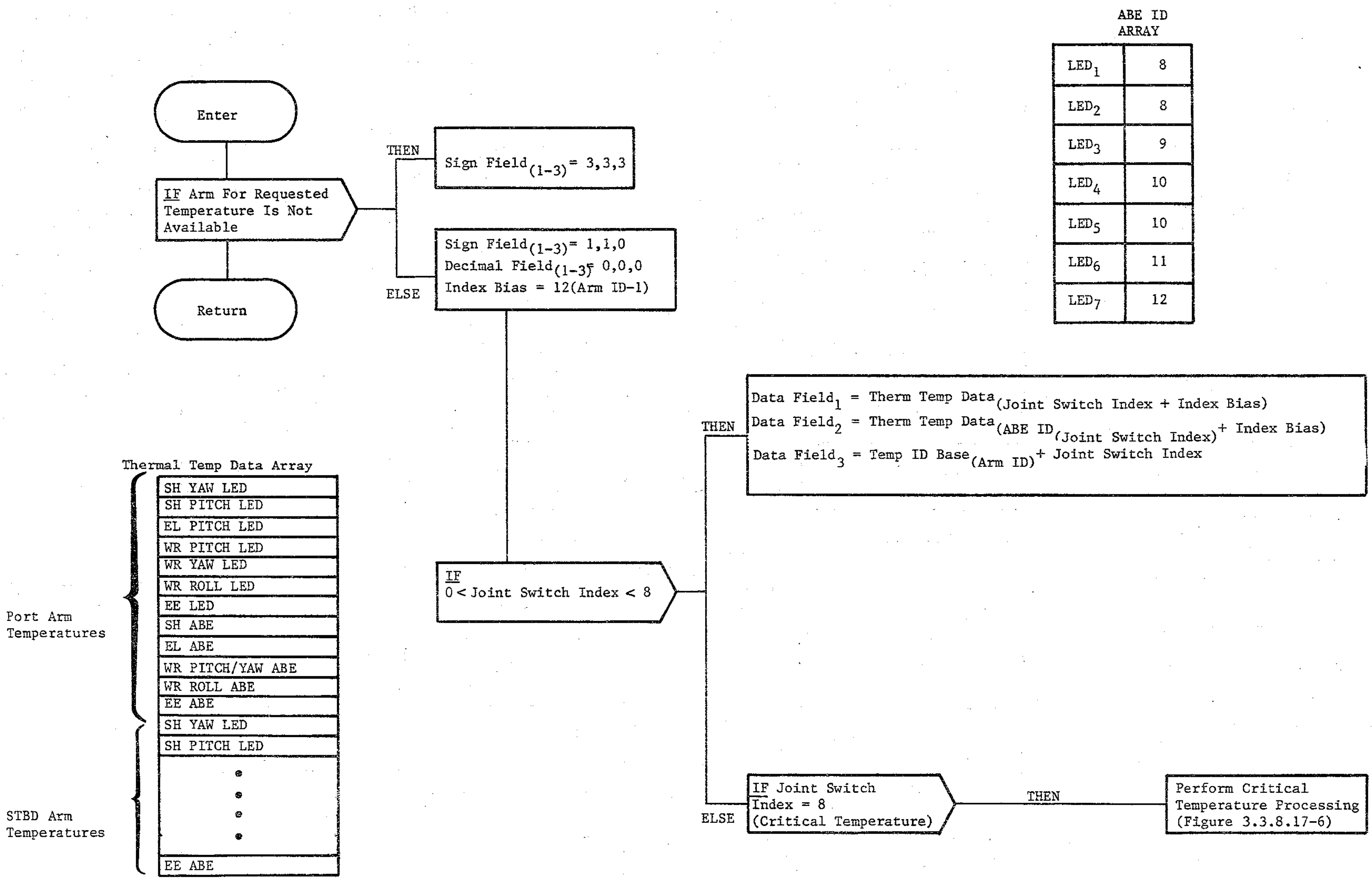


Figure 3.3.8.17-5. Temperature Processing

<u>IF</u> Critical Temp Index$_{(Arm\ ID)}$ = 0 (No Temperature Critical)

THEN

Sign Field$_{(1-3)}$ = 3,3,3

ELSE

<u>IF</u> Critical Temp Index$_{(Arm\ ID)}$ - Index Bias < 8 (LED Temperature)

THEN

Data Field$_1$ = Therm Temp Data$_{(Critical\ Temp\ Index_{(Arm\ ID)})}$

Data Field$_2$ = Therm Temp Data$_{(ABE\ ID_{(Critical\ Temp\ Index_{(Arm\ ID)} -\ Index\ Bias)} +\ Index\ Bias)}$

Data Field$_3$ = Temp ID Base$_{(Arm\ ID)}$ + Critical Temp Index$_{(Arm\ ID)}$ - Index Bias

ELSE

Data Field$_1$ = Therm Temp Data$_{(LED\ ID_{(Critical\ Temp\ Index_{(Arm\ ID)} -\ Index\ Bias\ -7)} +\ Index\ Bias)}$

Data Field$_2$ = Therm Temp Data$_{(Critical\ Temp\ Index_{(Arm\ ID)})}$

Data Field$_3$ = Temp ID Base$_{(Arm\ ID)}$ + LED ID$_{(Critical\ Temp\ Index_{(Arm\ ID)} -7\ -\ Index\ Bias)}$

LED ID ARRAY

ABE$_1$	1
ABE$_2$	3
ABE$_3$	4
ABE$_4$	6
ABE$_5$	7

Figure 3.3.8.17-6. Critical Temperature Processing

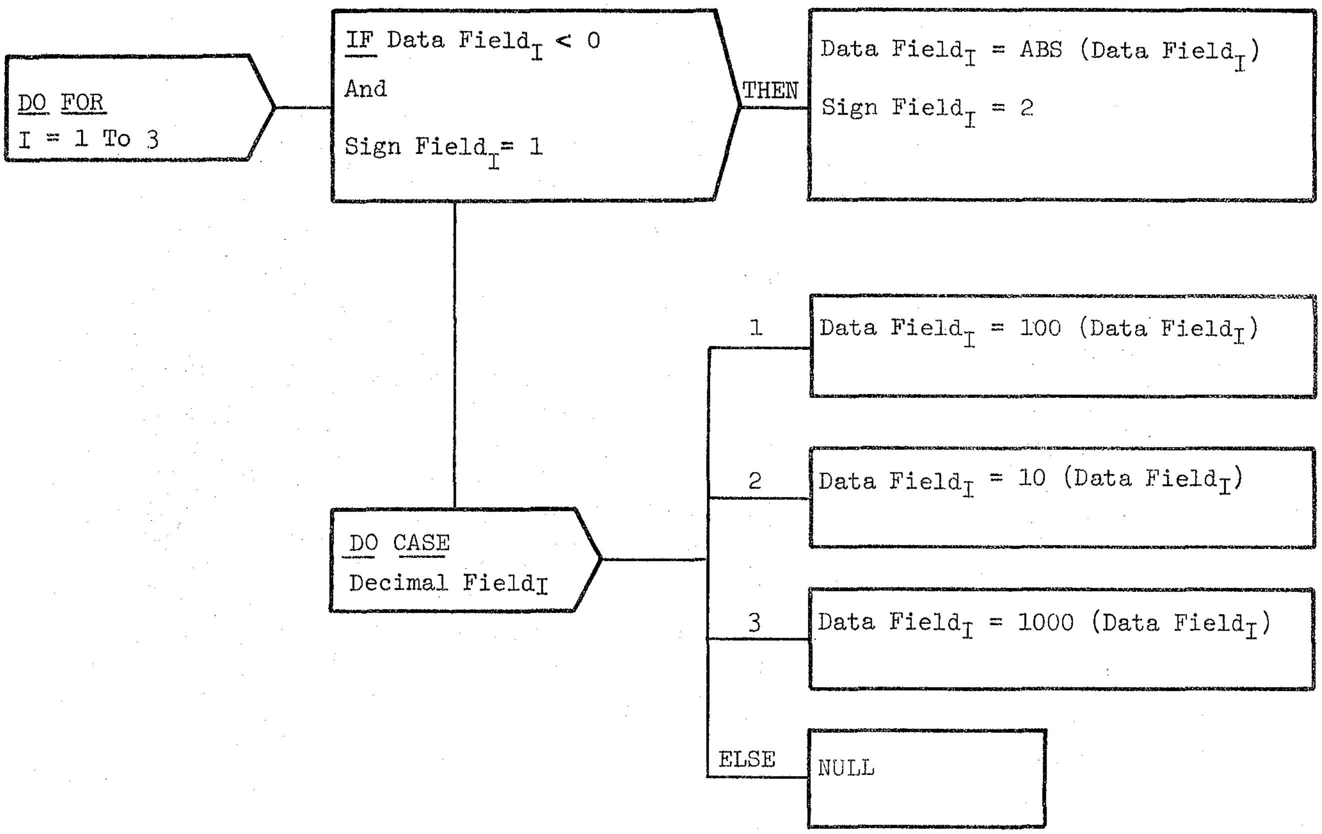


Figure 3.3.8.17-7. Data Field Processing

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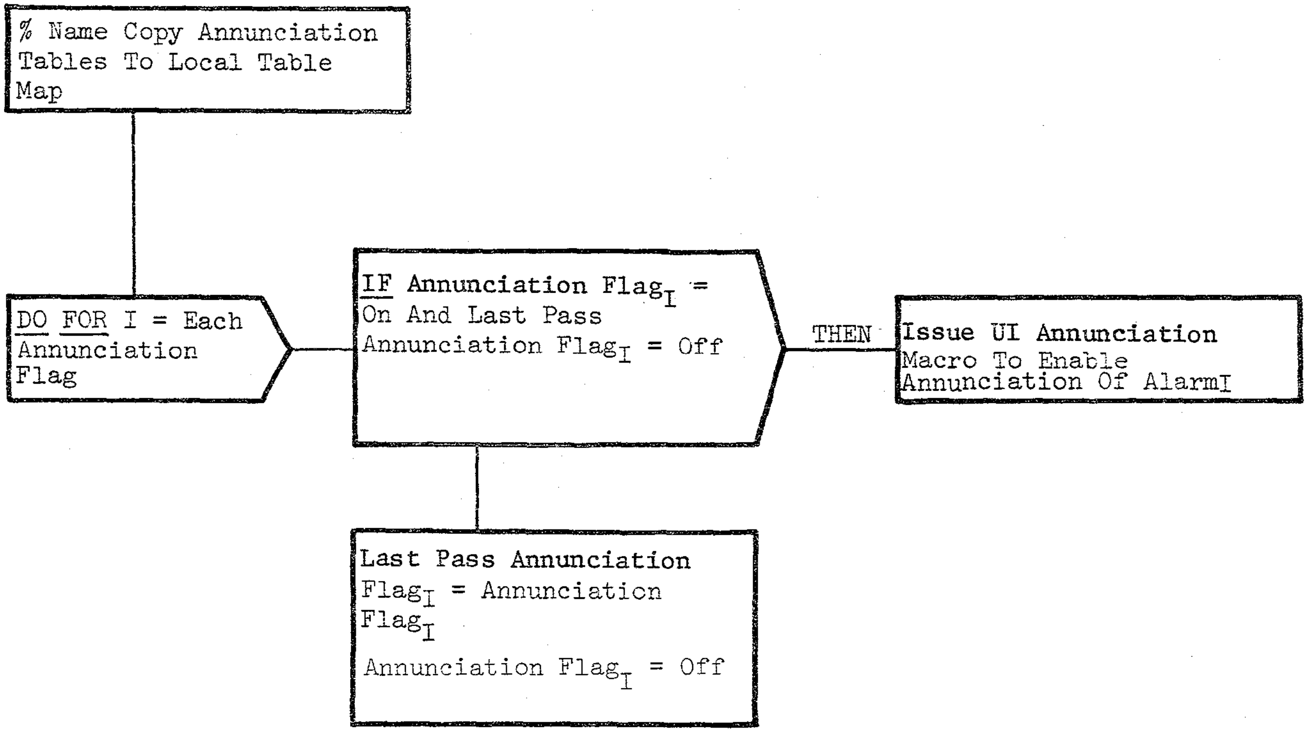

Figure 3.3.8.17-8. Annunciation Processing

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3.3.8.18 Input Processing and Configuration Determination (RQC_IPCD)

The Input Processing and Configuration Determination Module validates MCIU input data and performs configuration determination.

a. Control Interface - RQC is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RQC_IPCD

b. Inputs - Inputs to thos module are specified in Table 3.3.8.18-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.18-1 through 3.3.8.18-5.

   The FCOS transaction error flag and/or the Test Word Echo read test, determine whether or not a good read has occurred. Whenever a good read is determined, the I/O error count is zeroed, the MCIU Frame ID Change is calculated (or set to a 1 if it is the first pass after I/O has been turned on), and the MCIU Frame ID Change is saved. (The Test Word Echo read test is not performed if it is the first pass since I/O has been turned on.)

   Whenever FCOS and/or the Test Word Echo read test indicates a read error, the I/O error counter is incremented. If only one I/O error has occurred, no further processing is done. If two I/O errors have occurred, Suspend Configuration is requested.

   Whenever there are no I/O read errors, and the MCIU Frame ID has changed (new data has been received), the MCIU Decoder (RCD) is called to process the data in the input compool, the Data Conversion Processor (RYE) is also called to process the input data, and further configuration determination is performed.

   The TEMPERATURE configuration is requested when no arm is selected on the RMS D&C panel.

   When an arm is selected, one of the following conditions could require that the software be in the IDLE configuration: 1) safing is the progress, 2) all brakes are on, 3) the arm selected is not the same one selected on the last pass, 4) the previous configuration was SUSPEND, or 5) the mode switch setting changed. A request for IDLE due to any one of these conditions also requires that the RHM first time flag be set for Health Monitor initialization.

   When an arm is selected, and the above conditions are all false, the software stop flag is tested. If the software stop flag is set, the IDLE configuration is requested.

An operator request for a new configuration is indicated by the control mode enter discrete being ON. The previous value of this discrete must be OFF for the request to be processed. When the arm is at rest (no joint movement) the mode switch setting is used to determine which configuration is desired. Single is the only valid mode switch setting when the software stop flag is on. Other validity checks are performed as follows:

Automatic Mode (auto sequence or operator commanded) - The auto seq/proceed stop switch must be in the null position.

Manual Mode (orbiter unloaded, end effector, payload, or orbiter loaded) - The hand controllers must be in the null position.

Single Mode - The single/direct drive switch must be in the null position.

If the checks indicate that the requested mode is valid, that configuration is requested. A mode switch setting of TEST is a request for IDLE configuration.

d. Outputs - Outputs from this module are specified in Table 3.3.8.18-1.

e. Module References -

Process	Section	Reference
Decoder Function (RCD)	3.3.8.5	CALL
Data Conversion Processor (RYE)	3.3.8.3	CALL

f. Module Type and Attributes -

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism)

g. Template References -

D INCLUDE TEMPLATE CZ1_COMMON	System Services Common Compool
D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRB_MCI	Input Compool
D INCLUDE TEMPLATE CRD_CIL	Constants and I-Load Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool
D INCLUDE TEMPLATE RCDDCO	RCD
D INCLUDE TEMPLATE RYECNV	RYE

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions -

- RQC has no need to recognize the DIRECT MODE SELECT from the MCIU.

TABLE 3.3.8.18-1 Input Processing & Configuration Determination MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Configuration Request	A.2.32	O	REX,RXY	CRAV_CONFIG_REQ		
2	Mode Switch Index	A.2.32	I	RCD	CRAV_MODE_SWITCH_INDEX		
3	Submode	A.2.32	O	RAS,DL,RXY	CRAV_SUBMODE_ID	V92J3135C	
4	Auto Seq Proceed/Stop	A.2.32	I	RCD	CRAV_AUTO_GO_STOP		
5	MCIU Frame ID Change	A.2.32	O	RQC, RCD, REX, RYE, RVM	CRAV_MCIU_FRAME_ID_CHANGE	V92J3905C	
6	Configuration	A.2.32	I/O	REX/DL, REX	CRAV_CONFIG	V92U3100C	
7	I/O Error Count	A.2.32	I/O	RXY/REX	CRAV_IO_ERROR_COUNT		
8	HC Null Flag	A.2.32	I	RYE	CRAB_HC_NULL	V92X3121X	
9	Manual to Idle Flag	A.2.32	I	RXY	CRAB_MAN_TO_IDLE		
10	FCOS Transaction Error Flag	D.26	I	FCOS	CZEB_COMM_FAULT$(2:27)		
11	Arm Select Index	A.2.32	I	RCD	CRAV_ARM_SEL		
12	Arm Select Index Last	A.2.32	I	REX	CRAV_ARM_SEL_PAST		
13	Safing in Progress	A.2.32	I	RCD	CRAB_SAFING_IN_PROG		
14	All brakes on Flag	A.2.32	I	RCD	CRAB_ALL_BRAKES_ON		
15	Control Mode Enter Discrete	A.2.32	I	RCD,RXY	CRAB_CONTROL_MODE_ENTER		
16	Control Mode Enter Sidcrete Last Pass	A.2.32	I	REX	CRAB_CONTROL_MODE_ENTER_PAST		
17	Software Stop Flag	A.2.34	I/W	RXY/MCIU	CREB_SOFTWARE_STOP	V72X2937J	
18	OK to Enter Flag	E	L		RQC_OK_TO_ENTER		
19	Joint Angle Ratês (JAR)	A.2.32	I	RYE	CRAV_JAR_ATL	V92R3310C-315C	
20	Threshold Value	A.2.33	Z		CRDK_MODE_CHG_THRESH		
21	Single Direct Drive Pos/Neg	A.2.32	I	RCD	CRAV_SING_DRV_POSNEG		

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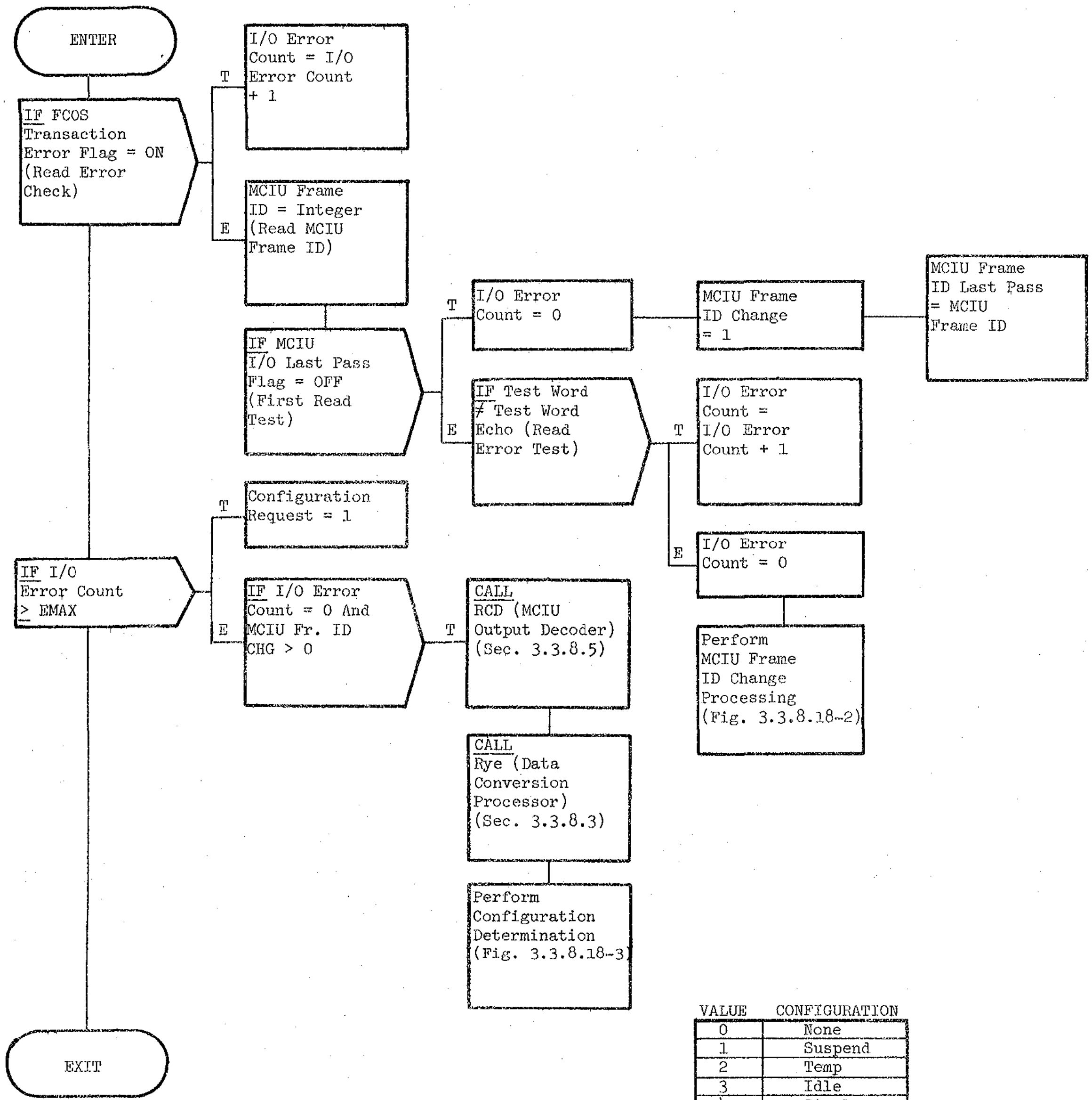
TABLE MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
22	Mode Case Index	E	L		RQC_MODE_CASE_INDEX		
23	Mode Case Array	E	L		RQC_MODE_CASE_ARRAY		
24	EMAX	A.2.33	Z		CRDK_MAX_ERR_CNT		
25	Mode Switch Index Last Pass	A.2.32	I	REX, RXY	CRAV_MODE_SWITCH_INDEX_LAST_PASS		
26	MCIU Frame ID Last Pass	A.2.32	I/O	RQC	CRAV_MCIU_FRAME_ID_PAST		
27	Read MCIU Frame ID	A.2.30	R	MCIU	CRBV_MCIU_FRAME_ID	V54J2040J	
28	MCIU I/O Last Pass Flag	A.2.32	I	REX	CRAB_MCIU_IO_ON_OFF_LP		
29	Test Word	A.2.34	W	MCIU	CREV_TEST_WORD	V72U3050J	
30	Test Word Echo	A.2.30	R	MCIU	CRBV_TEST_WORD_ECHO	V54U2045J	
31	MCIU Frame ID	E	L		RQC_MCIU_FRAME_ID		

620



VALUE	CONFIGURATION
0	None
1	Suspend
2	Temp
3	Idle
4	Single
5	Manual
6	Auto

Figure 3.3.8.18-1. Input Processing And Configuration Determination

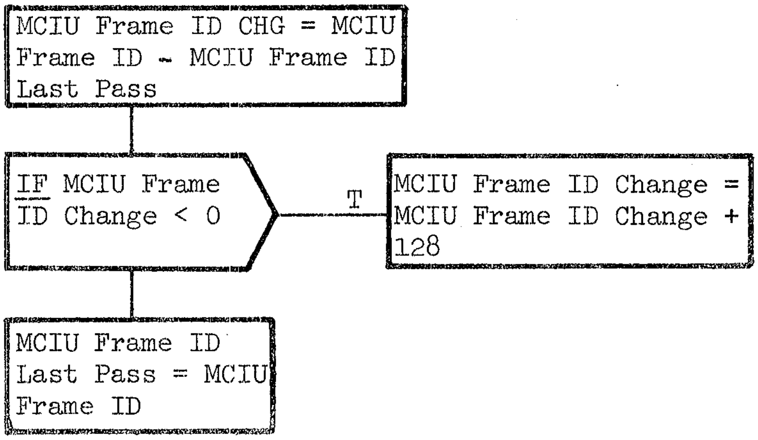
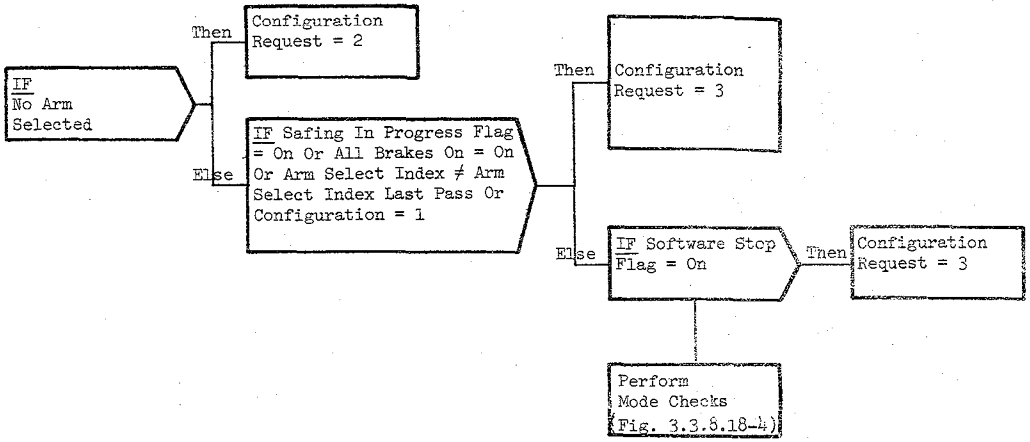


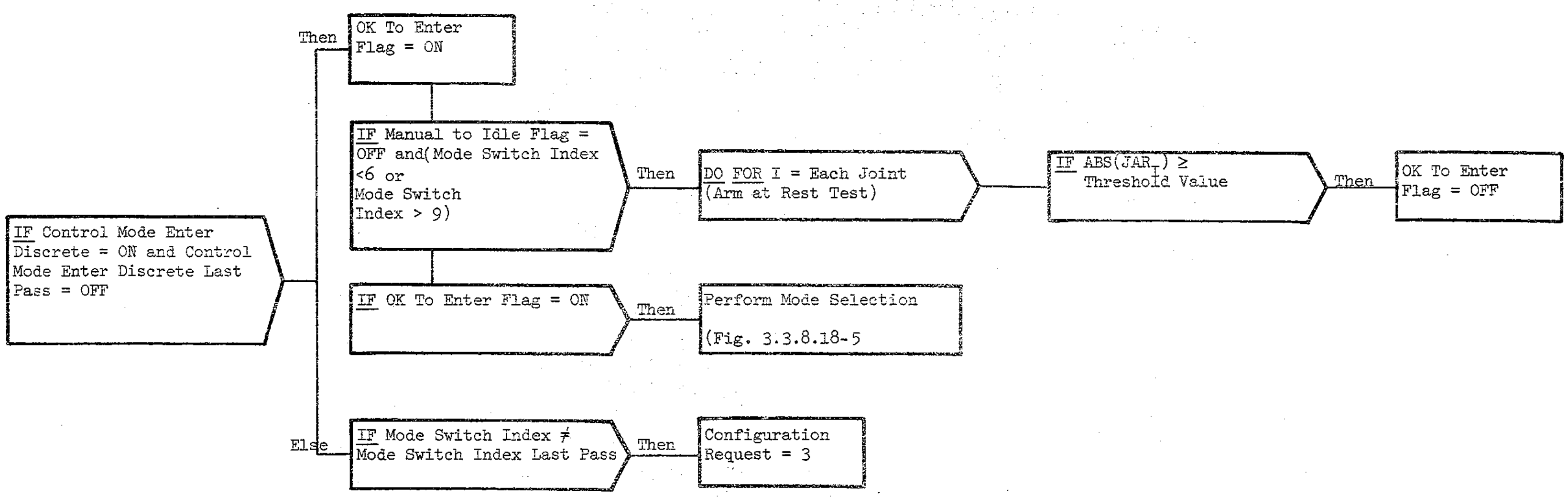
Figure 3.3.8.18-2. MCIU Frame ID Change Processing



CONFIGURATIONS

Value	Configurations
0	None
1	Suspend
2	Temp
3	Idle
4	Single
5	Manual
6	Auto

Figure 3.3.8.18-3 Configuration Determination



CONFIGURATIONS

Value	Configurations
0	None
1	Suspend
2	Temp
3	Idle
4	Single
5	Manual
6	Auto

MODE SELECTED

Mode Switch	Index
Null	0
Auto 1	1
Auto 2	2
Auto 3	3
Auto 4	4
OPR CMD	5
MAN UNL	6
MAN EE	7
MAN LOD	8
MAN PL	9
Single	10
Test	11

Figure 33.8.18-4 Mode Checks

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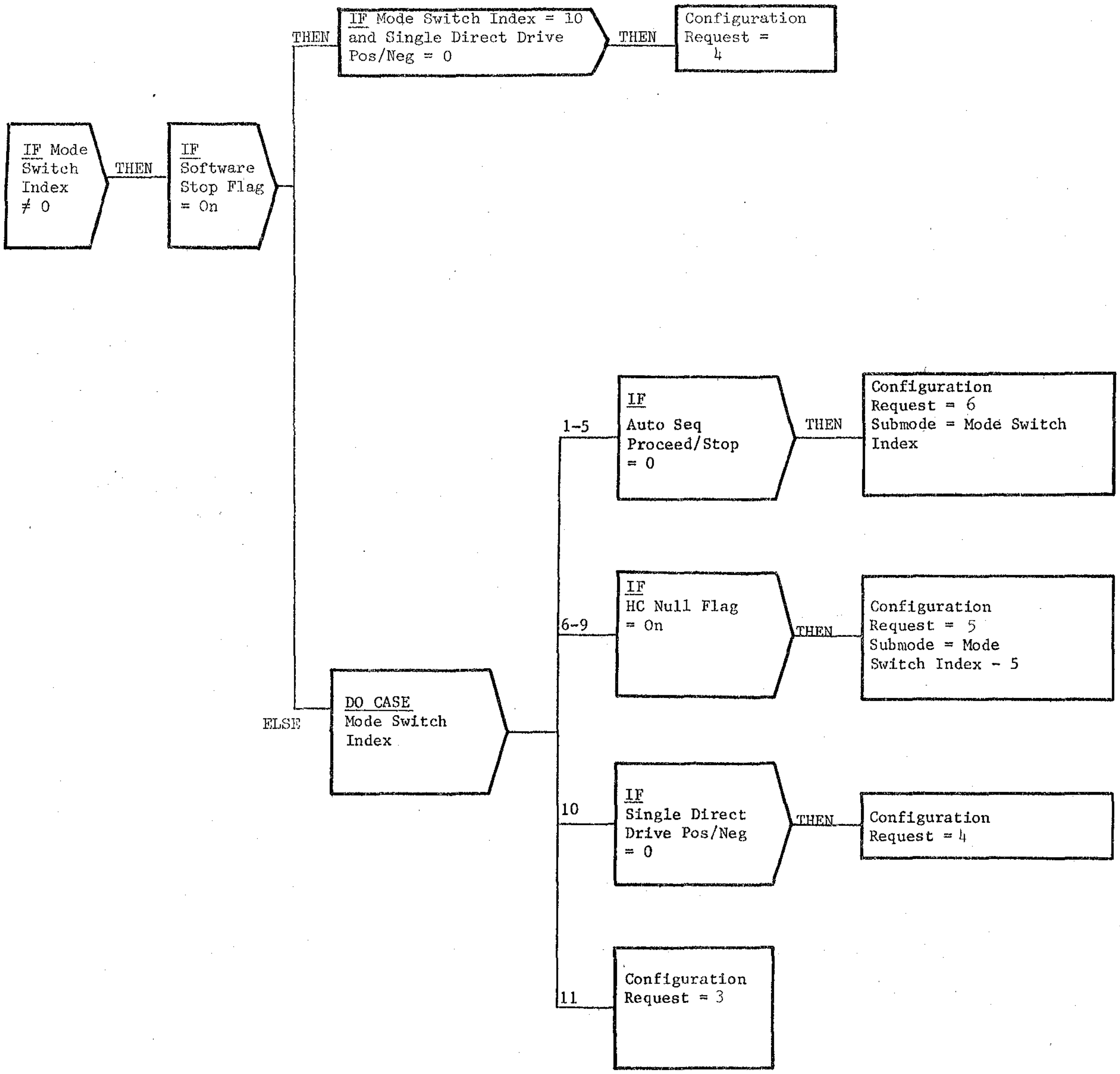

CONFIGURATIONS

Value	Configuration
0	None
1	Suspend
2	Temp
3	Idle
4	Single
5	Manual
6	Auto

MODE SELECTED

Mode Switch	Index
Null	0
Auto 1	1
Auto 2	2
Auto 3	3
Auto 4	4
OPR CMD	5
MAN UNL	6
MAN EE	7
MAN LOD	8
MAN PL	9
Single	10
Test	11

THREE STATE FLAG TABLE

Item Name	0	1	2
Single Dir. Dr. Pos/Neg	Off	+	-
Auto Seq. Proceed/Stop	Off	Proceed	Stop

SUBMODE INDEX

Submode	Auto	Manual
1	Auto 1	Unloaded
2	Auto 2	EE
3	Auto 3	Loaded
4	Auto 4	PL
5	OPRCMD	X

Figure 3.3.8.18-5. Mode Selection

3.3.8.19 Configuration Initialization (RXY_CINIT)

The Configuration Initialization module performs initialization based on the configuration requested.

a. Control Interface - RXY is CALL'ed by the RMS Executive (REX) at 12.5 Hz.

   Invocation: CALL RXY_CINIT

b. Inputs - Inputs to this module are specified in Table 3.3.8.19-1.

c. Process Description - The control flow for this module is shown in Figures 3.3.8.19-1 through 3.3.8.19-7. Initialization is done for the following modes:

   1. SUSPEND
   2. TEMP
   3. IDLE
   4. SINGLE
   5. MANUAL
   6. AUTO

   The configuration state is updated. Configuration entry unique processing is performed which consists of 1) setting dispatcher pointer to correct table, 2) setting reference identifiers, 3) setting operating mode matrix flag (which controls status lights), 4) setting other flags and inputs and 5) blanking or allowing fields to be displayed on CRT. Standard reconfiguration initialization is also done.

d. Outputs - Outputs from this module are specified in Table 3.3.8.19-1.

e. Module References - None

f. Module Type and Attributes

   Type: External Procedure
   Attributes: Default (serially reusable with no protective mechanism)

g. Template Reference

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool
D INCLUDE BMODMACS	SVC Restore Macro

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - None

TABLE 3.3.8.19-1 Configuration Initialization MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
1	Configuration Request	A.2.32	I	REX, RQC	CRAV_CONFIG_REQ		
2	MCIU I/O Flag	A.2.32	O	CRT, REX, RHM	CRAB_MCIU_IO	V92X3835X	
3	Configuration	A.2.32	O	DL, REX, RWP	CRAV_CONFIG	V92U3100C	
4	I/O Error Count	A.2.32	O	RQC, REX	CRAV_IO_ERROR_COUNT		
5	Arm Select Index	A.2.32	I	RCD	CRAV_ARM_SEL		
6	Control Mode Enter Discrete	A.2.32	O	RQC	CRAB_CONTROL_MODE_ENTER		
7	Software Stop Flag	A.2.34	W/O	MCIU/RNC, RQC	CREB_SOFTWARE_STOP	V72X2937J	
8	Mode Switch Index	A.2.32	I	RCD	CRAV_MODE_SWITCH_INDEX		
9	Rate Hold Selected Flag	A.2.34	W	MCIU	CREB_RATE_HOLD_ACT	V72X2940J	
10	Singularity Caution Flag	A.2.34	W	MCIU	CREB_SING_CAUT	V72X2923J	
11	Reach Limit Caution Flag	A.2.34	W	MCIU	CREB_REACH_LIM_CAUT	V72X2930J	
12	Check CRT Caution Flag	A.2.34	W	MCIU	CREB_CK_CRT_CAUT	V72X2929J	
13	Actual Resultant POR Translation Rate	A.2.32	O	RDD, DL	CRAV_POR_XLT_RSLT_ATL	V92R3326C	
14	Commanded Resultant POR Translation Rate	A.2.32	O	RDD, DL	CRAV_POR_XLT_RSLT_CMD	V92R3270C	
15	Manual Aug. Orbiter Un-Loaded Mode Selected Discrete	A.2.34	W	MCIU	CREB_MAN_UNL_ACT	V72X2906J	
16	Manual Aug. EE Mode Selected Discrete	A.2.34	W	MCIU	CREB_MAN_EE_ACT	V72X2907J	
17	Man.Aug.ORB Loaded Disc.	A.2.34	W	MCIU	CREB_MAN_LOD_ACT	V72X2908J	
18	Man. Aug. PL Mode Selected Discrete	A.2.34	W	MCIU	CREB_MAN_PYLD_ACT	V72X2909J	

TABLE 3.3.8.19-1 Configuration Initialization (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
19	Auto Seq. 1 Mode Selected Discrete	A.2.34	W	MCIU	CREB_AUTO_1_ACT	V72X2900J	
20	Auto Seq. 2 Mode Selected Discrete	A.2.34	W	MCIU	CREB_AUTO_2_ACT	V72X2901J	
21	Auto Seq. 3 Mode Selected Discrete	A.2.34	W	MCIU	CREB_AUTO_3_ACT	V72X2902J	
22	Auto Seq. 4 Mode Selected Discrete	A.2.34	W	MCIU	CREB_AUTO_4_ACT	V72X2903J	
23	Operator Commanded Mode Selected Discrete	A.2.34	W	MCIU	CREB_OPR_CMD_ACT	V72X2904J	
24	Single Mode Selected Discrete	A.2.34	W	MCIU	CREB_SINGL_JNT_ACT	V72X2910J	
25	Max Torque Flag	A.2.32	O	RNC	CRAB_MAX_TORQUE		
26	Test Mode Selected Discrete	A.2.34	W	MCIU	CREB_TEST_ACT	V72X2905J	
27	Shoulder Yaw Singularity Flag	A.2.32	O	RHM, DL	CRAB_SING_SHY	V92X3200X	
28	Elbow Pitch Sing. Flag	A.2.32	O	RHM, DL	CRAB_SING_ELP	V92X3202X	
29	Wrist Yaw Singularity Flag	A.2.32	O	RHM, DL	CRAB_SING_WRY	V92X3201X	
30	Auto Sequence Ready	A.2.34	W/O	MCIU/RAS	CREB_AUTO_SEQ_READY	V72X2941J	
31	Auto Sequence In Progress	A.2.34	W/O	MCIU/RAS	CREB_AUTO_SEQ_IN_PROG	V72X2942J	
32	Minimum Rate Selected	A.2.34	W	MCIU	CREB_MIN_RATE_ACT	V72X2938J	
33	Saved Dispatcher Table Pointer	A.2.32	O	REX	CRAV_DISPATCHER_POINTER_SAVED		
34	TD Reference ID	A.2.32	O	RTV, RJS, RAS	CRAV_TD_REF_ID	V92U3110C	
36	RD Reference ID	A.2.32	O	RTV, RJS, RAS	CRAV_RD_REF_ID	V92U3115C	
36	EE Derigidized Warning Flag	A.2.34	W	MCIU	CREB_EE_DERIG_WARN	V72X2926J	

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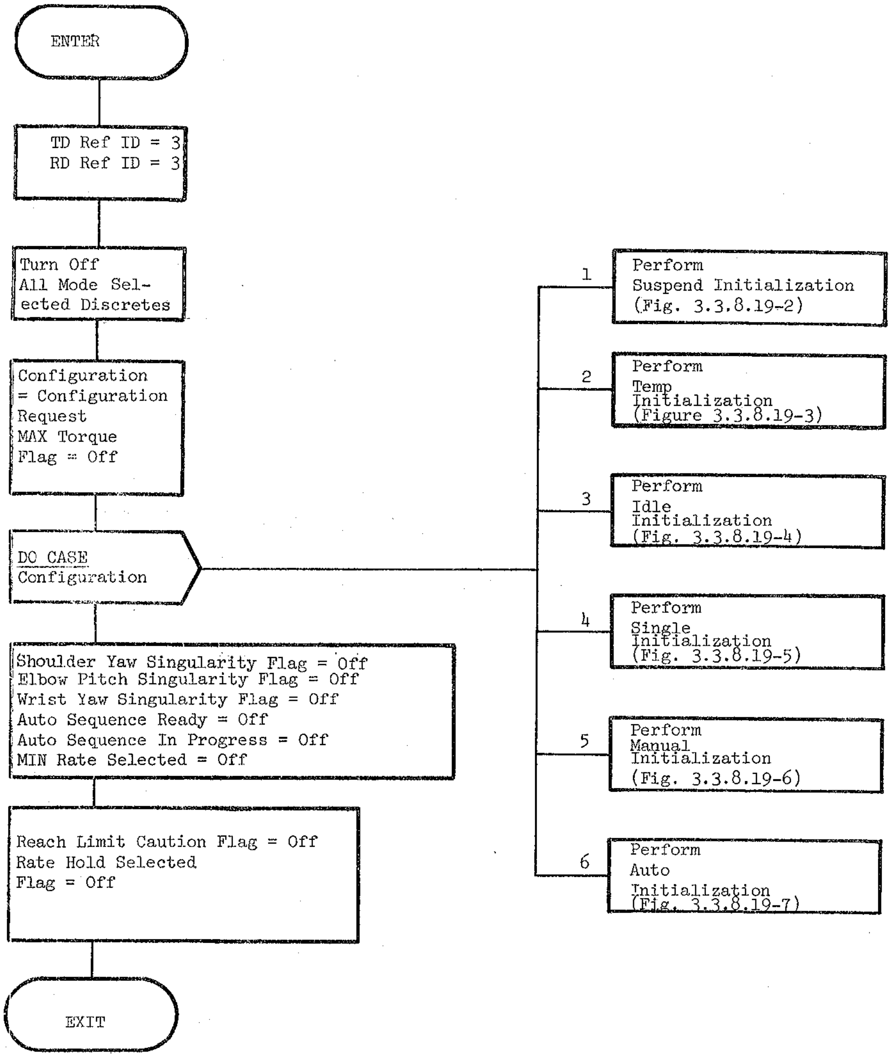
TABLE 3.3.8.19-1 Configuration Initialization (Cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
37	EE Release Warning Flag	A.2.34	W	MCIU	CREB_EE_REL_WARN	V72X2927J	
38	RHM Alarm Flag	A.2.32	O	RDD	CRAB_RHM_ALARM		
39	Soft Stop Limits Enable Flag	A.2.32	O	RHM, CRT	CRAB_SOFT_STOP_ENABLE	V92X3120X	
40	RAS First Time Flag	A.2.32	O	RAS	CRAB_RAS_FIRST_TIME	V92X3149X	
41	Position Hold Flag	A.2.32	O	DL, RWP	CRAB_POSITION_HOLD	V92X3141X	
42	Saved Joint Switch Index	A.2.32	O	RWP	CRAV_JNT_PAST		
43	RMS Auto Seq	A.2.32	I	RUD	CARV_AUTO_SEQ_ID	V93J7510C-513C	
44	Selected RMS Seq ID	A.2.32	O	RAS, DL	CRAV_AUTO_SEQ_ACT	V92U3105C	
45	Manual to idle Flag	A.2.32	O	RQC	CRAB_MAN_TO_IDLE		
46	Rate Demand ID's	A.2.32	O	RNC	CRAV_RATE_DMD_ID	V92J3801C-803C	
47	Joint Angle Rate Command	A.2.32	O	RTV, RNC, DL, RHM	CRAV_JAR_CMD	V92R3205C-210C	
48	Mode Switch Index Last Pass	A.2.32	O	RQC	CRAV_MODE_SWITCH_INDEX_LAST_PASS		
49	RSC First Time Flag	A.2.32	O	RSC	CRAB_RSC_FIRST_PASS	V92X3149X	
50	Control Error Caution Flag	A.2.34	W	MCIU	CREB_CTL_ERROR_CAUT	V72X2924J	
51	Arm Selected for CRT	A.2.32	O	CRT	CRAD_RMS_SEL_CRT		
52	Auto Seq. Last Point Blanking word	A.2.32	O	CRT	CRAV_AUTO_SEQ_LAST_PT_BM		
53	Trans flag	A.2.32	O	RTV	CRAB_TRANS_FLAG	V92X2425X	
54	Rate POS and ATD Blanking word	A.2.32	O	CRT	CRAV_ACT_RATE_POS_ATD_BM		
55	Command Rate Blanking word	A.2.32	O	CRT	CRAV_CMD_RATE_BLNK		
56	Submode	A.2.32	I	RQC	CRAV_SUBMODE_ID	V92J3135C	

TABLE 3.3.8.19-1. Configuration Initialization (cont'd) MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	
57	Fault Blanking Word	A.2.32	O	CRT	CRAD_RMS_FAULT_BLANK		
58	Rate Hold Request Flag	A.2.32	O	RJS	CRAB_RATE_HOLD_REQ_FLAG	V92X3113X	
59	POR INDEX	A.2.32	O	RAS, RKG	CRAV_POR_INDEX	V92X3107X	
60	RMS PYLD ID	A.2.32	I	RUD	CRAV_RMS_PL_ID	V93J7505C-506C	
61	PL INIT ID	A.2.32 D.64	I	RUD	CRAV_PL_INIT	V93J7541C	
62	Auto Sequence PYLD ID	A.2.35	Z		CRFS_SEQ_PYLD_ID		
63	MOT Rate Filt	A.2.32	O	RVM	CRAV_MOT_RATE_FILT	V92U3436C-441C	
64	MOT Rate Filt LP	A.2.32	O	RVM	CRAV_MOT_RATE_FILT_LP		
65	Arm Select Index LP	A.2.32	I	REX	CRAV_ARM_SEL_PAST		
66	Test WD INCNT	A.2.32	O	RNC	CRAV_TEST_WD_INCNT		
67	RHM First Pass Flag	A.2.32	O	RHM, RVM	CRAB_RHM_FIRST_PASS		



TD Ref	RD Ref	Display Reference
1	1	POR To OS
2	2	POR To AM
3	3	OS To AM

Value	Configuration
0	None
1	Suspend
2	Temp
3	Idle
4	Single
5	Manual
6	Auto

Figure 3.3.8.19-1. Configuration Initialization

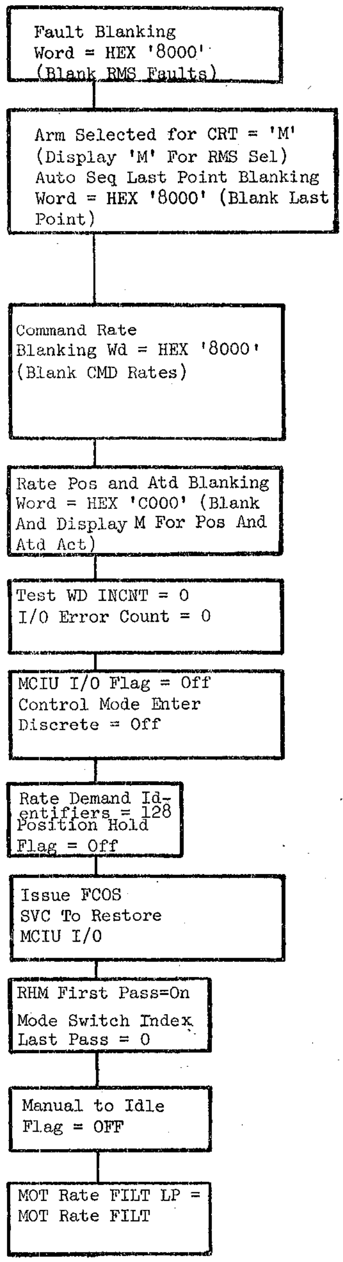


Figure 3.3.8.19-2. Suspend Initialization

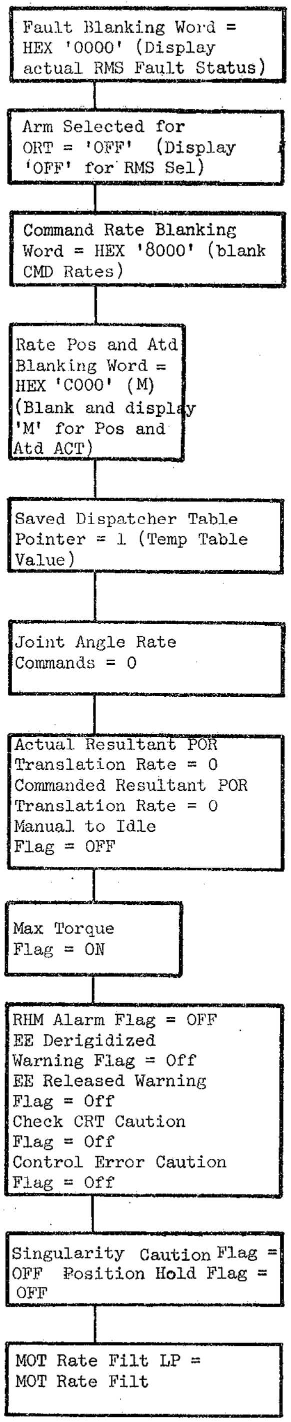
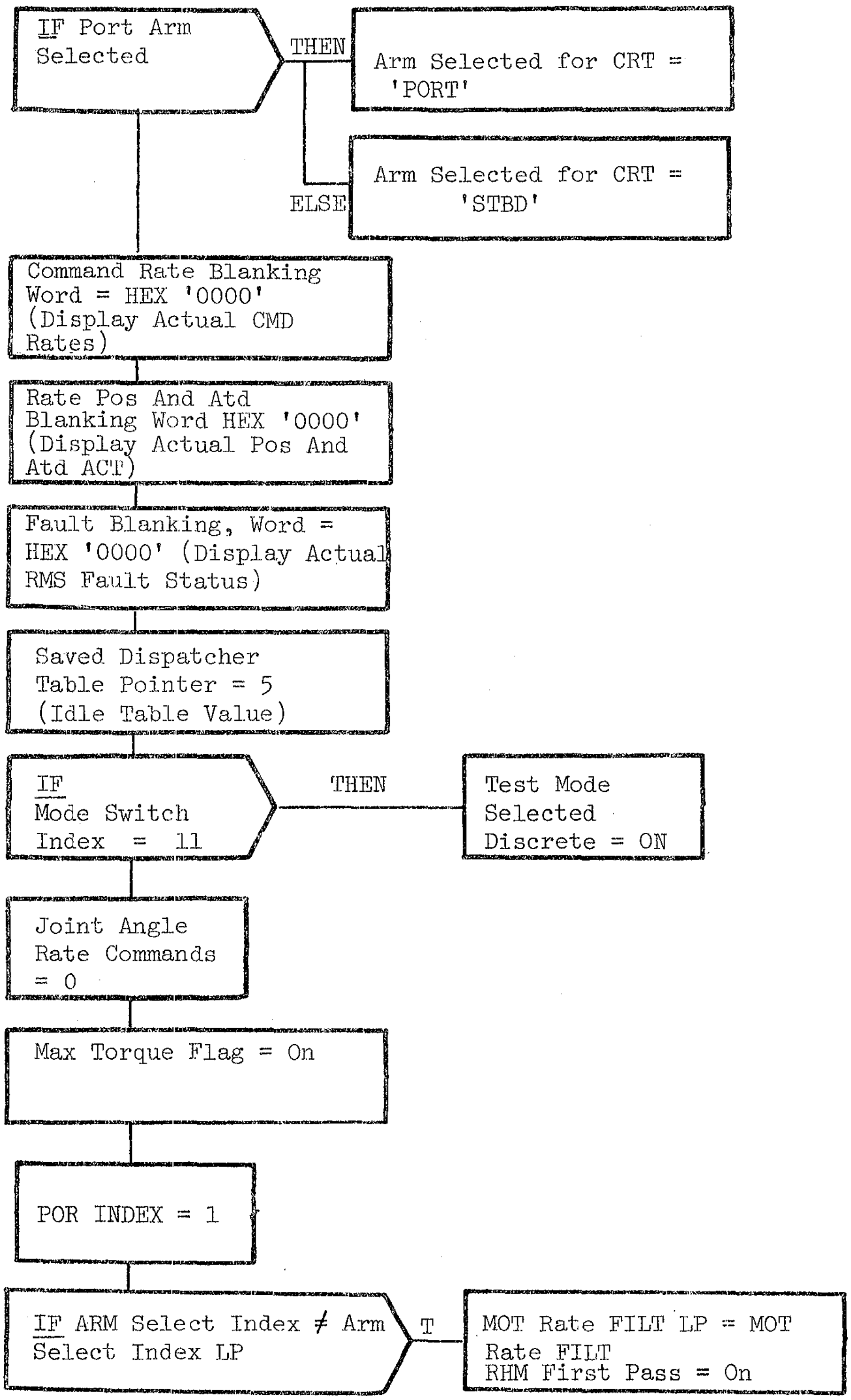


Figure 3.3.8.19-3. Temp Initialization



Mode Selected

Mode Switch	Index
Null	0
Auto 1	1
Auto 2	2
Auto 3	3
Auto 4	4
OPR CMD	5
MAN UNL	6
MAN EE	7
MAN LOD	8
MAN PL	9
Single	10
Test	11

Figure 3.3.8.19-4. Idle Initialization

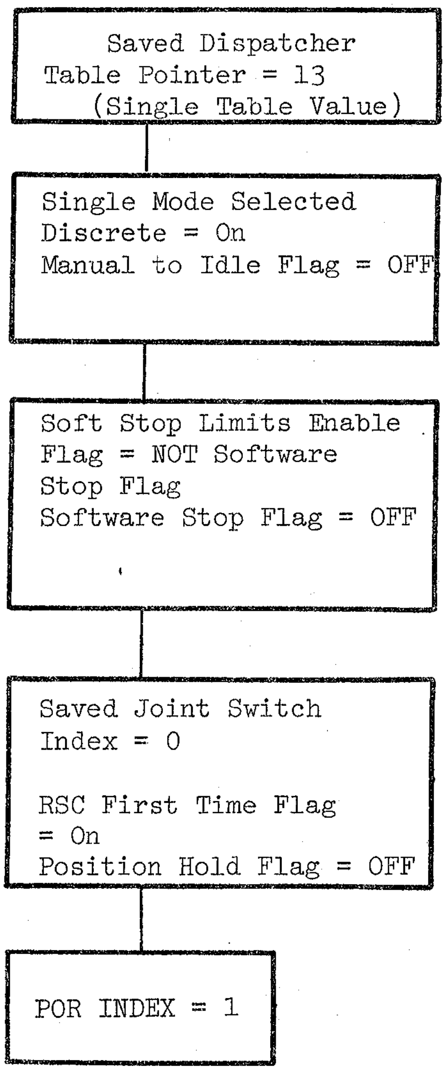
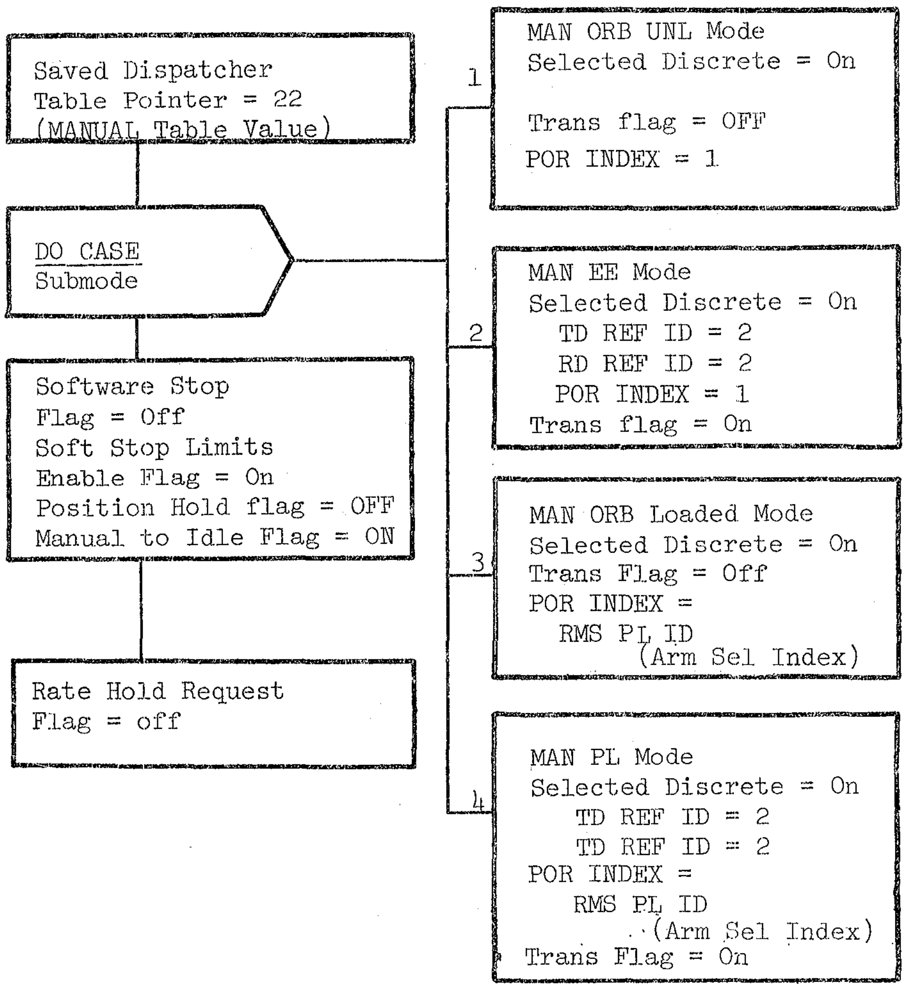


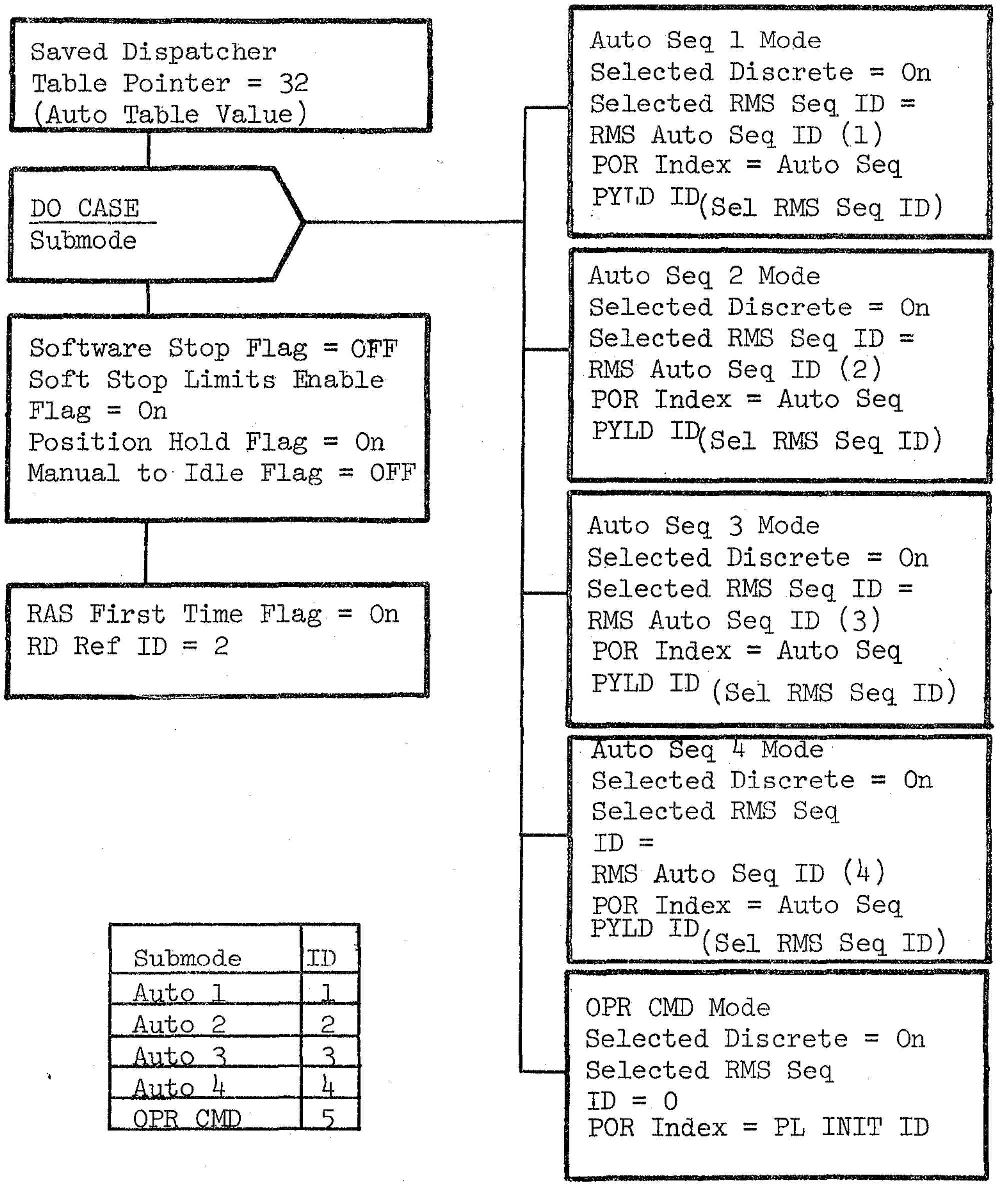
Figure 3.3.8.19-5. Single Initialization



Submode	ID
MAN ORB UNL	1
MAN EE	2
MAN ORB Loaded	3
MAN PL	4

TD Ref	RD Ref	Display Reference
1	1	POR To OS
2	2	POR To AM
3	3	OS To AM

Figure 3.3.8.19-6. Manual Initialization



Submode	ID
Auto 1	1
Auto 2	2
Auto 3	3
Auto 4	4
OPR CMD	5

TD Ref	RD Ref	Display Reference
1	1	POR To OS
2	2	POR To AM
3	3	OS To AM

Figure 3.3.8.19-7. Auto Initialization

BOOK: OFT SM Detailed Design Specification

3.3.8.20 Position Hold Checks (RWP_PHC)

The Position Hold Checks module determines whether position hold is requested and modifies the dispatcher tables to allow execution of the Position Hold (RFP) module.

a. Control Interface - RWP is CALL'ed by the RMS Executive at 12.5Hz.

   Invocation: CALL RWP_PHC

b. Inputs - Inputs to this module are specified in Table 3.3.8.20-1.

c. Process Description -The control flows for this module are shown in Figures 3.3.8.20-1 and 3.3.8.20-2.

   If the current configuration is SINGLE and the selected joint has changed, then joint angles (JA) are flagged to be saved.

   If the current configuration is AUTO and the position hold flag status has changed, then the position hold flag is saved. If position hold is requested, then JA's are flagged to be saved and the AUTO dispatcher table is modified to allow execution of Position Hold (RFP) module and disallow execution of Resolved Rate Algorithm (RRP) module. If position hold is not requested the AUTO dispatcher table is modified to allow execution of RRP and disallow execution of RFP.

   If the current configuration is IDLE and if the position hold flag is OFF and the arm is at rest, the position hold flag is turned ON and the JA's are flagged to be saved. If position hold is requested, the IDLE dispatcher table is modified to allow the execution of RFP. If position hold is not requested, the IDLE dispatcher table is modified to disallow the execution of RFP.

   If the current configuration is MANUAL, and if position hold is requested, and the HC null flag is OFF, then the position hold flag is turned OFF and the MANUAL dispatcher table is modified to allow the execution of RRP and to disallow the execution of RFP. If position hold is not requested, and if the arm is at rest and the HC null flag is ON, then the position hold flag is turned ON, the JA's are flagged to be saved, and the MANUAL dispatcher table is modified to allow the execution of RFP and to disallow the execution of RRP.

   The current JA's are saved when they have been flagged to be saved.

d. Outputs - Outputs from this module are specified in Table 3.3.8.20-1.

e. Module References - None

f. Module Type and Attributes

Type: External Procedure
Attributes: Default (serially reusable with no protective mechanism)

g. Template Reference

D INCLUDE TEMPLATE CRA_TE	Working Compool
D INCLUDE TEMPLATE CGE_DISPATCHER	Hybrid Dispatcher Code
D INCLUDE TEMPLATE CRT_DIS	Dispatcher Compool
D INCLUDE TEMPLATE CRD_CIL	Constants and ILOAD Compool

h. Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i. Constraints and Assumptions - None

TABLE 3.3.8.20-1 Position Hold Checks

MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	Freeze Flag	E	L		RWP_FREEZE		
2	Configuration	A.2.32	I	RXY,REX	CRAV_CONFIG	V92U3100C	
3	Position Hold Flag	A.2.32	I	RAS,RXY	CRAB_POSITION_HOLD	V92X3141X	
4	Saved Position Hold Flag	E	L		RWP_POSITION_HOLD_SAVED		
5	Commanded Joint Angles	A.2.32	O	RFP, DL	CRAV_JA_CMD	V92H3235C-240C	
6	Joint Angles	A.2.32	I	RYE	CRAV_JA_ATL	V92H3300C-305C	
7	Joint Switch Index	A.2.32	I	RCD	CRAV_JNT_SEL_ID		
8	Saved Joint Switch In-dex	A.2.32	I	RXY,RSC	CRAV_JNT_PAST		
9	Dispatcher Tables Active Bits (RRP) - AUTO (RFP) - AUTO (RFP) - IDLE (RRP) - MANUAL (RFP) - MANUAL	A.2.36	O	REX	CRTD_DISPATCH_TBL. FREQ $(34;) $(35;) $(6;) $(24;) $(25;)		
10	Threshold Value	A.2.33	Z		CRDK_MODE_CHG_THRESH		
11	Joint Angle Rates (JAR)	A.2.32	I	RYE	CRAV_JAR_ATL	V92R3310C-315C	
12	HC Null flag	A.2.32	I	RYE	CRAB_HC_NULL	V92X3121X	

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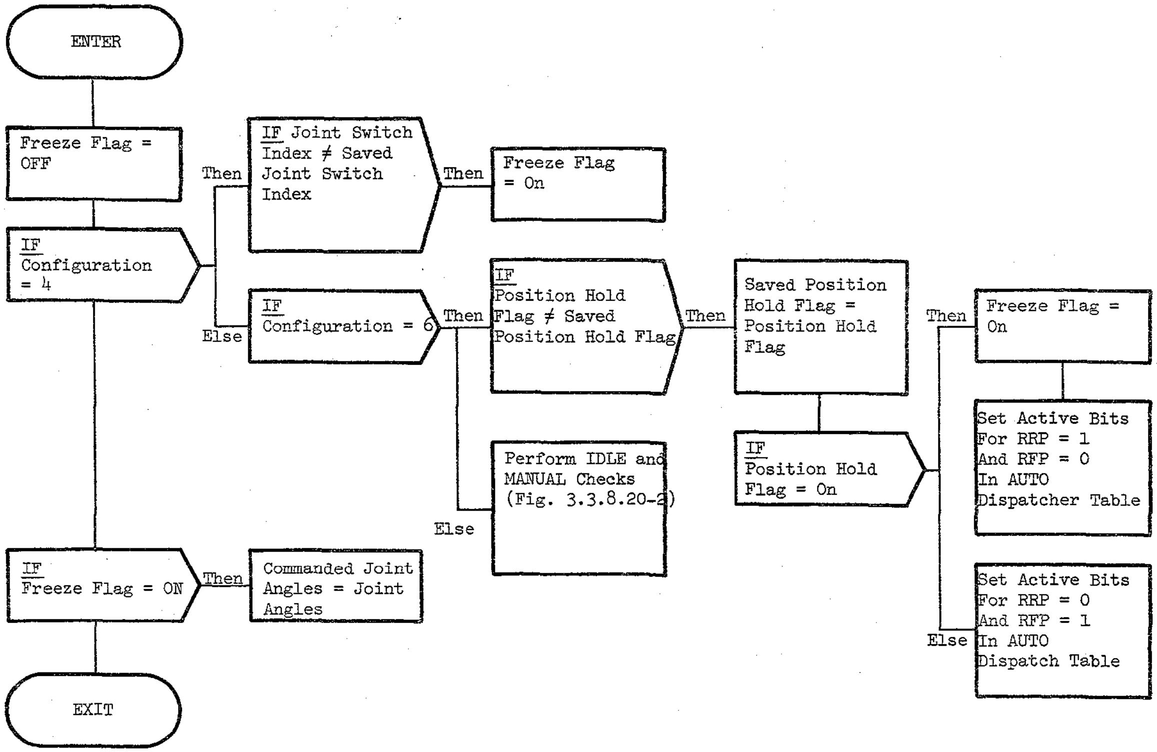

Value	Configuration
0	None
1	Suspend
2	Temp
3	Idle
4	Single
5	Manual
6	Auto

Figure 3.3.8.20-1. Position Hold Checks

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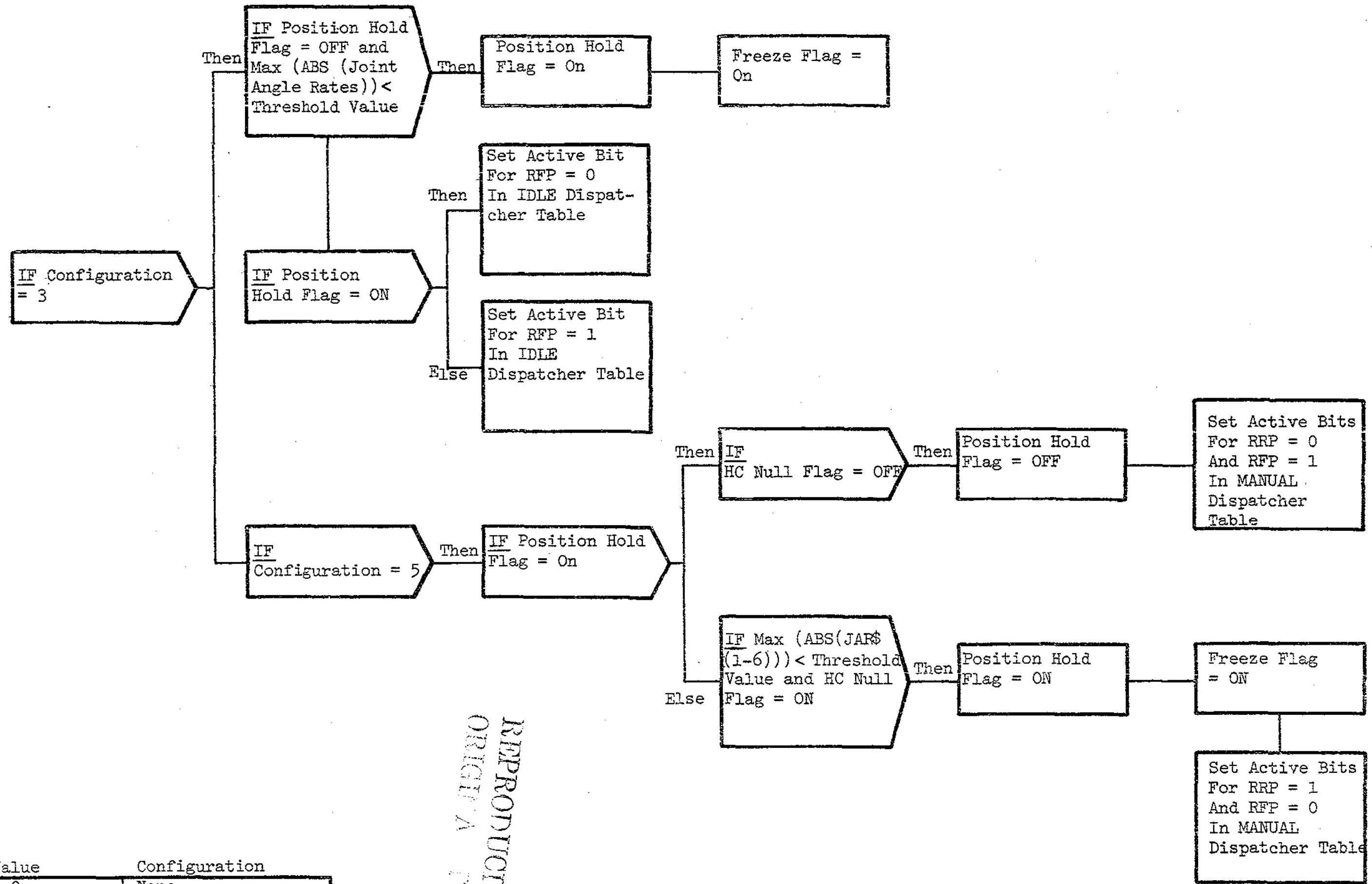

Value	Configuration
0	None
1	Suspend
2	Temp
3	Idle
4	Single
5	Manual
6	Auto

Figure 3.3.8.20-2. Idle and Manual Checks

3.3.8.21 Consistency and Encoder Checks (RVM_CONEN)

The consistency and encoder check module checks for a suspected runaway joint condition and determines the validity of each joint position encoder. Should a discrepancy be found, RVM sets the appropriate flag or discrete required for annunciation. Annunciation of faults to the operator is done via the caution and warning lights on the RMS dedicated display panel.

a) Control Interface - RVM is called by the RMS Health Monitor (RHM) at 12.5 Hz.

Invocation: CALL RVM_CONEN

b) Input - Inputs to this module are specified in Table 3.3.8.21-1.

c) Process Description - The control flow for this module is shown in Figures 3.3.8.21-1 through 3.3.8.21-7.

The position encoder check determines the validity of each joint position encoder. An encoder check flag is turned ON for each joint position encoder failure after a given number of cycles.

To determine if a runaway joint should be suspected, the commanded motor speeds are corrected to actual motor rates and filtered. As input, the filtered control error, the filtered rate increment, and the angular increment are computed. If the elapsed displacement of a joint is equal to or greater than the joint displacement then the RVM alarm is turned ON and flags are set for fault logging and annunciation to the operator.

d) Outputs - Outputs for this module are specified in Table 3.3.8.21-1.

e) Module References - None.

f) Module Type and Attributes -

Type: External Procedure

Attributes: Default (serially reusable with no protective mechanism.)

g) Template References

D INCLUDE TEMPLATE CRA_ TE	Working Compool
D INCLUDE TEMPLATE CRE_MCO	Output Compool
D INCLUDE TEMPLATE CRD_CIL	Constants and I-Load Compool
D INCLUDE TEMPLATE CRC_COT	Constants Compool

h) Error Handling - Other than standard FCOS recovery, no error recovery exists for this module.

i) Constraints and Assumptions - None.

TABLE 3.3.8.21-1 Consistency and Encoder Check MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
1	First Pass Flag	A.2.32	I	RXY	CRAB_RHM_FIRST_PASS		
2	Jnt Angles	A.2.32	I	RYE	CRAV_JA_ATL	V92H3300C-305C	
3	Tach Fail Flag	A.2.32	I	RCD	CRAB_JNT_TACH_FAIL		
4	Raw Jnt Rate	A.2.32	I	RYE	CRAV_JAR_RAW	V92R3410C-415C	
5	MCIU Frame ID Change	A.2.32	I	RQC	CRAV_MCIU_FRAME_ID_CHANGE	V92J3905C	
6	Payload Cap	A.2.32	I	RCD	CRAB_PYLD_CAP		
7	Rate Demand ID Return	A.2.32	I	RCD	CRAV_RATE_DMD_ID_RET		
8	Rate Demand ID	A.2.32	I	RNC	CRAV_RATE_DMD_ID	V92J3801C-803C	
9	Vern Scal Req	A.2.32	I	RCD	CRAB_VERN_RATE_REQ		
10	Mot Rate Filt	A.2.32	I	RYE, RXY	CRAV_MOT_RATE_FILT	V92U3436C-441C	
11	EE Auto/Man Flag	A.2.32	I	RCD	CRAV_EE_AUTO_MANUAL		
12	Capture CMD	A.2.32	I	RCD	CRAV_CAP_REL_CMD		
13	Rigid Cmd	A.2.32	I	RCD	CRAV_RIG_DERIG_CMD		
14	EE Rigidized Flag	A.2.32	I	RCD	CRAV_EE_RIG_DERIG		
15	Vern Scal Req LP	A.2.32	I	REX	CRAB_VERN_SCALE_PAST	V92X3103X	
16	Payload Cap Past	A.2.32	I/O	REX/RHM	CRAB_PL_CAPTURE_PAST	V92X3112X	
17	All Brakes On	A.2.32	I	RCD	CRAB_ALL_BRAKES_ON		
18	Mot Speed LP	A.2.32	I	RNC	CRAV_MOTOR_SPEED_LP	V92R3805C-3822C	
19	Mot Rate Filt LP	A.2.32	I	RXY	CRAV_MOT_RATE_FILT_LP		
20	Encoder Chk Flag	A.2.32	O	CRT, RHM, RNC	CRAB_ENCOD_CK	V92X3530X-535X	
21	RVM Alarm Flag	A.2.32	O	RDD	CRAB_RVM_ALARM		
22	Chk CRT Annun	A.2.32	O	RDD	CRAB_CHK_CRT_ANNUN	V72X2929J	
23	Consis Flag	A.2.32	I	RUD	CRAB_CONSIS_FLAG	V93X7545X	
24	ERRJNT	A.2.32	O	DL, CRT, RNC	CRAB_ERRJNT	V92X3540X-545X	

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TABLE 3.3.8.21-1 Consistency and Encoder Check MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
25	Cntl Err Annun	A.2.32	O	RDD	CRAB_CTL_ERR_ANNUN	V72X2924J	
26	Cntl Err Caution Flag	A.2.34	W	MCIU	CREB_CTL_ERROR_CAUT	V72X2924J	
27	Chk Crt Caution	A.2.34	W	MCIU	CREB_CK_CRT_CAUT	V72X2929J	
28	MCIU Interval	A.2.33	Z		CRDK_MCIU_INTERVAL		
29	Encoder Tacho Error Lim	A.2.33	Z		CRDK_ENCOD_TACHO_ERR_LIM		
30	Integral Run Lim	A.2.33	Z		CRDK_INTEGRAL_RUN_LIM		
31	Jnt Disp Unl	A.2.37	R	STM	CRSS_JNT_DISP_UNL	V96U4894C-899C	
32	Jnt Disp Load Vern	A.2.37	R	STM	CRSS_JNT_DISP_VERN	V96U4906C-911C	
33	Jnt Disp Load Coarse	A.2.37	R	STM	CRSS_JNT_DISP_COARSE	V96U4900C-905C	
34	Filt 1 Gain	A.2.37	R	STM	CRSS_FILT1_GAIN	V96U4881C	
35	Filt 1 Time	A.2.37	R	STM	CRSS_FILT1_TIME	V96W4882C	
36	Filt 2 Gain	A.2.37	R	STM	CRSS_FILT2-GAIN	V96U4883C	
37	Filt 2 Time	A.2.37	R	STM	CRSS_FILT2_TIME	V96W4884C	
38	Filt 3 Gain	A.2.37	R	STM	CRSS_FILT3_GAIN	V96U4885C	
39	Filt 3 Time	A.2.37	R	STM	CRSS_FILT3_TIME	V96W4886C	
40	Err Thresh	A.2.37	R	STM	CRSS_ERR_THRESH	V96U4890C	
41	Encoder First Chk	E	L		RVM_ENCOD_FIRST_CHK		
42	Tachc Integral	E	L		RVM_TACHO_INTEGRAL		
43	Integral Run Time	E	L		RVM_INTEGRAL_RUN_TIME		
44	Jnt Rate Match	E	L		RVM_JNT_RATE_MATCH		
45	Jnt Disp	E	L		RVM_JNT_DISP		
46	Mot Speed Cmd Unfilt	E	L		RVM_MOT_SPEED_RAW		
47	Mot Speed Cmd Lp	E	L		RVM_MOT_SPEED_CMD_LP		
48	F12	E	L		RVM_F12		
49	F11	E	L		RVM_F11		
50	F22	E	L		RVM_F22		

TABLE 3.3.8.21-1 Consistency and Encoder Check MODULE DATA LIST

#	ITEM	DESCRIPTOR	ACT	SOURCE/DESTINATION	HAL NAME	MML	REQT. SYMBOL
51	F21	E	L		RVM_F21		
52	F32	E	L		RVM_F32		
53	F31	E	L		RVM_F31		
54	Mot Speed Cmd	E	L		RVM_MOT_SPEED_CMD		
55	Cntl Err Unfilt	E	L		RVM_CNTL_ERR_RAW		
56	Cntl Err	E	L		RVM_CNTL_ERR		
57	Cntl Err Lp	E	L		RVM_CNTL_ERR_LP		
58	Rate Inc	E	L		RVM_RATE_INC		
59	Rate Inc Lp	E	L		RVM_RATE_INC_LP		
60	Rate Inc Unfilt	E	L		RVM_RATE_INC_RAW		
61	Ang Inc	E	L		RVM_ANG_INC		
62	Jnt Angles Lp	E	L		RVM_JA_ATL_LP		
63	Consis Flag Lp	E	L		RVM_CONSIS_LP		
64	All Brakes On Lp	E	L		RVM_BRAKES_LP		
65	Tach Fail Flag Lp	E	L		RVM_TACH_FAIL_LP		
66	Encoder Chk Flag Lp	E	L		RVM_ENCOD_CK_LP		
67	Disp Elaps	E	L		RVM_DISP_ELAPS		
68	Jnt Consis	E	L		RVM_JNT_CONSIS		
69	Z	E	L		RVM_J		

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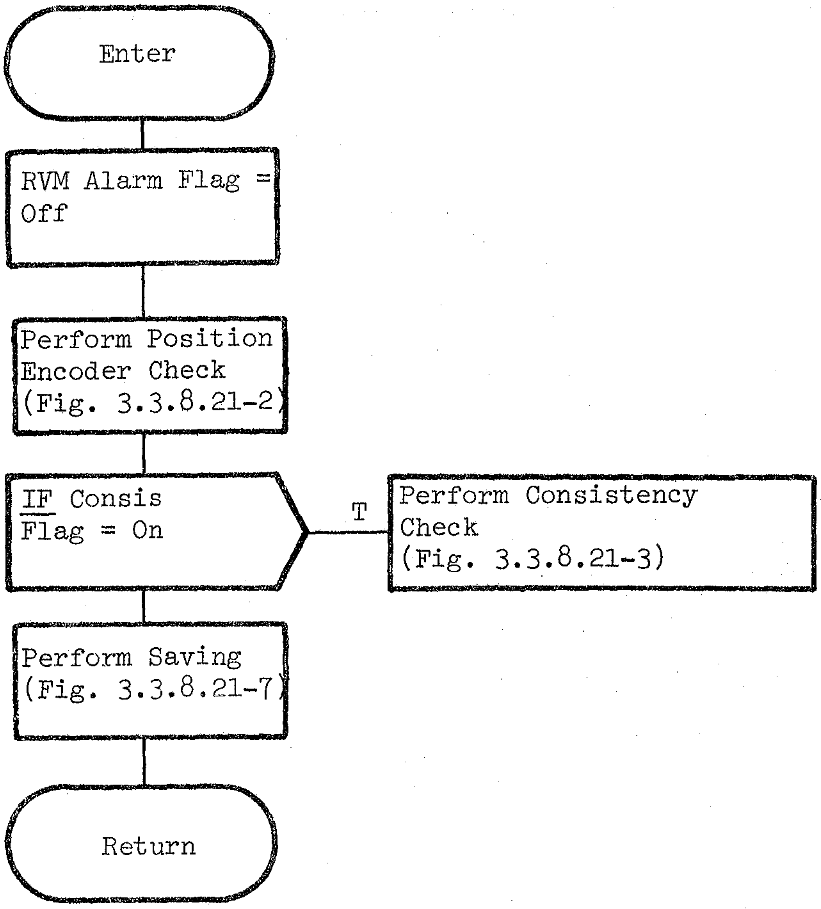

Figure 3.3.8.21-1. Consistency And Encoder Check

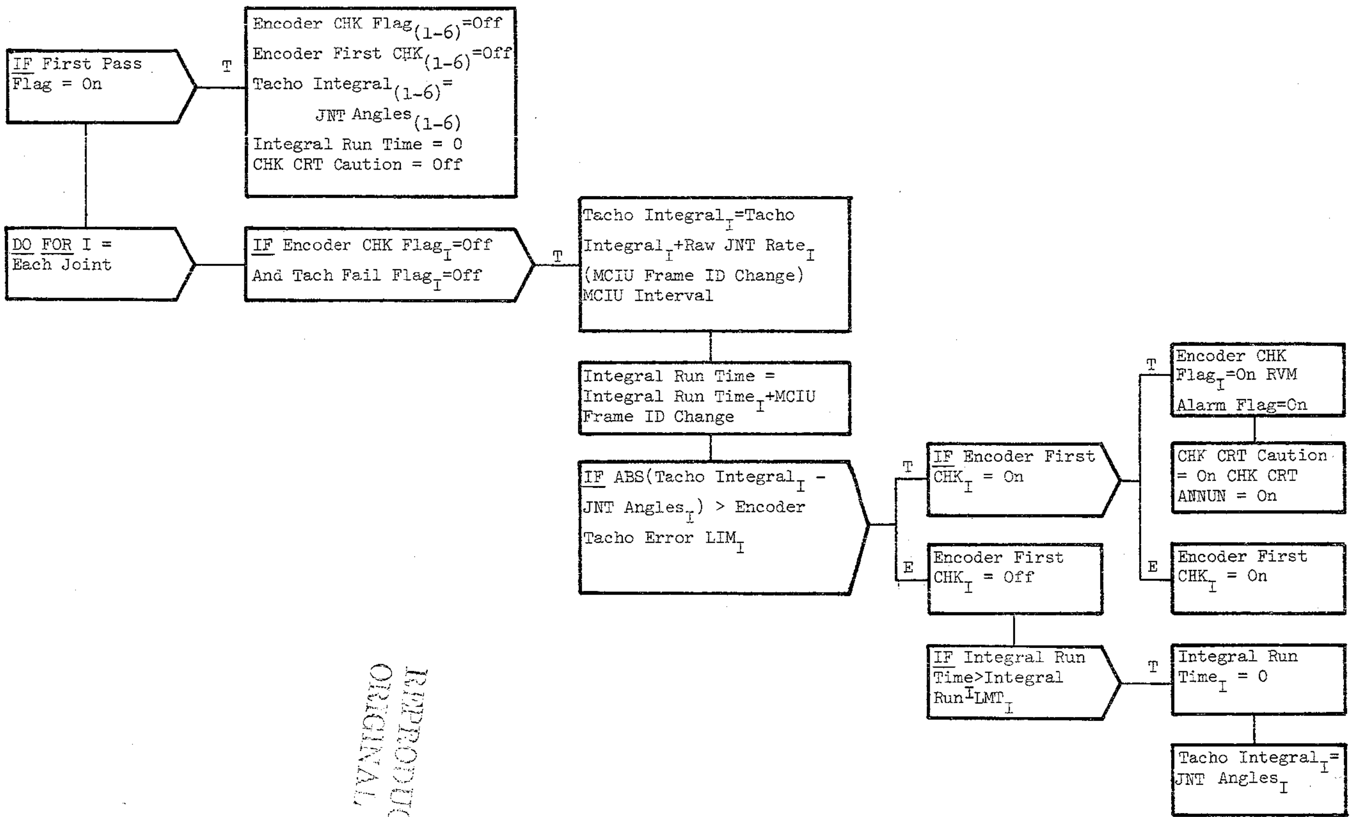

Figure 3.3.8.21-2. Position Encoder Check

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IF((EE Auto/Man Flag > 0) And (Capture CMD = On Or (Rigid CMD = On And EE Rigidized Flag = Off))) Or (Vern Scal Req ≠ Vern Scal Req LP) Or (Payload Cap ≠ Payload Cap Past) Or Consis Flag LP = Off Or First Pass Flag = On Or Rate Demand ID Return = 0 Or (All Brakes On = Off And All Brakes On LP = On)

T:

[ERR JNT] = OFF
[DISP ELAPS] = 0
[JNT Consis] = ON
CNTL ERR Caution Flag = OFF

E:

Perform Joint Consis Correlation (Fig. 3.3.8.21-4)

Figure 3.3.8.21-3. Consistency Check

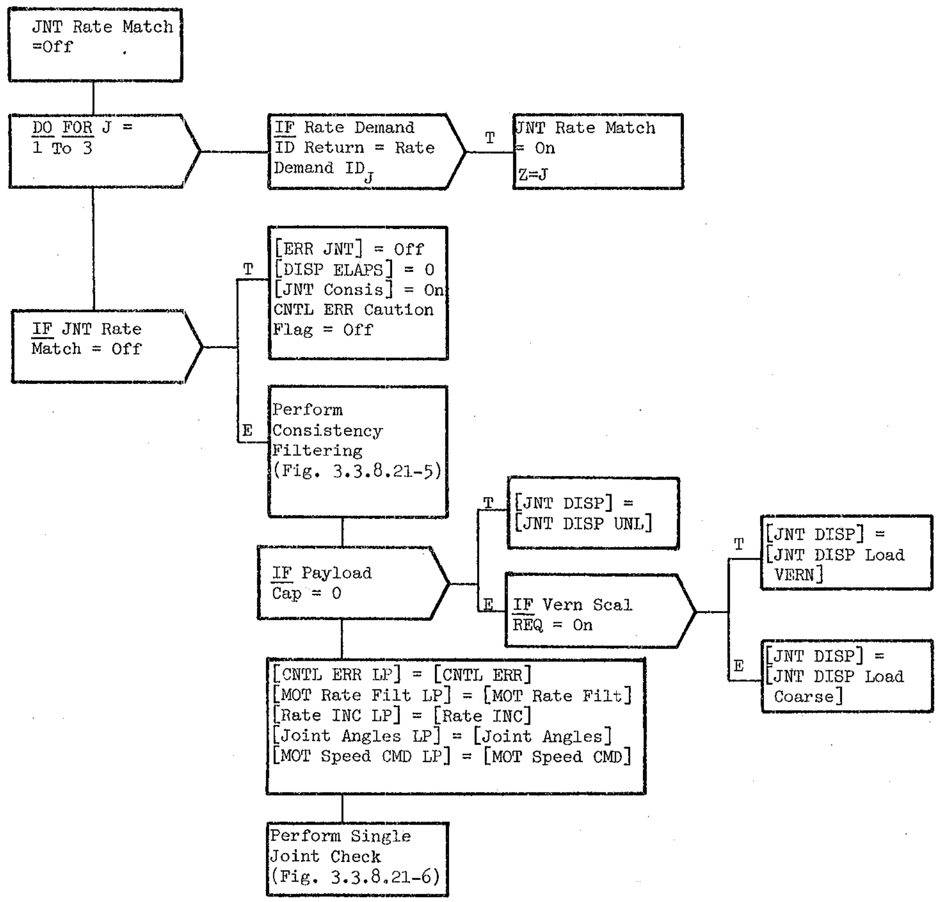

Figure 3.3.8.21-4. Joint Consis Correlation

F12=(Filt1 Gain)(MCIU Frame ID Change)/Filt1 Time Con
F11=1-(F12/Filt1 Gain)

F22=(Filt2 Gain)(MCIU Frame ID Change)/Filt2 Time Con
F21=1-(F22/Filt2 Gain)

F32=(Filt3 Gain)(MCIU Frame ID Change)/Filt3 Time Con
F31=1-(F32/Filt3 Gain)

DO FOR K = Each Joint

MOT Speed CMD Unfilt$_{(K)}$= MOT Speed LP$_{(Z,K)}$

Rate Inc Unfilt$_K$=MOT Rate Filt$_K$ -MOT Rate Filt LP$_K$

MOT Speed CMD$_K$=(MOT Speed CMD LP$_K$ F11)+(MOT Speed CMD Unfilt$_K$ F12)

CNTL ERR Unfilt$_K$=(MOT Speed CMD$_K$) -(MOT Rate Filt$_K$)

CNTL ERR$_K$=(CNTL ERR LP$_K$)(F21)+ (CNTL ERR Unfilt$_K$)(1=22)

Rate INC$_K$=(Rate INC LP$_K$)(F31)+ (Rate INC Unfilt$_K$)(F32)

ANG INC$_K$=Joint Angles$_K$ -JNT Angles LP$_K$

Figure 3.3.8.21-5. Consistency Filtering

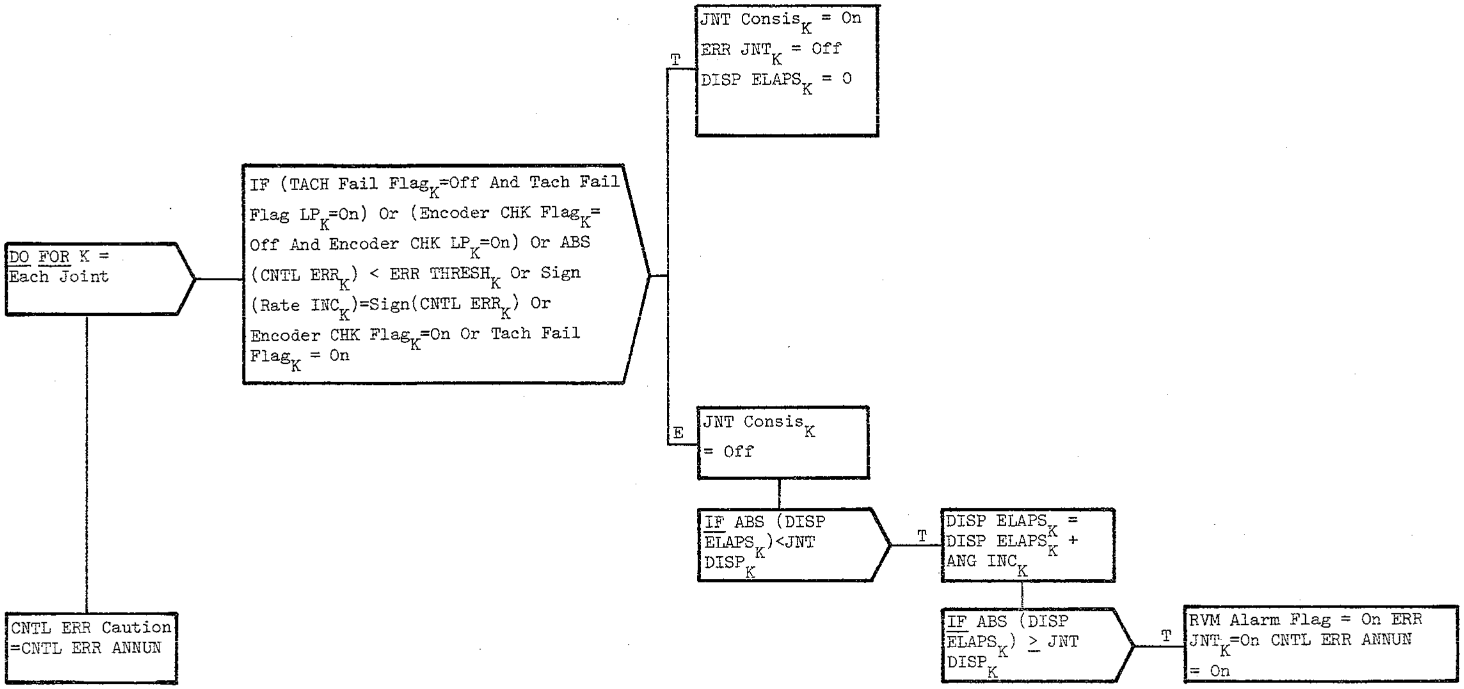

Figure 3.3.8.21-6. Single Joint Check

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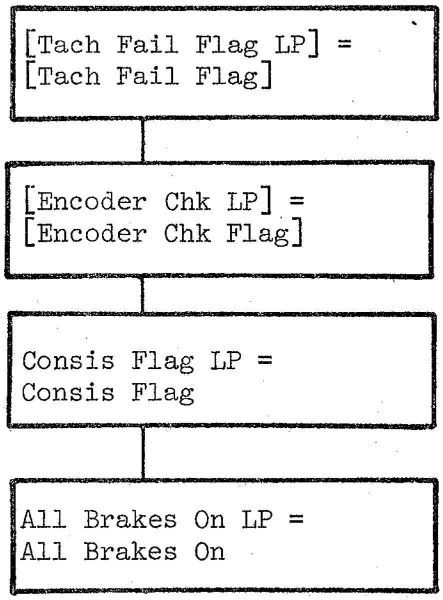

Figure 3.3.8.21-7. Saving

APPENDICES

A. DATA BASE DEFINITIONS

A.1 SM COMPOOL ORGANIZATION

All SM tables and buffers are listed and described in Appendix A.2. Each of these tables and buffers reside in one of the SM Compool's defined below. The contents and organization of the SM Compool's are determined in such a way that the simplicity and efficiency of the SM code is enhanced.

COMPOOL Name ***	Contents	Appendix A.2 Reference
**CSS_SXT	Special Processes Scaling Cross Reference Table (SXT)	A.2.13
*CSC_SCMT	SCM Text Dictionary (SCMT)	A.2.15
*CSC_AXX_SCAT	SCM Address Table for list number XX	A.2.14
*CSC_XX_SCML	SCM List and SCM SXT for list number XX	A.2.14
CSA_SM_CMT	Basic Processes CMT	A.2.11.1
CSC_ CMT_SCM	SCM display parameters	A.2.11.2
CSS_SP_CMT	Special Processes Parameters: includes SP Exec parameters and SP parameters set by OPS initialization/cleanup	A.2.11.3
CST_TM_CMT	Table Maintenance display parameters	A.2.11.4
CSB_PBD_CMT	Payload Bay Doors display parameters	A.2.11.5
CSM_AM_CMT	Antenna Management display parameters	A.2.11.6
CSZ_ICC_CMT	ICC input buffers and flags	A.2.11.7
CSZ_SM_COMN_BUFR	SM Mass Memory Common Buffer	A.2.25
CSD_RTC_CMT	Display Remote Text COMPOOL	
CDD_MDT_UI	Multiple Discrete Text (Displays Compool	–
SHD_HYB_DISPATCH	SM Hybrid Dispatcher	A.2.22
CSC_MM_DIR	SCM MM DIRECTORY	–

* = Preprocessor Generated
** = Preprocessor Initialized
*** = The third character of each Compool name is the functional ID of the area using that Compool-reference Section 1, discussion of name standards.

A.1 (Cont'd.)

COMPOOL Name***	Contents	Appendix A.2 Reference
*CSA_DART	Basic Processes Data Acquisition Read Table (DART)	A.2.3
*CSA_INB	Basic Processes Input Buffer (INB)	A.2.10
*CSA_IXP	Input Buffer to PPB Cross Reference Table (IXP)	A.2.4
*CSA_SXT	Basic Processes Scaling Cross Reference Table (SXT)	A.2.13
*CSA_PPB	Parameter Processing Buffer (PPB)	A.2.2
*CSA_CDA	Current Data Array (CDA)	A.2.7
*CSA_PIT	Parameter Information Table (PIT)	A.2.1
*CSA_LIT	Limit Sense Table (LIT)	A.2.8
*CSA_PCT	Precondition Control Table (PCT)	A.2.5
	Precondition Group Table (PGT)	A.2.6
*CSA_SAT	Scaling Table (SAT)	A.2.9
**CSS_COT	Constants Table - Values to be used by Special Processes and RMS	A.2.12
CSS_TM_COT	Constants Table - Header information and pointers used by Table maintenance	A.2.12
CSS_SPINB	Special Processes Input Buffer (SPINB)	A.2.17
CSS_SPOB	Special Processes Output Buffer (SPOB)	A.2.16
CSS_DDT	Display Downlist Table (DDT)	A.2.18
CSS_DART	Special Processes Data Acquisition Read Table (DART)	A.2.3

* = Preprocessor Generated
**= Preprocessor Initialized
***The third character of each Compool name is the functional ID of the area using that Compool - reference section 1, discussion of name standards.

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A.1 (Cont'd)

COMPOOL Name***	Contents	Appendix A.2 Reference
*CSP_PLC	Payload Control General cross reference Table (GXT)	A.2.19
	Payload Control Discrete Information Table (DIT)	A.2.20
	Payload Control Analog Information Table (ANIT)	A.2.21
	Payload Control Channel Status Table (CST)	A.2.24
CRB_MCI	RMS Input Data from MCIU	A.2.30
**CRI_LVC	RMS Level C Constants	A.2.31
CRA_TE	RMS Working Data Compool	A.2.32
CRD_CIL	RMS Constants and I-LOAD Data	A.2.33
CRE_MCO	RMS Output Data to MCIU	A.2.34
*CRF_ASC	RMS Pre-stored Auto Sequence Data	A.2.35
CRT_DIS	RMS Dispatcher Compool	A.2.36

* = Preprocessor Generated
** = Preprocessor Initialized
*** = The third character of each Compool name is the functional ID of the area using that Compool - reference Section1, discussion of name standards.

INSERT A:

CVN_MM_UTILITY

INSERT B:

CRC_COT RMS Constants Compool A.2.37

A.2 TABLE DEFINITION

Many tables and buffers referenced in the previous sections are built by the SM offline preprocessor. The contents of these tables can be updated during ground turnaround operations and some of the tables (i.e., the Constants Table, the Parameter Information Table, and the Limit Table) can be changed inflight via the Table Maintenance SPEC.

These tables and buffers, utilized by several SM functions, reside in the SM COMPOOL's but are not compiled with the executable programs.

Each table or buffer is presented in the remainder of this section by means of a description, overview of table/buffer organization and a description of the contents of a typical entry.

Figure A.2-1 is a cross-reference between the SM Basic Processes tables and the SM processors in which the tables are used.

Functions	Parameter Information Table PIT A.2.1	Parameter Processing Buffer PPB A.2.2	Data Acquisition Read Table DART A.2.3	Input Buffer To PPB Cross-Ref. Table IXP A.2.4	Precondition Table PCT A.2.5	Precondition Group Table PGT A.2.6	Current Data Array CDA A.2.7	Limit Sense Table LIT A.2.8	Scaling Table SAT A.2.9	Constant Table COT A.2.12	Scaling XREF Table SXT A.2.13	Input Buffer INB A.2.10	Communications Table CMT A.2.11	Fault Message Parameter Table FMPT*
Data Acq. (3.2.1.3)		X	X	X			X					X	X	X
PM Control (3.2.1.4)		X					X						X	
FDA (3.2.1.6)	X	X					X	X					X	X
Precondition (3.2.1.5)	X				X	X	X							
Table Maint. (3.3.1)	X						X	X		X			X	X
Analog Scaling (3.2.1.7)									X		X			

Figure A.2-1. Basic SM Processes Table/Buffer Usage Matrix

*UI Tables But Are Accessed And Used By SM

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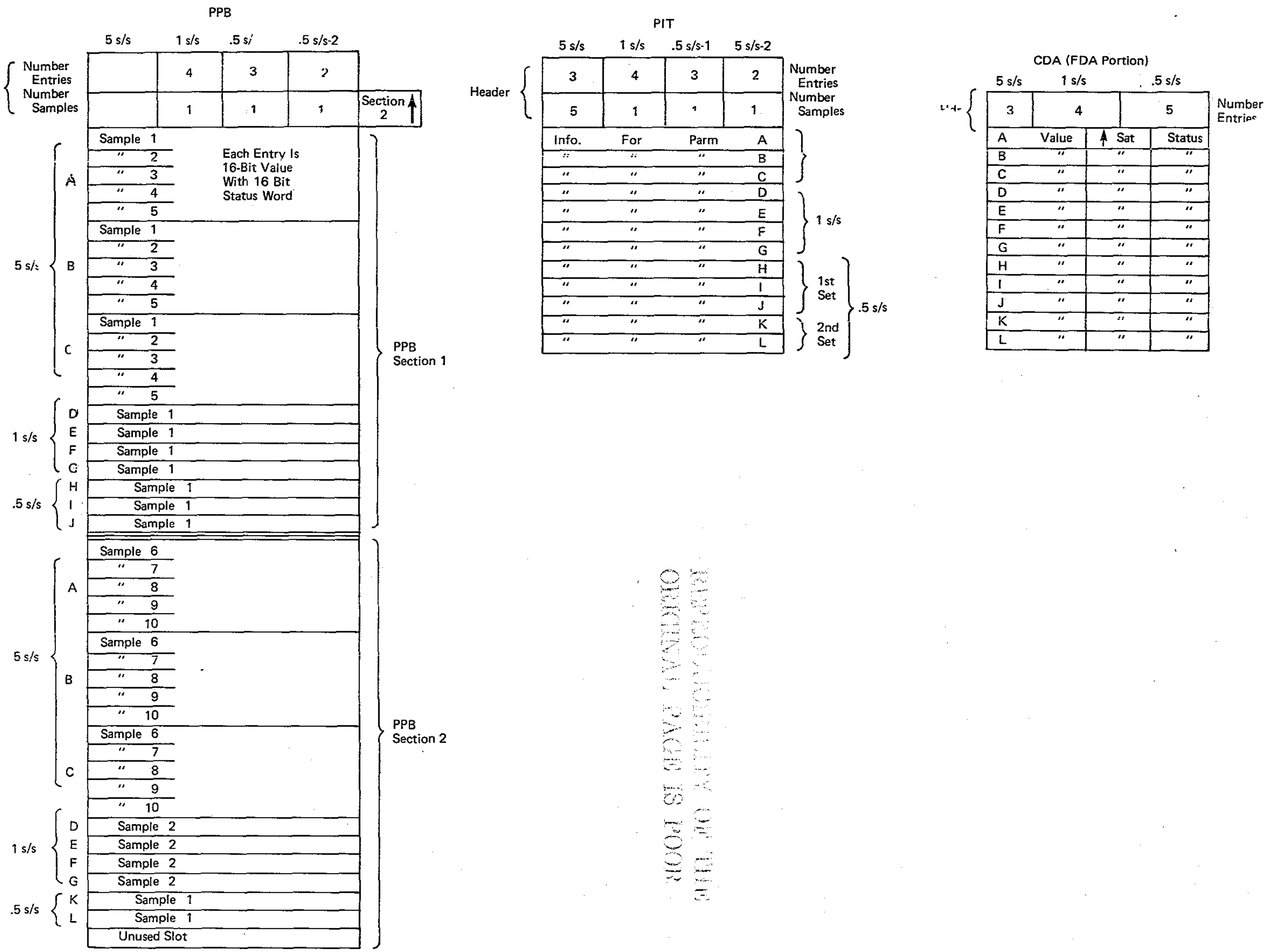

Figure A.2-2. Table/Buffer Relationships For Analog Parameters
(Same For EU Parameters)

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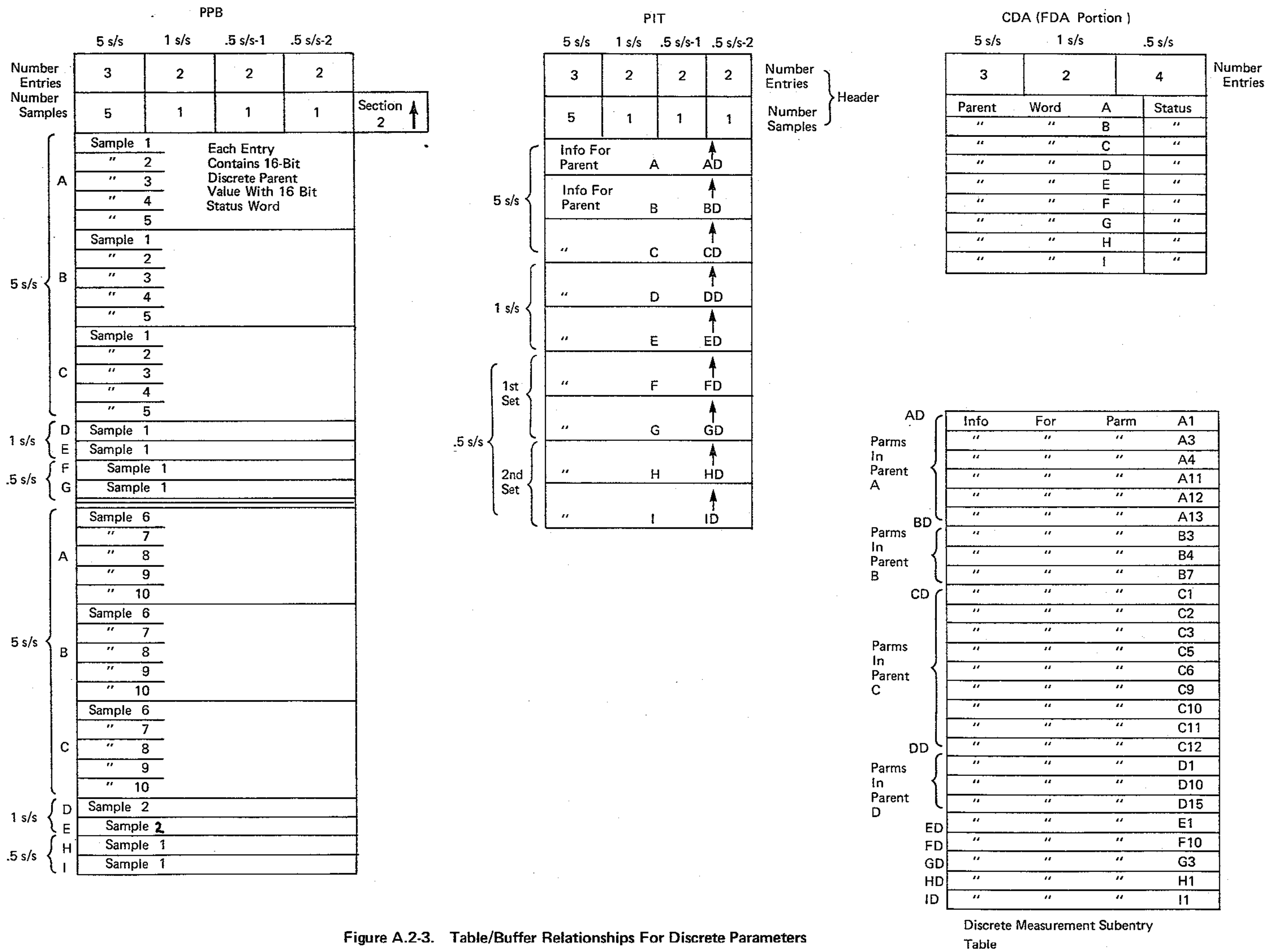

Figure A.2-3. Table/Buffer Relationships For Discrete Parameters

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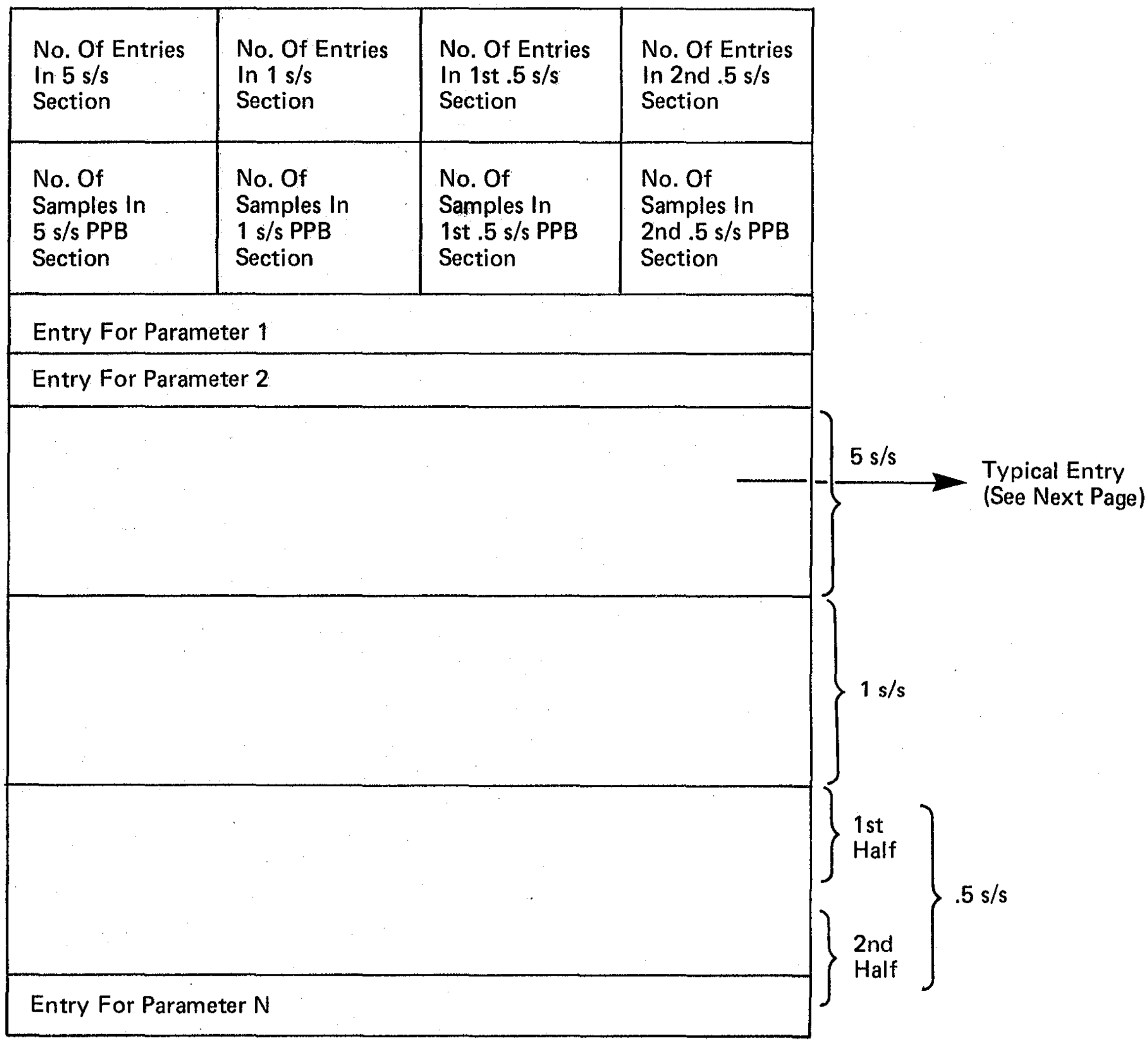
A.2.1 Parameter Information Table (PIT) Compool: CSA_PIT

The PIT contains information used to perform the limit sense, false alarm avoidance and annunciation functions on those parameters that have limits defined. There is an entry for each parameter that has limits defined with an additional entry for parameters with dual limit sets.

- A different PIT exists for analogs, discrete parents and engineering unit parameters.
- Each PIT is divided into three sections for 5 s/s, 1 s/s and .5 s/s parameters respectively.
- 5 s/s and 1 s/s sections have an entry for each FDA'd parameter acquired at that rate.
- .5 s/s sections have an entry for each FDA'd parameter at that rate, however this section is further divided into two subsections such that:
  - subsection one has an entry for each .5 s/s parameter acquired in Data Acquisition cycles 1-5.
  - subsection two has an entry for each .5 s/s parameter acquired in Data Acquisition 6-10.

The discrete PIT contains parent word entries for FDA discretes only. The discrete measurement subentry index points to a table of entries containing FDA information for individual discretes contained within the parent words.



Parameter Information Table (PIT)
(A Similar Table Exists For Analog, EU And Discrete Parents)
Figure A.2.1-1

<table>
<tr><td colspan="2">Parameter ID</td><td colspan="2">Active Limit Set</td></tr>
<tr><td colspan="4">Number Of Limit Sets</td></tr>
<tr><td colspan="4">Limit Table Index</td></tr>
<tr><td colspan="2">Max N Count</td><td colspan="2">Current N Count</td></tr>
<tr><td colspan="4">Index To Application FMPT</td></tr>
<tr><td>Hard
Fail
Indicator</td><td colspan="2">Alarm
Inhibit
Indicator</td><td>FDA
Bypass
Indicator</td></tr>
<tr><td colspan="2">Limit Sense High Indicator</td><td colspan="2">Limit Sense Low Indicator</td></tr>
</table>

Analog/EU Typical Entries In PIT

<table>
<tr><td>Number Of Parameters</td><td>MASK 1</td><td>MASK 2</td><td>Parameter Count</td></tr>
<tr><td>Discrete Measurement
Subentry Index</td><td colspan="3">Limit Status</td></tr>
</table>

Figure A.2.1-2. Discrete Parent Word Typical Entry In PIT

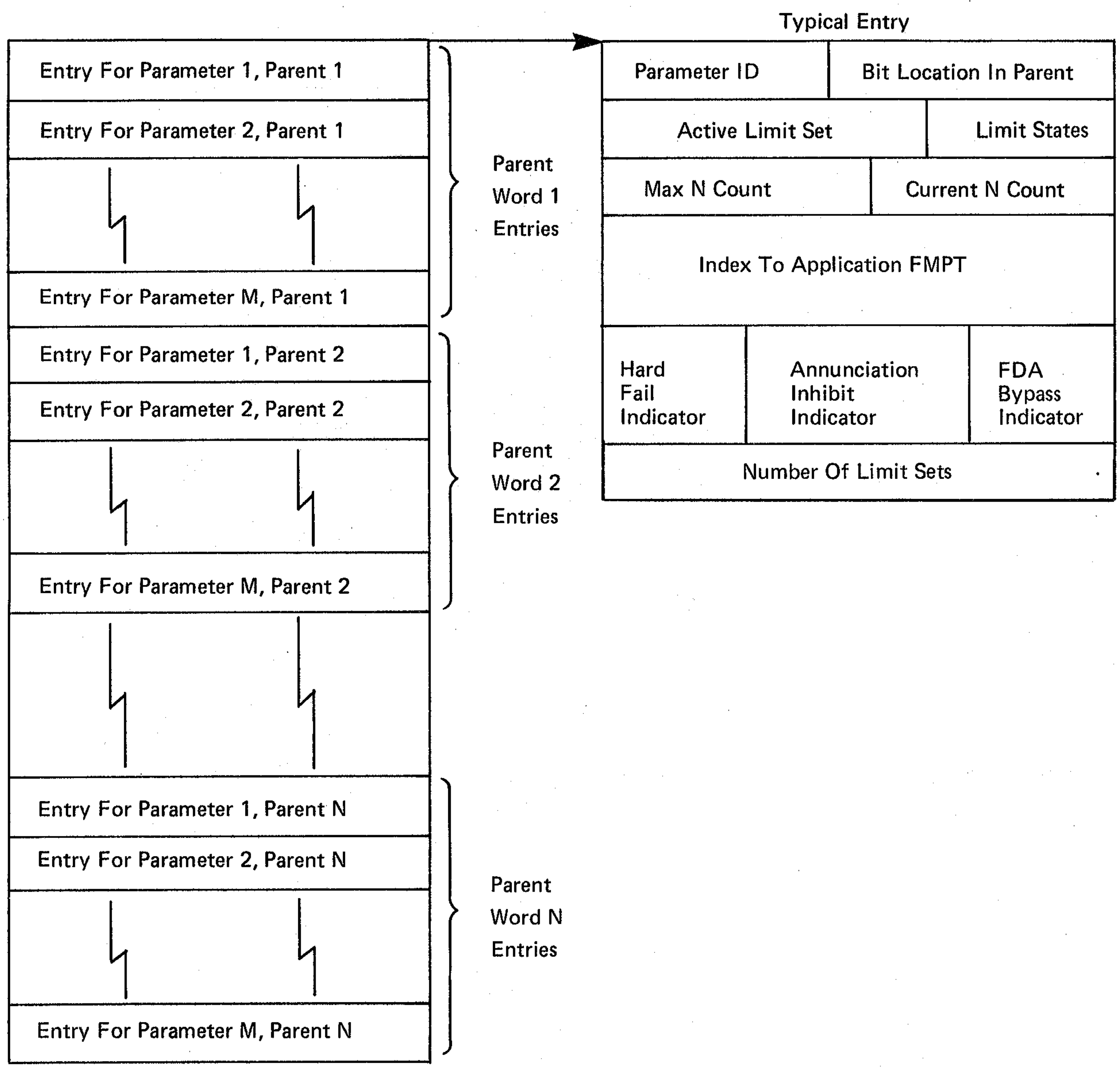


Figure A.2.1-3. Discrete Measurement Subentry Table

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	Analog, EU, Discrete Parent PIT Header			
1	Number of entries in each s/s section	CSAS_PITA_NUM_ENTRIES(Analog CSAS_PITE_NUM_ENTRIES(EU) CSAS_PITP_NUM_ENTRIES (Discrete Parent)	An array of 4 elements giving the number of entries in the 5 s/s, 1 s/s, 1st .5 s/s and 2nd .5 s/s sections of the PIT. Initial Values - Level C dependent.	ARRAY(4) INTEGER
2	Number of samples buffered in PPB for each s/s section	CSAS_PITA_NUM_SAMPLES CSAS_PITE_NUM_SAMPLES CSAS_PITP_NUM_SAMPLES	An array of 4 elements giving the number of samples buffered in half the PPB for each of the parameter entries of the 5 s/s, 1 s/s, .5 s/s and 2nd .5 s/s section of the PIT. Initial Values - (5, 1, 1, 1)	ARRAY(4) INTEGER
	Analog/EU Typical PIT Entry			
1	Parameter - ID	CSAS_PITA_PARM_ID (Analog) CSAS_PITE_PARM_ID (EU)	Seven character parameter ID reduced to an integer value. Initial Value - Level C dependent.	BIT(24)
2	Active Limit Set	CSAS_PITA_ACT_LIM_SET CSAS_PITE_ACT_LIM_SET	Current limit set as selected by precondition processing. Initial Value - 1	BIT(2)
3	Number of Limit Sets	CSAS_PITA_LIM_SET CSAS_PITE_LIM_SET	Number of limit sets defined for parameter (one to three). Initial Value - Level C dependent.	BIT(2)
4	Limit Table Index	CSAS_PITA_LIM_TAB_INDEX CSAS_PITE_LIM_TAB_INDEX	Relative location of limit table entry for parameter from beginning of limit table block. Initial Value - Level C dependent.	INTEGER
5	Max Noise (N) Count	CSAS_PITA_MAX_N_CT CSAS_PITE_MAX_N_CT	Noise Filter upper limit to be used in False alarm avoidance. Initial Value - Level C dependent.	BIT(4)
6	Current Noise (N) Count	CSAS_PITA_CUR_N_CT CSAS_PITE_CUR_N_CT	Current count for either successive out of limits or in limit occurences. Initial Value -0.	BIT(4)
7	FMPT_INDEX	CSAS_PITA_FMPT_INDEX CSAS_PITE_FMPT_INDEX	Index into the Application Fault Message Parameter Table. Initial Value - Level C dependent	INTEGER
8	Hard Fail Indicator	CSAS_PITA_HARD_FAIL CSAS_PITE_HARD_FAIL	"Hard Fail" Indication ('N' count reached) Initial Value - off.	BOOLEAN
9	Annunciation Inhibit Indicator	CSAS_PITA_ALARM_INH_IND CSAS_PITE_ALARM_INH_IND	Indication that all annunciation applicable to this parameter is inhibited. Initial Value - off.	BOOLEAN

TABLE NAME: PIT

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
10	FDA Bypass Indicator	CSAS_PITA_BYPASS_IND CSAS_PITE_BYPASS_IND	Indication that parameter should not be subjected to FDA processing. Set by Precondition Processing during group warmup.	BOOLEAN
11	Limit Sense High Indicator	CSAS_PITA_LIMIT_HIGH CSAS_PITE_LIMIT_HIGH	Indication that a parameter has failed the high limit check. Off - within high limit (Initial Value) On - exceeded high limit; Initial Value - off	BOOLEAN
12	Limit Sense Low Indicator	CSAS_PITA_LIMIT_LO CSAS_PITE_LIMIT_LO	Indication that a parameter has failed the low limit check. Off - within low limit (Initial Value) On - failed low limit Initial Value - off	BOOLEAN
	Discrete Parent Typical PIT Entry			
1	No. of Parameters	CSAS_PITP_NUM_PARMS	The number of FDA discretes contained within the parent word (ranges from 1 to 16). Initial Value - Level C dependent.	BIT(5)
2	Mask 1	CSAS_PITP_MASK1	A map of bits to be FDA'd (significant bits) in the parent word. Initial Value - Level C dependent.	BIT(16)
3	Mask 2	CSAS_PITP_MASK2	A map of expected values of the FDA bits in the parent word. Initially set to the "should be" (desired) states. If a measurement has multiple limits, the initial value should represent the Prime limit set. Initial Value - Level C dependent.	BIT(16)
4	Parameter Count	CSAS_PITP_PARM_CT	The number of FDA discretes within the parent word that have reached their max N count. Initial Value - 0	BIT(5)
5	Discrete Measurement Subentry Index	CSAS_PITP_DISCRETE_SUB_ INDEX	Points to first entry in Discrete Measurement Subentry Table for this parent.	INTEGER
6	Limit Status	CSAS_PITP_LIMIT_STATUS	A map of limit statuses of the FDA bits in the parent word. On - fails limits; off - within limits. Initial Value - all 0's.	BIT(16)
	Discrete Measurement Subentry Table Typical Entry			
1	Parameter ID	CSAS_PITS_PARM_ID	Seven character parameter ID reduced to an integer value. Initial Value - Level C dependent.	BIT(24)
2	Bit Location in Parent	CSAS_PITS_BIT_LOC	The bit position occupied by this parameter in its parent word. Initial Value - Level C dependent.	BIT(5)
3	Active Limit Set	CSAS_PITS_ACT_LIM_SET	Current Limit Set as selected by precondition processing. Initial Value - 1.	BIT(2)

TABLE NAME: PIT (con't)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
4	Limit States	CSAS_PITS_LIM_STATES	Predefined comparison states of a discrete. Three bit positions are defined to allow for a maximum of three limit sets. Initially each limit is set to the "should be" (desired) state. Initial Value - Level C dependent.	BIT(3)
5	Max Noise (N) count	CSAS_PITS_MAX_N_CT	Noise filter upper limit to be used in false alarm avoidance. Initial Value - Level C dependent.	BIT(5)
6	Current Noise (N) count	CSAS_PITS_CUR_N_CT	Current count for either successive out of limits or in limits occurrences. Initial Value - 0.	BIT(5)
7	Number of Limit Sets	CSAS_PITS_NUM_LIM_SET	Number of limit sets defined for this parameter. Initial value - Level C dependent.	BIT(2)
8	FMPT_INDEX	CSAS_PITS_FMPT_INDEX	Index into the Application Fault Message Parameter Table. Initial Value - Level C dependent.	INTEGER
9	Hard Fail Indicator	CSAS_PITS_HARD_FAIL	"Hard Fail" indication ('N' count reached). Initial Value - off.	BOOLEAN
10	Annunciation Inhibit Indicator	CSAS_PITS_ALARM_INH_IND	Indication that all annunciation applicable to this parameter is inhibited. Initial Value - off.	BOOLEAN
11	FDA Bypass Indicator	CSAS_PITS_BYPASS_IND	Indication that parameter should not be subjected to FDA processing. Set by Precondition Processing during group warm up.	BOOLEAN

TABLE NAME: PIT (cont'd)

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A.2.2 Parameter Processing Buffer (PPB) Compool: CSA_PPB

The PPB contains an entry for each parameter that is to be limit sensed. It contains PCM Master Unit, interapplication and software generated parameters. The PPB is divided into two portions with each portion containing one second of data such that data acquired in data acquisition cycles 1-5 is the first half of the PPB and data acquired in data acquisition cycles 6-10 is in the second half. Each buffer half contains one second of data samples for the 5 and 1 s/s parameters. .5 s/s parameters are split between buffer halves such that the .5 s/s parameters acquired in data acquisition cycles 1-5 are in the first portion of the PPB and the .5 s/s parameters acquired in data acquisition cycles 6-10 are in the second portion of the PPB. The SM offline preprocessor ensures that acquisition of 1 s/s and .5 s/s parameters is evenly distributed across the 10 Data Acquisition read cycles. Reference Section A.2.3 (DART).

Each portion of the PPB is mapped to the PIT such that there is a 5 s/s and 1 s/s entry in each PPB half for each 5 s/s and 1 s/s entry in the PIT. There is a .5 s/s entry in each PPB half for the .5 s/s entries in the PIT corresponding to that second of data.

For parameters with dual limits there will be two separate but contiguous entries in the PPB as if they were different parameters. This is done to preserve the validity of the PPB-PIT mapping scheme so that the FDA process can efficiently index into both tables.

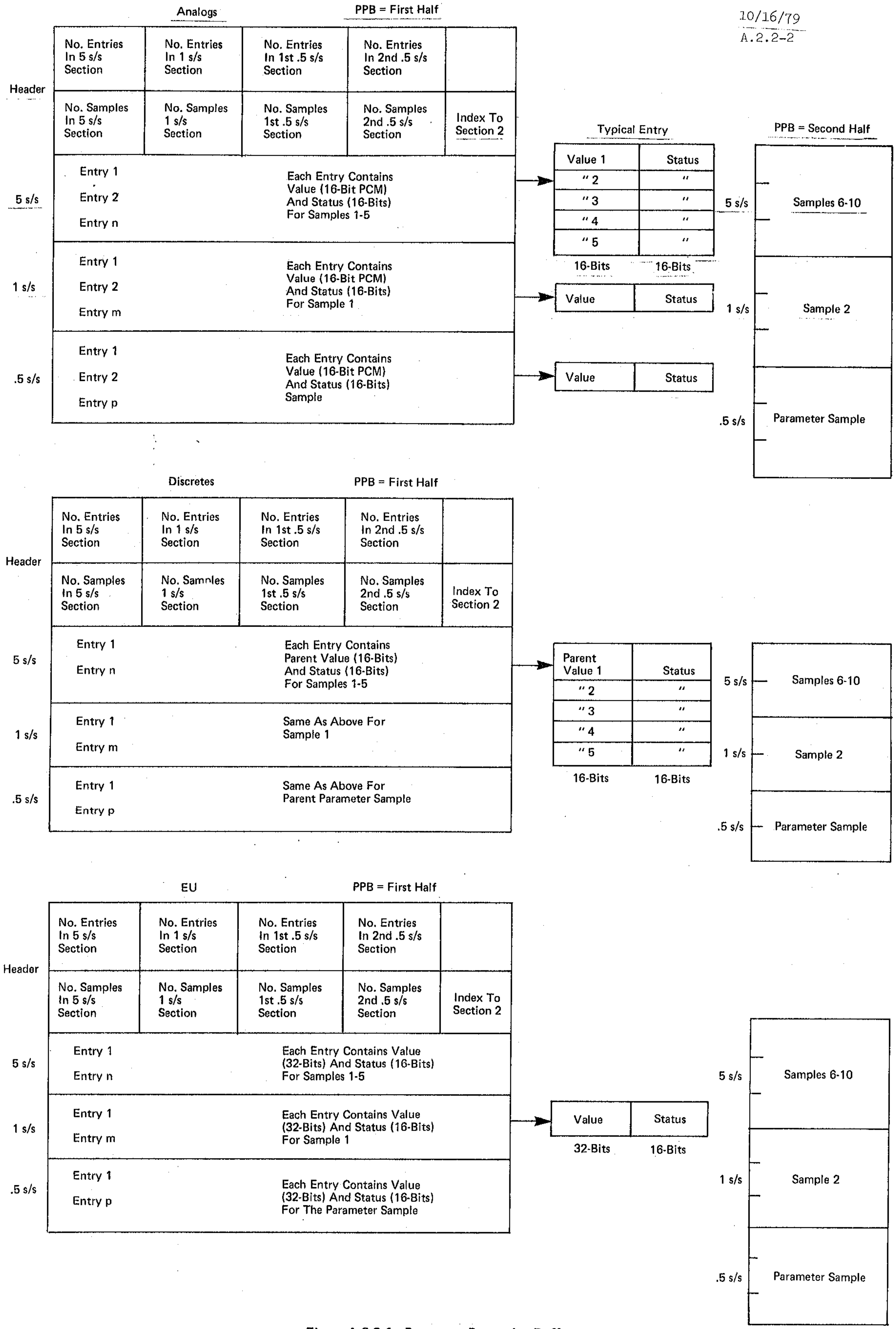

Figure A.2.2-1. Parameter Processing Buffer

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	Analog PPB Header			
1	Number of entries in each s/s section	CSAS_PPBA_NUM_ENTRIES	An array of 4 elements giving the number of entries in the 5 s/s, 1 s/s, 1st .5 s/s and 2nd .5 s/s sections of the analog PPB. Initial Value - Level C dependent.	ARRAY (4) INTEGER
2	Number of samples buffered in PPB for each s/s section	CSAS_PPBA_NUM_SAMPLES	An array of 4 elements giving the number of samples buffered for each of the parameter entries of the 5 s/s, 1 s/s, 1st .5 s/s and 2nd .5 s/s sections of the analog PPB. Initial Value - (5, 1, 1, 1)	ARRAY (4) INTEGER
3	Section Two Pointer	CSAS_PPBA_SECTION_TWO	An index to section two (the 2nd half) of the Analog PPB.	INTEGER
	Analog PPB			
1	Parameter Value	CSAS_PPBA_VALUE	Parameter sample PCM value. Initial Value - 0	INTEGER
2	Parameter Status	CSAS_PPBA_STATUS	Status associated with the corresponding parameter sample. Initial Value - HEX'4000' (Invalid I/O).	BIT (16)
	Discrete PPB Header			
1	Number of entries in each s/s section	CSAS_PPBP_NUM_ENTRIES	Same as corresponding entry of analog PPB header.	ARRAY (4) INTEGER
2	Number of samples buffered in PPB for each s/s section	CSAS_PPBP_NUM_SAMPLES	Same as corresponding entry of analog PPB header.	ARRAY (4) INTEGER
3	Section Two Pointer	CSAS_PPBP_SECTION_TWO	Same as corresponding entry of analog PPB header.	INTEGER
	Discrete PPB			
1	Parameter Value	CSAS_PPBP_VALUE	Parent word sample value. Initial Value - 0	INTEGER
2	Parameter Status	CSAS_PPBP_STATUS	Status associated with the corresponding parent word sample. Initial Value - HEX'4000' (Invalid I/O).	BIT (16)
	EU PPB Header			
1	Number of entries in each s/s section	CSAS_PPBE_NUM_ENTRIES	Same as corresponding entry of analog PPB header.	ARRAY (4) INTEGER
2	Number of samples buffered in PPB for each s/s section	CSAS_PPBE_NUM_SAMPLES	Same as corresponding entry of Analog PPB header	ARRAY (4) INTEGER
3	Section Two Pointer	CSAS_PPBE_SECTION_TWO	Same as corresponding entry of Analog PPB header.	INTEGER

TABLE NAME: PPB

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```
MEMBER NAME  CRBMCI
C                                  MML#-                     V72K3012J
    2 CRBB_JNT_REQ_WRP BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-WRIST PITCH JOINT SELECT DISC.
C                                  FSSR-JNT_SW_WRP
C                                  DESC-WRIST PITCH JOINT SELECT
C                                       1=SELECTED
C                                  MML#-                     V72K3013J
    2 CRBB_JNT_REQ_WRY BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-WRIST YAW JOINT SELECT DISC.
C                                  FSSR-JNT_SW_WRY
C                                  DESC-WRIST YAW JOINT SELECT
C                                       1=SELECTED
C                                  MML#-                     V72K3014J
    2 CRBB_JNT_REQ_WRR BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-WRIST ROLL JOINT SELECT DISC.
C                                  FSSR-JNT_SW_WRR
C                                  DESC-WRIST ROLL JOINT SELECT
C                                       1=SELECTED
C                                  MML#-                     V72K3015J
    2 CRBB_SINGL_DIR_POS BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-SINGLE DIRECT DRIVE POSITIVE
C                                       DISCRETE
C                                  FSSR-SINGL_DIR_DRIVE_POS_FLAG
C                                  DESC-SINGLE DIRECT DRIVE POSITIVE
C                                       1=SELECTED
C                                  MML#-                     V72K3020J
    2 CRBB_SINGL_DIR_NEG BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-SINGLE DIRECT DRIVE NEGATIVE
C                                       DISCRETE
C                                  FSSR-SINGL_DIR_DRIVE_NEG_FLAG
C                                  DESC-SINGLE_DIRECT_DRIVE_NEGATIVE
C                                       1=SELECTED
C                                  MML#-                     V72K3021J
    2 CRBB_EE_TEMP_REQ BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-END EFFECTOR TEMP JOINT SELECT
C                                       DISCRETE
C                                  FSSR-JNT_SW_EE_TEMP
C                                  DESC-END EFFECTOR TEMP JOINT SELECT
C                                       1=SELECTED
C                                  MML#-                     V72K3016J
    2 CRBB_DC_WD1_PARITY BIT(1),
C                                  ITEM-
C                                  FSSR-
C                                  DESC-D&C WORD1 PARITY      none
C                                  MML#-                     V72K2987J
  1 CRBV_WORD33,
C                                  DESC-PACKED DISCRETES FROM D&C PANEL
C                                  MML#-                     V54M3433P
    2 CRBV_DC_WD2_ADDR BIT(5),
C                                  ITEM-
C                                  FSSR-
C                                  DESC-D&C WORD2 ADDRESS
```

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```
MEMBER NAME  CRBMCI                                                    nonE
C                                      MML#-                     V72K2969J
    2 CRBB_SINGL_JNT_REQ BIT(1),
C                                      (MCIU/RCD)
C                                      ITEM-SINGLE JOINT MODE SELECT
C                                           DISCRETE
C                                      FSSR-SINGLE_JOINT_MODE_REQ
C                                      DESC-SINGLE MODE SELECT
C                                           1=SELECTED
C                                      MML#-                     V72K2979J
    2 CRBB_DIRECT_REQ BIT(1),
C                                      ITEM-
C                                      FSSR-
C                                      DESC-DIRECT_MODE_SELECT
C                                           1=SELECTED
C                                      MML#-                     V72K2980J
    2 CRBB_OPR_CMD_REQ BIT(1),
C                                      (MCIU/RCD)
C                                      ITEM-OPERATOR COMMAND MODE SELECT
C                                           DISCRETE
C                                      FSSR-OPR_CMD_MODE_REQ
C                                      DESC-OPR CMD SELECT
C                                           1=SELECTED
C                                      MML#-                     V72K2970J
    2 CRBB_AUTO_1_REQ BIT(1),
C                                      (MCIU/RCD)
C                                      ITEM-AUTO SEQUENCE 1 MODE SELECT
C                                           DISCRETE
C                                      FSSR-AUTO_SEQ_MODE_SEL
C                                      DESC-AUTOMATIC SEQUENCE MODE SELECT
C                                           1=SELECTED
C                                      MML#-                     V72K2971J
    2 CRBB_AUTO_2_REQ BIT(1),
C                                      (MCIU/RCD)
C                                      ITEM-AUTO SEQUENCE 2 MODE SELECT
C                                           DISCRETE
C                                      FSSR-AUTO_SEQ_MODE_SEL
C                                      DESC-AUTOMATIC SEQUENCE MODE SELECT
C                                           1=SELECTED
C                                      MML#-                     V72K2972J
    2 CRBB_AUTO_3_REQ BIT(1),
C                                      (MCIU/RCD)
C                                      ITEM-AUTO SEQUENCE 3 MODE SELECT
C                                           DISCRETE
C                                      FSSR-AUTO_SEQ_MODE_SEL
C                                      DESC-AUTOMATIC SEQUENCE MODE SELECT
C                                           1=SELECTED
C                                      MML#-                     V72K2973J
    2 CRBB_AUTO_4_REQ BIT(1),
C                                      (MCIU/RCD)
C                                      ITEM-AUTO SEQUENCE 4 MODE SELECT
C                                           DISCRETE
C                                      FSSR-AUTO_SEQ_MODE_SEL
C                                      DESC-AUTOMATIC SEQUENCE MODE SELECT
C                                           1=SELECTED
C                                      MML#-                     V72K2974J
    2 CRBB_TEST_REQ BIT(1),
C                                      (MCIU/RCD)
C                                      ITEM-TEST MODE SELECT DISCRETE
```

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	EU PPB			
1	Parameter Value	CSAS_PPBE_VALUE	Parameter Sample Value. Initial Value - 0	INTEGER
2	Parameter Status	CSAS_PPBE_STATUS	Status associated with the corresponding parent word sample. Initial Value - 'HEX '4000' (Invalid I/O).	BIT (16)

TABLE NAME: PPB (cont'd)

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A.2.3 Data Acquisition Read Table (DART) Compool: CSA_DART (Basic)
CSS_DART (Special Processes)

The Data Acquisition Read Table provides the information required to read the proper words from the PCM master unit and Payload MDMs. A unique DART exists for Basic Data Acquisition and Special Processes Data Acquisition. The Basic Data Acquisition DART is mission dependent and therefore built by SM off-line Preprocessor. The Special Processes Data Acquisition DART is not mission dependent and is hand generated.

The table is organized into 10 sections corresponding to the 10 read cycles per SM processing cycle (2 seconds). Each section consists of an entry for each read to be performed for that cycle and is sorted by device type. The number of reads per cycle, the address and the number of contiguous words to be read must be determined from Level C specifications. The SM Offline Preprocessor constructs the DART such that acquisition of .5 s/s and 1 s/s parameters is evenly distributed across the 10 read cycles.

All Payload MDM data is read at least once per second via FCOS fixed BCE programs. If any Payload MDM data is required at 5 sample per second, then all Payload MDM data is read at 5 samples per second. There is one BCE element per card on the MDM and it reads all data on that card from the first required parameter through the last required parameter on that card. Thus, extra 'dummy' parameters may be acquired for more efficient reads. The DART (and IXP) entries for Payload MDM data is set up to screen and move required data only at the requested rate. The 'dummy' parameters are not moved from the input buffer.

Header	PLMDM 5 S/S Flag	Index To Entries In Cycle 1	No. PMU Entries In Cycle 1	No. PLMDM Entries In Cycle 1	-----	-----	-----	Index To Entries In Cycle 10	No. PMU Entries In Cycle 10	No. PLMDM Entries In Cycle 10
	Entries For Read Cycle 1									
	" " " " 2									
	" " " " 3									
	" " " " 4									
	" " " " 5									
	" " " " 6									
	" " " " 7									
	" " " " 8									
	" " " " 9									
	" " " " 10									

Typical Entry

PMU Bite Read Flag	Device Address	Read Length	Input Buffer Displacement

Figure A.2.3-1. Data Acquisition Read Table (DART)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	DART Header			
1	Payload 5 S/S	CSAS_DART_PL5SS	Payload MDM 5 Sample per second Flag, ON= 5 Sample per second data	Bit 16
2	Index to Section	CSAS_DART_INDEX	Relative location of first entry for the section	Integer (16 Bits)
3	No. PMU Entries In Section	CSAS_DART_NUM_PMU_ENTRIES	Number of PMU entries in section	Integer (16 Bits)
4	No. PLMDM Entries in Section	CSAS_DART_NUM_PLMDM_ENTRIES	Number of PLMDM entries in section	Integer (16 Bits)
	Typical DART Entry			
1	PMU BITE READ FLAG	CSAS_DART_BITE_READ	Flag for PMU BITE Read 01=PMU BITE Read Entry	2 Bits
2	Device Address	CSAS_DART_DEV_ADDR	Level C PMU RAM address or null if PL MDM Data	14 Bits
3	Read Length	CSAS_DART_READ_LNGTH	No. of contiguous 16-bit words to be read.	6 Bits
4	Input Buffer (INB) Displacement	CSAS_DART_INB_INDEX	Displacement index into input buffer. The input buffer address as passed to FCOS plus this value is the target location for retrieved data.	9 Bits

TABLE NAME: DART

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A.2.4 Input Buffer to PPB Cross-Reference Table (IXP) Compool: CSA_IXP

The IXP provides the information required to move data read from the PCM Master Unit, PLMDM's, and Interprocess COMPOOLs to the proper position in the PPB or CDA. The IXP is divided into two main sections.

1. A section representing data acquired from the PMU and PLMDM's.
2. A section representing data acquired from other functional areas.

Each of the main sections is organized by the source of the data, READ cycle, and order of the data in the input buffer or COMPOOL. There is an IXP entry for every word read from the PMU, PLMDM, and interprocess COMPOOLs.

Index Pointer To Sect. 1	No. Entries In Sect. 1	----	Index Pointer To Sect. 10	No. Entries In Sect. 10
PMU And PLMDM Entries For Read Cycle				1
" " " " "				2
" " " " "				3
" " " " "				10
Index Pointer To Sect. 1	No. Entries In Sect. 1		Index Pointer To Sect. 10	No. Entries In Sect. 10
Interprocess Entries For Read Cycle				1
" " " " "				2
" " " " "				3
" " " " "				10

Typical Entry In PMU/PLMDM Section

FDA IND	Type	Dual Limits IND	Rate
PPB/CBA Index Pointer			

Typical Entry In Interprocess Section

FDA IND	Type	Dual Limits IND	Rate
PPB/CDA Index Pointer			
Parm's Interprocess Compool Addr.			
Status Interprocess Compool Addr.			

Figure A.2.4-1. Input Buffer To PPB Cross-Reference Table (IXP)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	IXP Header			
1	Index Pointer to Section	CSAS_IXP_DEV_INDEX CSAS_IXP_PROC_INDEX	Relative location for first entry of the corresponding section Initial value - Level C Dependent	Integer
2	No. Entries in Section	CSAS_IXP_DEV_NUM_ENTRIES CSAS_IXP_PROC_NUM_ENTRIES	Total number of entries in section Initial value - Level C Dependent	Integer
	Typical IXP Entry			
1	FDA IND	CSAS_IXP_DEV_FDA_IND CSAS_IXP_PROC_FDA_IND	Indication as to whether or not parameter is to be limit sensed Initial value - Level C Dependent 0 = Non-FDA 1 = FDA Initial value - Level C Dependent	1 Bit
2	Type	CSAS_IXP_DEV_TYPE CSAS_IXP_PROC_TYPE	Parm type indication: 00 = EU (in device section, EU represents analogs to be scaled to EU), 01 = Discrete, 10 = Analog, 11 = Dummy (Don't Move) Initial value - Level C Dependent	2 Bits
3	Dual Limits Ind.	CSAS_IXP_DEV_DUAL CSAS_IXP_PROC_DUAL	Indication as to whether or not DUAL limits are specified for parm: 0 = No DUAL limits specified, 1 = DUAL limits specified. Initial value - Level C Dependent	1 Bit
4	Rate	CSAS_IXP_DEV_RATE CSAS_IXP_PROC_RATE	Indicates whether or not parameter is retrieved 5 times per second 0 = No, 1 = Yes. Initial value - Level C Dependent	1 Bit
5	PPB/CDA Index Pointer	CSAS_IXP_DEV_PNTR CSAS_IXP_PROC_PNTR	Index to target location in either PPB or CDA for retrieved parm. Index is from top of appropriate section of table. Parms that are to be limit sensed or are inputs to special comps are placed into the PPB. Non-FDA parms are placed into Non-FDA CDA (index is from top of Non-FDA CDA). Initial value - Level C Dependent	11 Bits
6	Parameter's Interprocess COMPOOL Addr	CSAS_IXP_PROC_COMPOOL_ADDR	Address of parameter. Initial value - Level C Dependent	Integer
7	Status Interprocess COMPOOL Addr.	CSAS_IXP_PROC_COMPOOL_STATUS	Address of parameter's status indicator. Initial value - Level C Dependent	Integer

TABLE NAME: IXP

BOOK: OFT SM Detailed Design Specification

A.2.5 Precondition Control Table (PCT) Compool: CSA_PCT

The Precondition Control Table contains the information necessary to perform precondition processing. The Table consists of 2 sections: Precondition Information Blocks, and Set Solution Blocks. The number of precondition groups is contained in the header entry. A diagram for PCT is contained in Figure A.2.5-1.

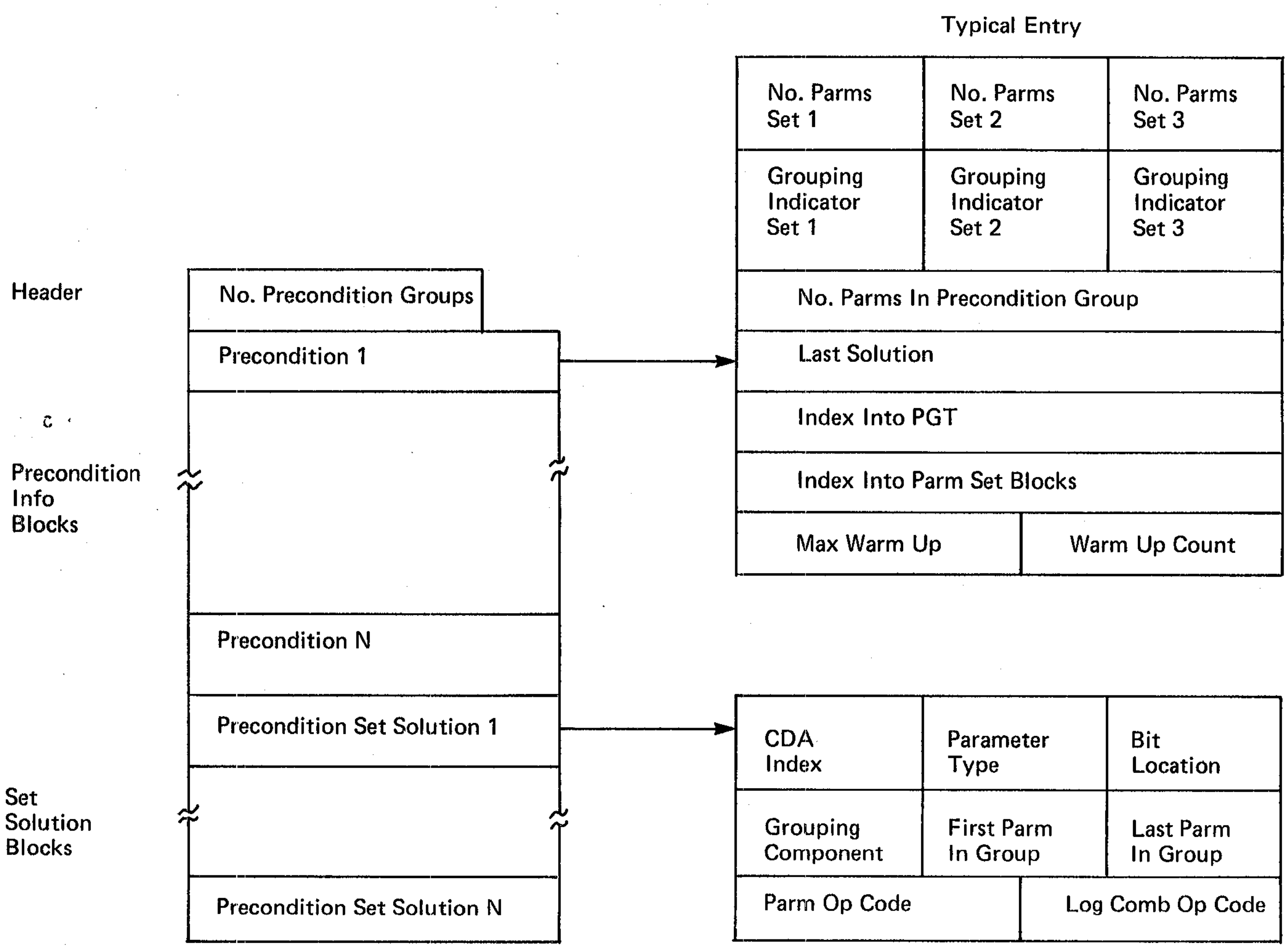

Figure A.2.5-1. Precondition Control Table C-8

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	Precondition Header			
1	Number of Preconditions	CSAS_PCT_NUM_PRECONDS	Number of Preconditions to be processed	BIT (8)
	Information Block			
1	#Parms Set 1 #Parms Set 2 #Parms Set 3	CSAS_PCT_NUMPARMS_INSET (1) CSAS_PCT_NUMPARMS_INSET (2) CSAS_PCT_NUMPARMS_INSET (3)	Number of parameter entries in the set solution for each limit set solution.	BIT (3) BIT (3) BIT (3)
2	Grouping Ind Set 1 Grouping Ind Set 2 Grouping Ind Set 3	CSAS_PCT_GROUPING_SET (1) CSAS_PCT_GROUPING_SET (2) CSAS_PCT_GROUPING_SET (3)	One-bit indicators (one for each set solution) specifying whether parenthetical grouping is utilized for that set.	BIT (1) BIT (1) BIT (1)
3	#Parms in precondition group	CSAS_PCT_NUM_PARMS_IN_GROUP	Number of parameters affected by a precondition solution.	BIT (6)
4	Last Solution	CSAS_PCT_LAST_SOLUTION	Limit set number selected by last set solution.	BIT (2)
5	Index into PGT	CSAS_PCT_GROUP_INDEX	Location of associated entries in Precondition Group Table.	BIT (8)
6	Index into Parm Set Blocks	CSAS_PCR_PARM_SET_INDEX	Index into the set solution blocks of PCT.	BIT (9)
7	Max Warm Up Value	CSAS_PCT_MAX_WARMUP	Count provided for each group that determines the number of seconds (FDA cycles) that limit sensing is to be bypassed when the selected limit set changes.	INTEGER
8	Warm Up Count	CSAS_PCT_WARMUP_COUNT	Dynamic count of warm up cycles.	INTEGER
	Set Solution Block			
1	CDA Index	CSAS_PCT_CDA_INDEX	Location in CDA of parameter and corresponding status flags. If the PARM OP Code indicates an operation for a discrete, the CDA index will point to the parent word in the CDA. It will have associated with it a POSITION entry which will give the position of the discrete parameter in the parent word. If the PARM OP Code indicates an analog operation, the CDA index will be a pointer to the analog CDA.	BIT (12)
2	Subject Parameter Type	CSAS_PCT_TYPE	Parameter Type, where 1 = FDA Analog 2 = FDA EU 3 = FDA discrete 4 = Non-FDA discrete	BIT (3)
3	Bit Position	CSAS_PCT_POSITION	Position of the discrete parameter in the parent word. If the PARM OP Code indicates an analog operation, POSITION will be 0.	BIT (5)

TABLE NAME: PCT

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
4	Grouping Component	CSAS_PCT_GROUPING	Boolean indicator, which, when on, means that this parameter is a component of a parenthetical group.	BIT (1)
5	First Parm in Group	CSAS_PCT_FIRST_PARM	Boolean indicator denoting the first paramter within a parenthesized group.	BIT (1)
6	Last Parm in Group	CSAS_PCT_LAST_PARM	Boolean indicator denoting the last parameter within a parenthesized group.	BIT (1)
7	Parm OP Code	CSAS_PCT_PARM_OP_CODE	Determines operation or test to be performed on parameters, where 1 = Discrete = 0 Test 2 = Discrete = 1 Test 3 = Analog in limits Test 4 = Analog out-of-limits Test 5 = EU in limits Test 6 = EU out-of-limits Test	BIT (4)
8	Logical Comb OP Code	CSAS_PCT_LOG_COMB_OP_CODE	Operation code to be used between parameter solutions, where 1 = Simple (Single parameter precondition relation) 2 = 'OR' 3 = Not used 4 = 'AND'	BIT (3)

TABLE NAME: PCT (con't)

BOOK: OFT SM Detailed Design Specification

A.2.6 Precondition Group Table (PGT) Compool: CSA_PCT

The Precondition Group Table contains the information necessary to locate the parameters affected by a precondition solution. This provides a means for precondition processing to indicate the limit set selected for the argument parameter(s). The information contained in the PGT includes the PIT index, parameter type, position in parent word, and index to the discrete measurement subentry table of PIT.

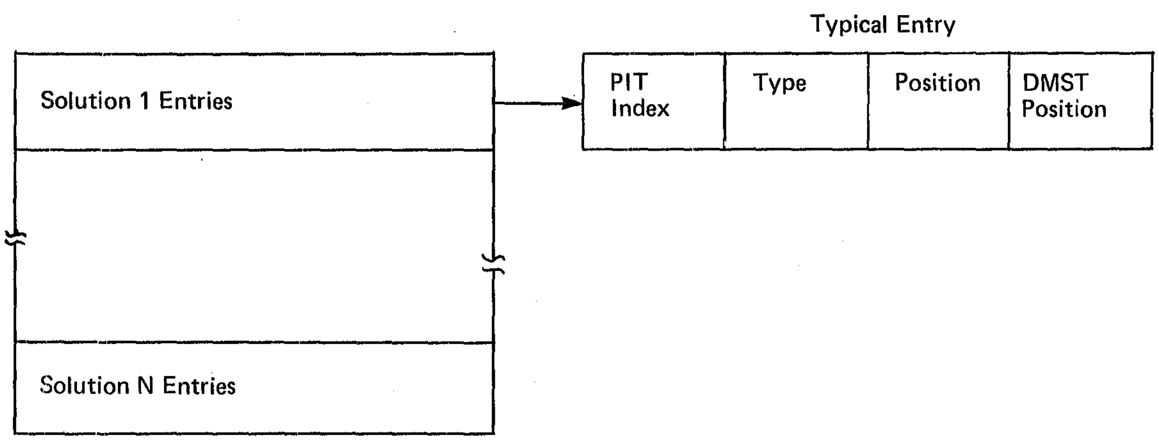

Figure A.2.6-1. Precondition Group Table (PGT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	PIT Index	CSAS_PGI_PIT_INDEX	Location of entry in PIT for parameter	BIT (9)
2	Type	CSAS_PGT_TYPE	Parameter type indicator where 0 = discrete, 1 = analog, 2 = EU.	BIT (2)
3	Position	CSAS_PGT_POSITION	Position of discrete in parent word. If type is not discrete, Position = 0.	BIT (5)
4	DMST Position	CSAS_PGT_DMST_POS	Absolute position within Discrete Measurement Subentry Table for this discrete. If not discrete, DMST Position = 0.	INTEGER

TABLE NAME: PGT

A.2.7 Current Data Array (CDA) Compool: CSA_CDA

The current Data Array is a buffer which is the primary source of SM parametric display information. It contains the current sample and associated status for each parameter. It also contains a SAT index for each analog. It is updated in the following manner:

1. Those parameters that have a Parameter Information Table (PIT) entry are updated by the Fault Detection and Annunciation (FDA) function.

2. Those parameters that are not limit sensed, i.e., display-only parameters, are updated by the Data Acquisition function.

When the FDA function is disabled, the PM Control function updates the FDA-processed parameters (Item 1 above) such that each 5 s/s and 1 s/s is updated once per second. Each .5 s/s parameter is updated every two seconds (every other PM control cycle).

Consequently, the CDA is organized into two main sections, one for FDA-processed parameters and one for display-only parameters. Each major section is further divided into subsections for parameter type: analog, engineering units and discretes.

FDA processed subsections are arranged in the same order as the corresponding PIT Table, i.e., the order of the CDA section for FDA-processed analogs is identical to that of the analog PIT. The display-only subsections have no set order other than for optimizing transfer of data from the input buffer to the CDA by Data Acquisition.

The FDA-processed analog subsection entries contain the PCM value in a 16-bit field plus status flags (blanking indication, I/O valid/invalid, limit high, limit low, offscale high, offscale low and PCM Master Unit indicator) and a SAT Index.

The FDA-processed discrete subsection entries contain the 16-bit parent word value and a 16-bit limit status field. The limit status field is defined such that the bit position corresponding to the bit position of a FDA parameter in the parent word contains the limit status of that parameter. Each entry also contains a 16-Bit Status Field identical to that of the FDA-Processed analog entries except that only the I/O Valid/Invalid Bit is used.

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The analog and EU portions of the display-only CDA contain entries that are identical to the analog and EU entries in the FDA-processed CDA. The display-only discrete entries contain a 16-bit parent word value and a 16-bit status field identical to that of the FDA-processed analog entries except that only the I/O valid/invalid bit is used.

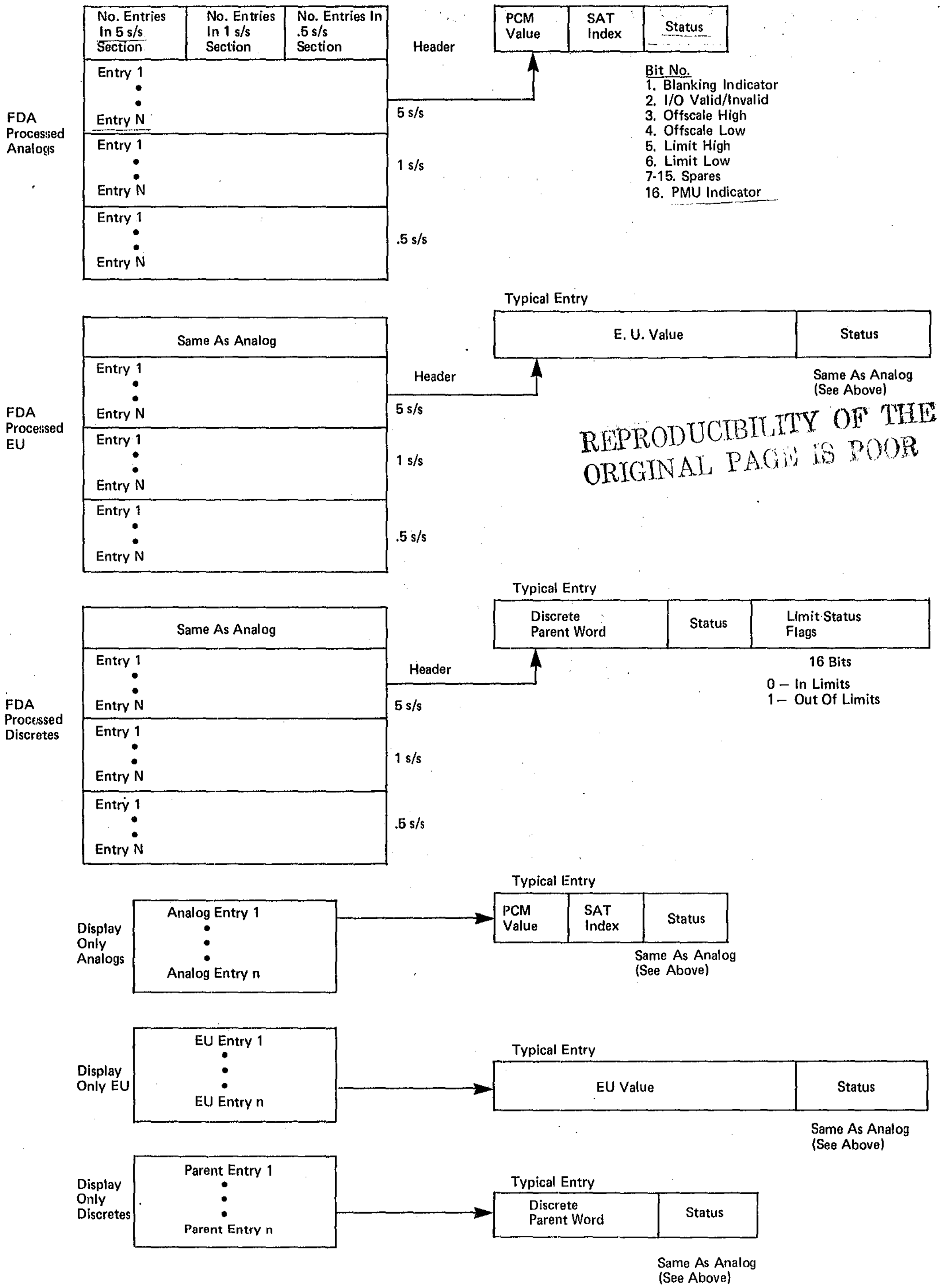

Figure A.2.7-1. Current Data Array (CDA)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	Analog, EU, Discrete Headers (FDA CDA)			
	No. of entries	CSAS_FCDAA_NUM_ENTRIES (ANALOG HEADER) CSAS_FCDAE_NUM_ENTRIES (EU HEADER) CSAS_FCDAP_NUM_ENTRIES (DISCRETE PARENT HEADER)	Number of entries in each subsection (5 s/s section, 1 s/s section, .5 s/s section) of the Analog, EU, or Discrete Parent sections of the FDA CDA.	ARRAY (3) INTEGER
	Analog FDA CDA			
1	PCM Value	CSAS_FCDAA_VALUE	Current PCM value of parameter (Initially 0)	
2	SAT index	CSAS_FCDAA_SAT_PTR	Points to the position in the scaling table where the coefficients needed to convert this PCM to engineering units can be found. Initial Value - Level C dependent.	INTEGER NAME SCALAR
3	Status	CSAS_FCDAA_STATUS	Status of the current value: Bit Number 1. Indication to blank the value field on the CRT. (INITIALLY OFF) 2. Questionable data - I/O validity (INITIALLY ON) 3. Offscale high (INITIALLY OFF) 4. Offscale low (INITIALLY OFF) 5. Limit Sense high (INITIALLY OFF) 6. Limit Sense low (INITIALLY OFF) 7-15. Spares 16. Indication of whether data is from PCMMU or not 0=PCMMU DATA, 1= NON_PCMMU DATA, INITIAL VALUE - Level C Dependent	BIT (16)
	EU FDA CDA			
1	EU Value	CSAS_FCDAE_VALUE	Current EU value of parameter (INITIALLY 0)	
2.	Status	CSAS_FCDAE_STATUS	Same as for analog FDA CDA entry - see above.	SCALAR BIT (16)
	Discrete Parent FDA CDS			
1.	Discrete Parent	CSAS_FCDAP_VALUE	Current discrete value of parent word (INITIALLY 0)	BIT (16)
2.	I/O Flag	CSAS_FCDAP_STATUS	I/O status of parent word: 1 - valid, 0 = valid (INITIALLY ON)	BIT (16)
3.	Limit Status Flags	CSAS_FCDAP_LIM_STATUS	Each bit position indicates the limit status of the corresponding bit in the parent word: 1 = out of limits, 0 = in limits. (INITIALLY all zeroes).	BIT (16)

TABLE NAME: CDA

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTE
	Analog non-FDA CDA			
1	PCM Value	CSAS_CDAA_VALUE	Same as for Analog FDA CDA - see above.	INTEGER
2	SAT Index	CSAS_CDAA_SAT_PTR	Same as for Analog FDA CDA - see above.	NAME SCALAR
3	Status	CSAS_CDAA_STATUS	Same as for Analog FDA CDA - see above. (For the Analog non-FDA CDA, the limit high and limit low flags are never used and are always 0)	BIT (16)
	EU non-FDA CDA			
1	EU value	CSAS_CDAE_VALUE	Same as for EU FDA CDA - see above.	BIT (16)
2	Status	CSAS_CDAE_STATUS	Same as for Analog FDA CDA - see above. (For the EU non-FDA CDA, the offscale high, offscale low, limit high and limit low flags are never used and are always zero.)	BIT (16)
	Discrete Parent non-FDA CDA			
1	Discrete Parent Word	CSAS_CDAP_VALUE	Same as for Discrete Parent FDA CDA - see above.	BIT (16)
2	Status	CSAS_CDAP_STATUS	For the discrete parent non-FDA CDA, the offscale low, offscale high, limit high, and limit low flags are never used and are always zero.	BIT (16)

TABLE NAME: CDA (Cont'd)

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A.2.8 Limit Sense Table (LIT) Compool: CSA_LIT

The Limit Sense Table provides the information required to perform the limit sensing function during FDA processing. The table is divided into two sections; one for analog limits (16-bits) and one for EU limits (32-bits). Multiple limit sets occupy contiguous locations in the table.

Analogs

16-Bits	16-Bits
Analog 1 Low Limit	Analog 1 High Limit
Analog 2 Low Limit - Set 1	Analog 2 High Limit - Set 1
Analog 2 Low Limit - Set 2	Analog 2 High Limit - Set 2
Analog 2 Low Limit - Set 3	Analog 2 High Limit - Set 3
Analog 3 Low Limit	Analog 3 High Limit
Analog n Low Limit	Analog n High Limit

Engineering Units

32-Bits	32-Bits
EU 1 Low Limit	EU 1 High Limit
EU 2 Low Limit - Set 1	EU 2 High Limit - Set 1
EU 2 Low Limit - Set 2	EU 2 High Limit - Set 2
EU 3 Low Limit	EU 3 High Limit
EU n Low Limit	EU n High Limit

Figure A.2.8-1. Limit Sense Table (LIT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	Analogs			
1	Low Limit	CSAS_LIT_ANALOG_LOW_LIMIT	Lower limit in PCM to be compared against parameter value.	INTEGER
2	High Limit	CSAS_LIT_ANALOG_HIGH_LIMIT	Upper limit in PCM to be compared against parameter value.	INTEGER
	EU			
1	Low Limit	CSAS_LIT_EU_LOW_LIMIT	Lower limit in EU to be compared against parameter value.	SCALAR
2	High Limit	CSAS_LIT_EU_HIGH_LIMIT	Upper limit in EU to be compared against parameter value.	SCALAR

TABLE NAME: LIT

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BOOK: OFT SM Detailed Design Specification

A.2.9 Scaling Table (SAT) Compool: CSA_SAT

The Scaling Table contains the information required to perform linear, second order, and third order polynomial conversion of PCM values to EU or EU to PCM values. The table contains entries for the linear, second order, and third order conversions that may be shared by several parameters. The indication of polynomial order is determined from the table.

Depending on the order of the equation, either two, three, or four consecutive coefficients will be picked up from the table for linear, second, or third order equations, respectively.

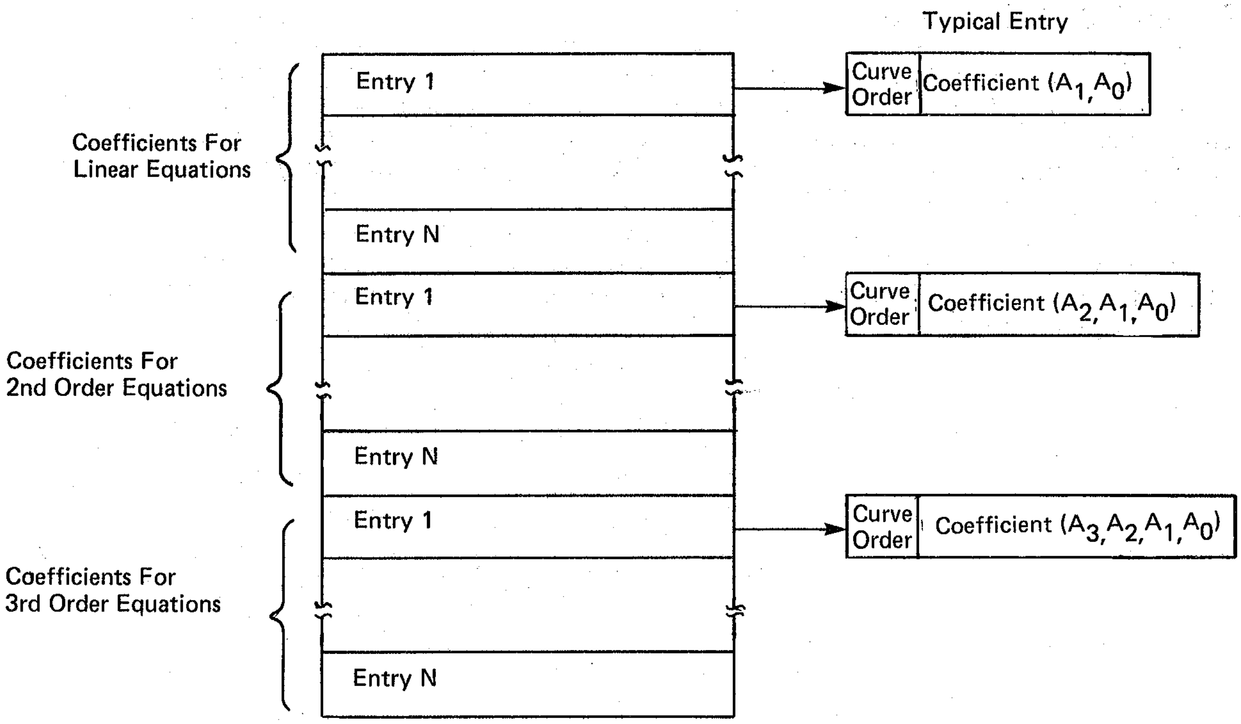

Figure A.2.9-1. Scaling Table (SAT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTE
1	Coefficient		Coefficient utilized by analog scaling to perform forward and backward polynomial solutions. INITIAL VALUE - LEVEL C DEPENDENT	Scalar
2	Curve Order		Curve Order Indicates Degree of Equation for Scaling Analog Value. INITIAL VALUE - LEVEL C DEPENDENT	Integer

TABLE NAME: SAT

BOOK: OFT SM Detailed Design Specification

A.2.10 Input Buffer (INB) Compool: CSA_INB

The Input Buffer is the intermediate (unformatted) storage area for data read from the PCM Master Unit and Payload MDMs. Parameters acquired as a result of executing a command word (DART entry or BCE element) are preceeded in the INB by an I/O status indicator. This indicator is a full, 32-bit word. Since data transfer is variable length, INB entries are variable length. The INB is large enough to accommodate all data transferred in any Data Acquisition Read Cycle.

A Transaction Status Word proceeds the input buffer for FCOS use.

	Transaction Status Word	
Read Request No. 1	I/O Status Indicator	Data Area
Read Request No. 2	I/O Status Indicator	Data Area
Read Request No. N-1	I/O Status Indicator	Data Area
Read Request No. N	I/O Status Indicator	Data Area

Figure A.2.10-1. Input Buffer (INB)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	TSW	N/A	Transaction Status Word as returned from FCOS	Bit 32
2	I/O Status Indicators	N/A	I/O status as returned from FCOS: a. Residual Count - Bits 1 through 16 b. I/O Error Log PTR - Bits 17 through 32	Bit 32
3	Data Areas	N/A	Parameters transferred by FCOS as a result of a read request.	Integer

TABLE NAME: INB

BOOK: OFT SM Detailed Design Specification

A.2.11.1 Basic Processes Communication Table Compool: CSA_SM_CMT

The SM CMT contains various control indicators, counters, and events used by two or more SM Basic processes.

Ready Flag 1
Ready Flag 2
PPB Buffer Half Indicator
FDA Inhibit Indicator
PM Cancel Flag
Read Cycle Counter
Data Cycle Error Indicator
Uplink Cancel Flag

Figure A.2.11.1-1. Basic Processes Communication Table (CSA_SM_CMT)

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	Basic SM Processes			
1	Ready Flag 1 and Ready Flag 2	CSAB_CMT_READY_FLAG1 CSAB_CMT_READY_FLAG2	Indicators used by PM Control to determine if appropriate PPB buffer half is ready to be processed.	EVENTS
2	Parameter Processing Buffer Half Indicator	CSAB_CMT_BUF_HALF	An indicator which is used by PM Control to determine which PPB half to process	INTEGER
3	(deleted)			
4	FDA Enable/Inhibit Indicator	CSAB_CMT_FDA_INHIBIT	Indicator set by Table Maintenance and used by PM Control to determine whether FDA processing is to be disabled. The indicator is set to enable FDA processing when SM is initialized from mass memory.	BIT (1)
5	Performance Monitor Control Cancel Flag	CSAB_CMT_PM_CANCEL	Indicator set by OPS 2 cleanup processing to cause PM Control to terminate processing. This indicator is turned off by OPS 2 initialization processing.	BIT (1)
6	Data Acquisition Read Cycle Counter	CSAV_CMT_CC	Counter maintained by Basic SM Data Acquisition to determine current read cycle. The counter is set to one by OPS 2 initialization processing.	INTEGER
7	Data Cycle Error Indicator	CSAV_CMT_CYC_ERROR	An indicator used by data acquisition to indicate an error within one cycle.	INTEGER
8	Uplink Cancel Flag	CSUE_UL_CANCEL	Event turned OFF at OPS initialization and ON at OPS termination by the OPS control segment. When this flag is ON the Uplink Processor terminates processing. Units-None. Initial Value - OFF.	EVENT

TABLE NAME: CSA_SM_CMT

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BOOK: OFT SM Detailed Design Specification

A.2.11.2 Subsystem Configuration Management Communication Table (CSC_SCM_CMT)

The SCM CMT contains various control indicators, counters, and events used to communicate between the SCM SPEC and the SCM Process. Also the SCM CMT contains the variable SCM display data.

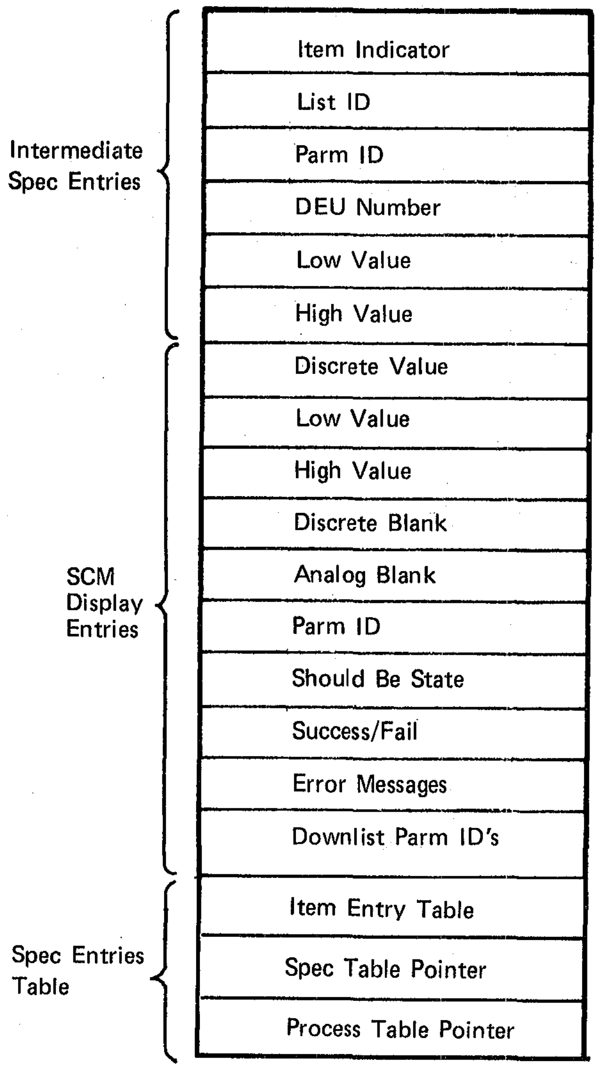

Figure A.2.11.2-1. Subsystem Configuration Management Communication Table (CSC_SCM_CMT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	SPEC ENTRIES			
1	Item Indicator	CSCV_CMT_ITEM_NO	ITEM NUMBER entered by user and passed by SCM SPEC. INITIAL VALUE = 0	INTEGER
2	LIST ID	CSCV_CMT_LIST_NO	ID of SCM LIST to be processed. INITIAL VALUE = 0	INTEGER Double
3	PARM ID	CSCV_CMT_PARMID	PARMID ENTERED via Keyboard. INITIAL VALUE = 0	INTEGER Double
4	DEU NUMBER	CSCV_CMT_DEU_NUM	DEU device ID of DEU with active SCM display. INITIAL VALUE = 0	INTEGER
5	LOW VALUE	CSCV_CMT_LOW_VAL	LOW LIMIT ENTERED via Keyboard. INITIAL VALUE = 0	SCALAR Double
6	HIGH VALUE	CSCV_CMT_HIGH_VAL	HIGH LIMIT ENTERED via Keyboard. INITIAL VALUE = 0	SCALAR Double
7	Discrete VALUE	CSCV_CMT_DISPLAY_DISCVAL	Discrete 1 or 0 to be displayed in LOW LIMIT value on display INITIAL VALUE = 0	INTEGER
8	LOW VALUE	CSCV_CMT_DISPLAY_LOWVAL	Value displayed for LOW LIMIT for E.U. Values. INITIAL VALUE = 0	SCALAR Double
9	HIGH VALUE	CSCV_CMT_DISPLAY_HIGHVAL	Value displayed for HIGH LIMIT for E.U. Values. INITIAL VALUE = 0	SCALAR Double
10	DISCRETE BLANK ANALOG BLANK	CSCB_CMT_DISPLAY_DISCBLK CSCB_CMT_DISPLAY_ANABLK	INDICATOR USED BY SCM TO indicate to the display to output the Discrete LOW LIMIT or E.U. HIGH and LOW LIMITS. INITIAL VALUE = 0	BIT (16)'s
11	PARM ID	CSCV_CMT_DISPLAY_PARMID	PARMID displayed after being found in SCM LIST. INITIAL VALUE = 0	INTEGER Double
12	Should BE STATE	CSCV_CMT_DISPLAY_STATE	4 Character text displayed for discrete should BE STATE INITIAL VALUE - BLANK	CHARACTER(4)
13	SUCCESS/FAIL	CSCV_CMT_DISPLAY_S/F	character text displayed after a SCM LIST comparison to indicate good or bad. INITIAL VALUE - BLANK	CHARACTER(4)
14	ERROR MESSAGES	CSCV_CMT_DISPLAY_ERROR	text error messages displayed and errors found in the SCM COMPARISON up to 10 errors. INITIAL VALUE - BLANK	ARRAY (10) CHARACTER(30)
15	DISPLAY PARM STATUS	CSCB_CMT_DISPLAY_STATUS	Parameter status (IO) associated with each error message.	ARRAY (10) BIT (16)
16	DOWNLIST PARMID	CSCV_CMT_DOWNLIST	Up to 10 PARMID associated with the error messages. INITIAL VALUE = 0	ARRAY (10) INTEGER

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
17	ITEM ENTRY TABLE	SCM_ITEM TABLE	TABLE of up to 5 Display Item entries Structure includes the item number, DEU number, Item integer or scalar values.	STRUCTURE (5)
		TBL_ITEM_NO		INTEGER
		TBL_ITEM_DEU		INTEGER
		TBL_ITEM_I		INTEGER DOUBLE
		TBL_ITEM_S		SCALAR DOUBLE
18	SPEC TABLE POINTER	TBL_WR_IDX	Index used by spec to file item table	INTEGER
19	PROCESS TABLE POINTER	TBL_RD_IDX	Index used by SCM PROCESS to read table	INTEGER

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

TABLE NAME: CSC_SCM_CMT (cont'd)

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A.2.11.3 Special Processes CMT Compool: CSS_SP_CMT

The Special Processes CMT contains indicators, flags, and timers used as control information and data by the various SM special processes.

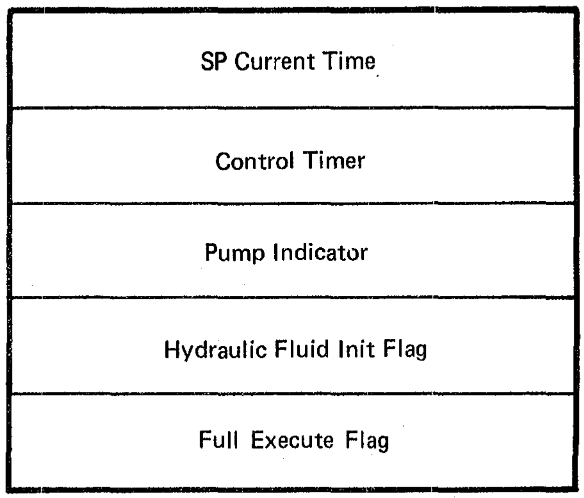

Figure A.2.11.3-1. Special Processes CMT

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	SP Current Time	CSSV_SP_CURRENT_TIME	Current GMT time obtained for use in the various special computations and sequences. Initial Value = 0.	SCALAR DOUBLE
2	Control Timer	CSLV_CONTROL_TIMER	Control to indicate to the Standby Water Coolant Special Process when the process is to be executed.	SCALAR DOUBLE
3	Pump Indicator	CSLB_PUMP_ONOFF	Indicates to the Standby Water Coolant process whether the pumps are to be turned on or off.	BOOLEAN
4	Hydraulic Fluid Init Flag	CSOB_SP_HYDR_INIT	Flag used to initially start the Hydraulic Fluid Temp Control Special Process. When flag is on, Hydraulic Fluid Temp initializes internal control flags. Set by OPS Initialization. Reset by Hydraulic Fluid Temp Control.	BIT (1)
5	Full Exectue Flag	CSSB_FULL_EX_FLAG	Flag set by SP Exec to indicate to Payload Day Doors or SP Data Acq that a full execution of the module is to be accomplished in the appropriate cycle. Reset by Payload Bay Doors and SP Data Acq.	BIT(1)

TABLE NAME: A.2.11. SP CMT

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A.2.11.4 Table Maintenance Display Parameters Table Compool: CST_TM_CMT

This table contains all the variable data that is to be transferred to the TM display. Data is placed into the display buffer by Table Maintenance Process (STM) in response to Item number entries from the DEU keyboard. The parameter value and status plus the active limit set is cyclically updated by the TM Cyclic Parameter Update program. This table also contains control interface variables used by the Uplink Processor (SUL), TM Specialist Function Control Segment (STS), TM Process (STM) and the TM Cyclic Update Process (STC).

Parameter Id	
Parameter Values	
Constant Id	
Constant Values	
Low Limit Values	
Discrete Limit Values	
High Limit Values	
Noise Filter Values	
TMBU Load Reject	
Checkpoint Time	
Checkpoint Status	STM_BUFFER
Parm ID Status	
Parm Value Status	
Constant Id Status	
Constant Value Status	
Low Limit Status	
Discrete Limit Status	
High Limit Status	
Noise Filter Status	
Control Flags	
CDA Status	
Active Limit Set	
Item Integer Entry	
DEU Item Number Entry	
Item Scalar Entry	
DEU Number	
Pit Index	STM_TM_VALUES
Pit Subindex	
Lit Index	
Parameter Type	
Constant Type	
MM in Use Flag	
Checkpoint OP Success	
TM Display Update Flag	
TM STORE INDEX	
TM PROCESS INDEX	
Parameter Display Flag	

Figure A.2.11.4-1. Table Maintenance Communication Table

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	Parameter Id	CSTV_PARM_ID	Most recent valid parm id entered. Initial value = 0.	Integer Double
2	Parameter Values	CSTV_PARM_VAL_SCAL CSTV_PARM_VAL_DISC	Value corresponding to the current parm id.	Scalar Integer
3	Constant Id	CSTV_CONST_ID	Most recent valid constant id entered. Initial value = o	Integer Double
4	Constant Values	CSTV_CONST_VAL_SCAL CSTV_CONST_VAL_DISC	Value corresponding to the current constant id. 2 separate variables hold values either from the integer, double scalar, scalar or discrete section of the COT.	Scalar Double Integer
5	Low Limit Values	CSTV_LOLIM_SCAL	Analog and EU low limit values for each of the 3 alert limit sets and the C&W limit set.	Array (4) Scalar
6	Discrete Limit Values	CSTV_LOW_LIM_VAL_DISC	Discrete limit values for each of the 3 alert limit sets and C&W limit set.	Array (4) Scalar
7	High Limit Values	CSTV_HILIM_SCAL	Analog and EU high limit values for each of the 3 alert limit sets and the C&W limit set.	Array (4) Scalar
8	Noise Filter Values	CSTV_NSEFLTR_CLASS034 CSTV_NSEFLTR_CLASS2	Current maximum noise count for class 0,3,or 4 or class 2 limits of the current parm id.	Integer Integer
9	(deleted)			
10	Checkpoint Time	CSTV_CHKPT_TIME	Last time for a checkpoint execute. Initial value = 0.	Scalar Double
11	Checkpoint Status	CSTV_CHKPT_STATUS	Indicates by a 'GOOD' or 'FAIL' whether or not the checkpoint has been successfully written to mass memory.	Char (4)
12	Parm Id Status	CSTB_PARM_ID_STAT	Indicates whether or not to blank parm id field on TM display. Hex '8000' value = blank field. Hex '0000' value = display field.	Bit (16)
13	Parm Value Status	CSTB_PARM_SCAL_STAT CSTB_PARM_DISC_STAT	Indicates whether or not to blank the status field for parm value. Hex '8000' value = blank field. Hex '0000' value = display in-out of limit status indicator.	Bit (16) Bit (16)
14	Constant Id Status	CSTB_CONST_ID_STAT	Indicates whether or not to blank constant id field on TM display. Hex '8000' value = blank field. Hex '0000' value = display in-out of limit status indicator.	Bit (16)
15	Constant Value Status	CSTB_CONST_SCAL_STAT CSTB_CONST_DISC_STAT	Value of Hex '0000' indicates which of the 4 constant value variables is to be displayed for the current constant id. If no current constant id, Hex '8000' value for both blanks constant value field.	Bit (16) Bit (16)

TABLE NAME: CST_TM_CMT

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
16	Low Limit Status	CSTB_LO_SCAL_STAT	Value of Hex '0000' indicates which limit sets have a low limit to be displayed for current parm id. Hex '8000' value = blank field.	Array (4) Bit (16)
17	Discrete Limit Status	CSTB_LOW_LIM_DISC_STAT	Value of Hex '0000' indicates which limit sets have a discrete limit to be displayed in the low limit field for current parm id. Hex '8000' value = blank field.	Array (4) Bit (16)
18	High Limit Status	CSTB_HI_SCAL_STAT	Value of Hex '0000' indicates which limit sets have a high limit to be displayed for current parm id. Hex '8000' value = blank field.	Array (4) Bit (16)
19	Noise Filter Status	CSTB_NSEFLTR_CLASS034_ST CSTB_NSEFLTR_CLASS2_ST	Value of Hex '0000' indicates that a maximum noise count is to be displayed for the given class of limits. Hex '8000' value = blank field	Bit (16) Bit (16)
20	Control Flags	CSTB_CONTROL_FLAGS	Indicates whether the following conditions are 'on' or off: class 2 lim ind, class 034 lim ind, ena class 2, ena class034, inh class 2, inh class 034, fda ena, and fda inh.	Bit (16)
21	TM CDA Status	CSTB_CDA_STATUS	Contains a parameter's CDA status for the TM display.	Bit (16)
22	Active Limit Set	CSTB_ACT_LIM_SET	Indicates which of the Class 0,3,4 or Class 2 limit sets are being used to check parm value status.	Array (4) Bit (1)
23	Item Integer Entry	CSTV_ITEM_I	Integer value corresponding to an item number entry.	Integer Double
24	DEU Item Number	CSTV_ITEM_NO	Number in a keyboard ITEM entry which represents one of the numbered data fields on a display.	Integer
25	Item Scalar Entry	CSTV_ITEM_S	Scalar value corresponding to an item number entry	Scalar
26	DEU Number	CSTV_D_DEU_NUMBER	Number of the DEU to which the keyboard entries are being made.	Integer
27	Pit Index	CSTV_CMT_PIT_INDEX	Pointer to PIT entry for selected analog or eu parm id.	Integer
28	Pit Subindex	CSTV_CMT_PIT_SUBINDEX	Pointer to PIT entry for selected discrete parm id.	Integer
29	Lit Index	CSTV_CMT_LIT_INDEX	Pointer to LIT entry for selected parm id.	Integer
30	Parameter Type	CSTV_CMT_PARM_TYPE	Indicates whether the given parameter is analog, eu, or discrete. 1 = analog. 2 = eu. 3 = discrete.	Integer
31	Constant Type	CSTV_CMT_CONST_TYPE	For given constant id, indicates whether constant is integer, scalar or discrete. 1 = integer. 2 = scalar. 3 = discrete.	Integer
32	MM in Use Flag	CSTV_COMN_BUF_IN_USE	Flag indicates whether or not the mass memory common buffer to which TM checkpoints data is available for a checkpoint to be executed.	Char (3)

TABLE NAME: CST_TM_CMT

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
33	Checkpoint Op Success Flag	CSTB_CHKPT_OP_SUCCESS	Flag set for Downlist indicating whether or not the checkpoint was written successfully to MM. 1 = Successful, 0 = Failed.	Bit (1)
34	TM Display Update Flag	CSTV_TM_DISP_UPD	Set by TM Processor to cause refresh of the TM display on demand. Reset by UI display processor.	Bit (16)
35	TMBU Load Reject Flag	CSUV_TMBU_LOAD_REJECT	Integer set by uplink processor to indicate state of the last TM Block update load. A value of 0 indicates a good load. A value of 11 indicates the load was rejected. Any other value indicates the last data set to be rejected in the last TMBU load. Units - none. Initial value = 0.	Integer
36	TM Spec Active Flag	CSTB_TM_SPEC_ACTIVE	Flag set by TM spec control segment to indicate whether the TM spec is active. ON = active, OFF = not active. Units - none. Initial value - OFF.	BOOLEAN
37	TM Uplink Active Flag	CSUB_TM_UL_ACTIVE	Flag set by uplink processor to indicate whether a TMBU load is being processed. ON = TMBU load being processed, OFF = no TMBU load being processed. Units - none. Initial value - OFF.	BOOLEAN
38	Parameter Display Flag	CSAV_CMT_PARM_DSPLY	Flag set by TM Processor when a valid parameter ID is entered and monitored by the TM Cyclic Update process to determine if a parameter value, status and limit set indicators are to be updated. Set off by TM Spec Control segment at Spec initialization Initial value - off.	BOOLEAN
39	TM Uplink Error Flag	CSTB_TM_ERR	Flag set by TM process to indicate to the uplink processor that an error occurred while processing an input from the uplink processor. Units - none. Initial value - OFF.	BOOLEAN
40	TM Input Values		Variables set by the TM spec control segment or the uplink processor to be used as inputs by the TM process. The TM spec control segment sets each variable to the corresponding keyboard input. The uplink processor sets the appropriate variables to values from the TMBU uplink load.	
41	TM Item Number	CSTV_ITEM_NO	Units - none. Initial value - 0.	Integer
42	TM Integer Value	CSTV_ITEM_I	Units - none. Initial value - 0.	Integer Double
43	TM Scalar VAlue	CSTV_ITEM_S	Units - none. Initial value - 0.	Scalar Double
44	TM DEU Number	CSTV_D_DEU_NUMBER	Units - none. Initial value - 0.	Integer

TABLE NAME: CST_TM_CMT

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A.2.11.5 Payload Bay Doors Communications Table Compool: CSB_PBD_CMT

The Payload Bay Doors Communications Table contains parameters needed by the Payload Bay Door cycle Processor and the Payload Bay Door Item Processor.

AUTO MODE ITEM
MANUAL MODE ITEMS
POWER ON/OFF ITEM
SWITCH BYPASS ITEM
PBD OPEN ITEM
PBD STOP ITEM
PBD CLOSE ITEM
PBD OPEN FAIL INDICATORS
PBD CLOSE FAIL INDICATORS
CONTROL SWITCH POSITION INDICATOR
PBD SWITCH INDICATOR TEXT
PBD SWITCH OUTPUT STATUS
LATCH AND DOOR STATUS TEXT
LATCH AND DOOR OUTPUT STATUS
PBD OUTPUT INDICATOR
AUTO MODE FLAG
MANUAL MODE FLAG
POWER ON/OFF FLAG
PBD DISPLAY UPDATE INDICATOR

Figure A.2.11.5-1. Payload Bay Doors Communications Table

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1.	Auto Mode Item	CSBB_AUTO_MODE_ITEM	Set by PBD Item Processor as a result of item entry from PBD display. Used by PBD cyclic processor to initiate an auto sequence. Initial value — Hex '0000'.	BIT(16)
2.	Manual Mode Items	CSBB_MANUAL_MODE_ITEMS	Set by PBD Item Processor as a result of item entry from PBD display. Used by PBD cyclic processor to determine the desired manual sequence to perform. Initial value - Hex '0000'.	BIT(16)
3.	Power On/Off Item	CSBB_POWER_ON_OFF_ITEM	Set by PBD Item Processor as a result of item entry from PBD display. Used PBD cyclic processor to determine if power commands need to be enabled or disabled. Initial value - Hex '0000'.	BIT(16)
4.	Switch Bypass Item	CSBB_SWITCH_BYPASS_ITEM	Set by PBD Item Processor as a result of item entry from PBD display. Used by PBD cyclic processor to determine if PBD hardware switch is to be bypassed or not. Initial value - OFF.	BOOLEAN
5.	PBD Open Item	CSBB_PBD_OPEN_ITEM	Set by PBD Item Processor as a result of item entry from PBD display. Used by PBD cyclic processor if switch bypass item is set on. Initial Value - OFF.	BOOLEAN
6.	PBD Stop Item	CSBB_PBD_STOP_ITEM	Set by PBD Item Processor as a result of item entry from PBD display. Used by PBD cyclic processor if switch bypass item is set on. Initial value - OFF.	BOOLEAN
7.	PBD Close Item	CSBB_PBD_CLOSE_ITEM	Set by PBD Item Processor as a result of item entry from PBD display. Used by PBD cyclic processor if switch bypass item is set on. Initial value - OFF.	BOOLEAN
8.	PBD Open Fail Indicators	CSBB_OPEN_FAIL_INDICATOR	Set by PBD cyclic processor to indicate that a failure to open a latch group or door has occurred. Initial value - Hex '0000'	BIT(16)
9.	PBD Close Fail Indicators	CSBB_CLOSE_FAIL_INDICATOR	Set by PBD cyclic processor to indicate that a failure to close a latch group or door has occurred. Initial value - Hex '0000'	BIT(16)
10.	Control Switch Position Indicator	CSBB_CONTROL_SWITCH_POS_INDIC	Set by PBD cyclic processor to indicate the position of the PBD control switch. 0 = STOP, 1 = OPEN, 2 = CLOSE. Initial value - 0.	INTEGER
11.	PBD Switch Indicator Text	CSBB_PBD_SWITCH_IND_TEXT	Set by PBD cyclic processor to contain the text to be displayed for the position of the hardware PBD control switch. Initial value - blanks.	CHAR(4)
12.	PBD Switch Ouput Status	CSBB_PBD_SW_OUT_STAT	Set by PBD cyclic processor to contain the output status for the PBD switch indicator text. Initial Value Hex '0000'.	BIT(16)
13.	Latch Status Text	CSBB_C_LCH_5_8_TEXT CSBB_C_LCH_9_12_TEXT CSBB_C_LCH_1_4_TEXT CSBB_C_LCH_13_16_TEXT CSBB_R_FWD_BHD_TEXT CSBB_R_AFT_BHD_TEXT CSBB_L_FWD_BHD_TEXT CSBB_L_AFT_BHD_TEXT	Set by PBD cyclic processor to contain the text to be displayed for the status of each centerline and bulkhead latch group. Initial Value - Blanks.	CHAR(2)

TABLE NAME:

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
14.	Door Status Text	CSBB_R_DOOR_TEXT CSBB_L_DOOR_TEXT	Set by PBD cyclic processor to contain the text to be displayed for the status of the right and left door. Initial Value - Blanks.	CHAR(3)
15.	Latch And Door Output Status	CSBB_LATCH_DOOR_OUT_STAT	Set by PBD cyclic processor to contain the output status for the latch and door status text. Initial Value - Hex '0000'.	BIT(16)
16.	PBD Output Indicator	CSBB_PBD_OUTPUT_INDICATOR	Set by PBD cyclic processor to indicate to data out that output to the PBD needs to be performed. Initial value off.	BOOLEAN
17.	Auto Mode Flag	CSBB_AUTO_MODE_FLAG	Reset by SM OPS 202 initialization and set by the PBD cyclic processor whenever an auto sequence is initiated. Initial value - off.	BOOLEAN
18.	Manual Mode Flag	CSBB_MANUAL_MODE_FLAG	Reset by SM OPS 202 initialization and set by the PBD cyclic processor whenever a manual sequence is initiated. Initial value - off.	BOOLEAN
19.	Power On/Off Flag	CSBB_POWER_ON_OFF_FLAG	Set by PBD item processor to alert PBD cyclic processor that power commands need to be enabled or disabled. Initial value - off.	BOOLEAN
20.	PBD Display Update Indicator	CSBB_PBD_DISP_UPDATE_IND	Set by PBD cyclic processor to alert the Display Processor that an auto sequence has completed and the auto sequence item needs to be updated on the display. Initial value - Hex'0000'.	BIT(16)

TABLE NAME:

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
14.	Door Status Text	CSBB_R_DOOR_TEXT CSBB_L_DOOR_TEXT	Set by PBD cyclic processor to contain the text to be displayed for the status of the right and left door. Initial Value - Blanks.	CHAR(3)
15.	Latch And Door Output Status	CSBB_LATCH_DOOR_OUT_STAT	Set by PBD cyclic processor to contain the output status for the latch and door status text. Initial Value - Hex '0000'.	BIT(16)
16.	PBD Output Indicator	CSBB_PBD_OUTPUT_INDICATOR	Set by PBD cyclic processor to indicate to data out that output to the PBD needs to be performed. Initial value off.	BOOLEAN
17.	Auto Mode Flag	CSBB_AUTO_MODE_FLAG	Reset by SM OPS 202 initialization and set by the PBD cyclic processor whenever an auto sequence is initiated. Initial value - off.	BOOLEAN
18.	Manual Mode Flag	CSBB_MANUAL_MODE_FLAG	Reset by SM OPS 202 initialization and set by the PBD cyclic processor whenever a manual sequence is initiated. Initial value - off.	BOOLEAN
19.	Power On/Off Flag	CSBB_POWER_ON_OFF_FLAG	Set by PBD item processor to alert PBD cyclic processor that power commands need to be enabled or disabled. Initial value - off.	BOOLEAN
20.	PBD Display Update Indicator	CSBB_PBD_DISP_UPDATE_IND	Set by PBD cyclic processor to alert the Display Processor that an auto sequence has completed and the auto sequence item needs to be updated on the display. Initial value - Hex'0000'.	BIT(16)

TABLE NAME:

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A.2.11.6 Antenna Management Communications Table Compool: CSM_AM_CMT

The Antenna Management Communications Table contains variables used by Antenna Management and set by other processes. These include items entered from the Antenna Management Display, variables obtained from GNC via ICC, variables updateable via I-load, and variables received via uplink.

Radar Range Estimate Item
Ku-Band TDRS Select Item
S-Band TDRS Select Item
Auto S-Band Select Item
S-Band Site Select Item
Orbiter Position Vector
Orbiter Pitch Angle
Orbiter Yaw Angle
Orbiter Roll Angle
Time Tag of NAV State Vector
GNC Pointing Flag
GNC Target Vector
Site Vectors
Ku-Band Uplink Command Word
Ku-Band TDRS Selected ID
S-Band TDRS Selected ID
S-Band QUAD Selected ID
S-Band HEMI Selected ID
Current Site Selected ID
TDRS ID Array
QUAD ID Array
HEMI ID Array
Site ID Array
Downlist Site Inhibit bits

Figure A.2.11.6-1. Antenna Management Communication Table

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	Ku-Band TDRS Select Item (Items 5-7)	CSMB_KUBAND_TDRS_SEL	Item entered from AM display to indicate to AM sequence which TDRS to use for the Ku-band antenna. Initial Value-Hex '8000'.	BIT(16)
2	Ku-Band TDRS Select Auto	CSMB_KUBAND_TDRS_SEL$1	Flag indicating that the TDRS to be used by Ku-band is to be automatically selected. Initial Value-ON.	
3	Ku-Band TDRS Select East	CSMB_KUBAND_TDRS_SEL$2	Flag indicating that the east TDRS is to be selected for use by Ku-band. Initial Value-OFF.	
4	Ku-Band TDRS Select West	CSMB_KUBAND_TDRS_SEL$3	Flag indicating that the west TDRS is to be selected for use by Ku-Band. Initial Value-OFF.	
5	S-Band TDRS Select Item (Items 8-10)	CSMB_SBAND_TDRS_SEL	Item entered from AM display to indicate to AM sequence which TDRS to use for S-band antennas. Initial Value-Hex '8000'.	BIT(16)
6	S-Band TDRS Select Auto	CSMB_SBAND_TDRS_SEL$1	Flag indicating that the TDRS to be used by S-Band is to be automatically selected. Initial Value-ON.	
7	S-Band TDRS Select East	CSMB_SBAND_TDRS_SEL$2	Flag indicating that the east TDRS is to be selected for use by S-band. Initial Value-OFF.	
8	S-Band TDRS Select West	CSMB_SBAND_TDRS_SEL$3	Flag indicating that the west TDRS is to be selected for use by S-band. Initial Value-OFF.	
9	Auto S-Band Select Item (Items 13-14)	CSMB_SBAND_AUTO_SEL	Item entered from AM display to indicate to AM sequence whether to select the antennas for use by S-band. Initial Value-Hex '8000'.	BIT(16)
10	Auto S-Band Select Enabled	CSMB_SBAND_AUTO_SEL$1	Flag indicating that the AM sequence is to select the antennas used by S-band. Initial Value-ON.	
11	Auto S-Band Select Inhibited	CSMB_SBAND_AUTO_SEL$2	Flag indicating that the AM sequence is not to select the antennas used by S-band. Initial Value-OFF.	
12	S-Band Site Select Item (Items 11-12)	CSMB_SBAND_SITE_SEL	Item entered from AM display to indicate to AM sequence whether to step up to next ground site. Initial Value-Hex '8000'.	BIT(16)
13	S-Band Site Select Auto	CSMB_SBAND_SITE_SEL$1	Flag indicating that the AM sequence is to automatically select the ground site used by S-band. Initial Value-ON.	
14	S-Band Site Select Next	CSMB_SBAND_SITE_SEL$2	Flag indicating that the AM sequence is to step up to the next site before selecting the ground site used by S-band. Initial Value-OFF.	
15	Orbiter Position Vector	CSMV_ORB_POS	Position of Orbiter in Greenwich True of Date Coordinate System. Includes Orbiter X Position, Orbiter Y Position, and Orbiter Z Position. Units-Feet. Initial Value-(0,0,0)	VECTOR(3) DOUBLE
16	Orbiter Pitch Angle	CSMV_ORB_PTCH	Orbiter pitch angle relative to Earth in Greenwich True of Date Coordinate System. Units-Radians. Initial Value-0.	SCALAR

TABLE NAME: AM CMT

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
17	Orbiter Yaw Angle	CSMV_ORB_YAW	Orbiter yaw angle relative to Earth in Greenwich True of Date Coordinate System. Units-Radians. Initial Value-0.	SCALAR
18	Orbiter Roll Angle	CSMV_ORB_ROLL	Orbiter roll angle relative to Earth in Greenwich True of Date Coordinate System. Unite-Radians. Initial Value-0.	SCALAR
19	M50 to Body QUAT Time	CSMV_M50_BODY_QUAT_TIME	Greenwich Mean Time associated with Orbiter Position Vector. Units-Seconds. Initial Value-0.	SCALAR DOUBLE
20	GNC Pointing Flag	CSMB_GNC_POINTING	Flag indicating whether Ku-band is to be pointed at TDRS or at GNC-designated target. ON = Point at GNC target, OFF = Point at TDRS. Units-None. Initial Value-OFF.	BOOLEAN
21	GNC Target Vector	CSMV_GNC_TGT_VEC	Position of GNC-designated target in Orbiter Body Axis coordinates system. Includes GNC Target Vector X-component, GNC Target Vector Y-component, and GNC Target Vector Z-component. Units-Feet. Initial Value-(0,0,0).	VECTOR(3)
22	Site Vectors	CSMK_SITE_POS	Positions of the sixteen ground sites in Greenwich True of Date Coordinates System. Includes X-component, Y-component, and Z-component of each site. Units-Feet. Initial Value-Shown in Table below.	ARRAY(16) VECTOR(3)

Site	X-Component	Y-Component	Z-Component
1	11820532	17186126	-1691290
2	15904932	-1159178	13507688
3	-7725588	-15245373	12038695
4	3706628	-15856880	13097755
5	7573693	-15991773	11133243
6	2975987	-18160107	9928190
7	-18188477	-6740700	7834022
8	-16630305	11758879	4786429
9	4145092	-20521707	-226205
10	20082784	-5129141	-2877001
11	5806675	-16550116	-11379253
12	-14591923	8782610	-12122954
13	2895274	-18074678	10105170
14	-8037450	-15173322	11925162
15	5367291	-13861617	14679318
16	2975987	-18160107	9928190

TABLE NAME: AM CMT (cont'd)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
23	KU-Band Uplink Command Word	CSMV_KUBAND_UL_CMD_WRD	Word containing uplinked commands for the Ku-band antenna. Antenna Management uses the bits in this word to set the appropriate discretes in the Special Processes Output Buffer. The following table shows the affected measurements and their initial values. Meas. No. / Meas. Name / Bit No. (1-16) / Initial Value V74K2634J / Spread Spect ON/OFF / 4 / 0 V74K2635J / KU A/B SEL / 5 / 0 V74K2636J / Self ON/OFF / 6 / 0 V74K2637J / MODLN CONT / 7-8 / 0 V74K2639J / Pri Acq ON/OFF / 9 / 0 V74K2640J / Intl Stb ON/OFF / 10 / 0 V74K2641J / Fwd LK Mode 1/2 / 11 / 0 V74K2642J / Mot S/O OVRD CMD / 12 / 0	BIT(16)
24-27	(Deleted)			
28	Radar Range Estimate Auto	CSMB_RADAR_RANGE_EST$1	Flag indicating that the radar range estimate to be used by KU-Band antenna is to be computed by AM sequence. Initial value - ON.	SCALAR DOUBLE
29	Radar Range Estimate Min	CSMB_RADAR_RANGE_EST$2	Flag indicating that the minimum radar range estimate is to be used by the KU-Band antenna. Initial value - OFF.	SCALAR DOUBLE
30	Radar Range Estimate Item (Items 1-2)	CSMB_RADAR_RANGE_EST	Item entered from AM display to indicate to AM sequence, which radar range estimate to use for KU-Band antenna, Initial value - Hex '8000'.	BIT(16)
31	Ku-Band TDRS Selected ID	CSMV_KUBAND_TDRS_SEL_ID	ID of TDRS selected for use by the Ku-Band Antenna System. Corresponds to CSMV_KUBAND_TRDS_SELECTED in DDT.	CHAR(4)

TABLE NAME: AM CMT (cont'd)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			The following is a list of possible ID's: TDRS Selected — TDRS Selected ID 2 — 'EAST' 1 — 'WEST' 0 — blank Units - None. Initial Value blank	
32	S-Band TDRS Selected ID	CSMV_SBAND_TDRS_SEL_ID	ID of TDRS selected for use by the S-Band Antenna system. Corresponds to CSMV_SBAND_TDRS_SELECTED in DDT. The following is a list of possible ID's: TDRS Selected — TDRS Selected ID 2 — 'EAST' 1 — 'WEST' 0 — blank Units - None. Initial Value - blank	CHAR(4)
33	S-Band QUAD Selected ID	CSMV_SBAND_QUAD_SEL_ID	ID of QUAD selected for use by the S-Band Antenna System. Corresponds to CSMV_SBAND_QUAD_SELECTED in DDT. The following is a list of possible ID's: QUAD Selected — QUAD Selected ID 1 — 'UR' 2 — 'LR' 3 — 'LL' 4 — 'UL' Units - None. Initial Value - blank	CHAR(2)
34	S-Band HEMI Selected ID	CSMV_SBAND_HEMI_SEL_ID	ID of HEMI Selected for use by the S-Band Antenna System. Corresponds to CSMV_SBAND_HEMI_SELECTED in DDT. The following is a list of possible ID's: HEMI Selected — HEMI Selected ID 1 — 'UP' 2 — 'LO' Units - None. Initial Value - blank	CHAR(2)
35	Current Site Selected ID	CSMV_CURRENT_SITE_ID	ID of Ground Site currently selected by Antenna Management. Corresponds to CSMV_CURRENT_GROUND_SITE in DDT. Units - None. Initial value - blank	CHAR(3)

TABLE NAME: CMT

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
36	TDRS ID Array	CSMK_TDRS_IDS	Constant list of TDRS ID's which are used to display the currently selected TDRS. Units - None. Initial Value - (blank, 'WEST', 'EAST')	ARRAY(3) CHAR(4)
37	QUAD ID Array	CSMK_QUAD_IDS	Constant list of QUAD ID's which are used to display the currently selected TDRS. Units - None. Initial Value - ('UR', 'LR', 'LL', 'UL')	ARRAY(3) CHAR(2)
38	HEMI ID Array	CSMK_HEMI_IDS	Constant list of HEMI ID's which are used to display the currently selected HEMI. Units - None. Initial Value - ('UP', 'LO')	ARRAY(2) CHAR(2)
39	Site ID Array	CSMK_SITE_IDS	Constant list of ground site ID's which are used to display the currently selected ground site. Units - None. Initial value -(blank, 'IOS', 'MAD', 'GDS', 'ETC', 'BDA', 'MIL', 'HAW', 'GWM', 'QUI', 'ACN', 'AGO', 'ORR', 'PDL', 'BUC', 'BAN', 'SPR')	ARRAY(17) CHAR(3)
40	Downlist Site Inhibit Bits	CSMB_DL_SITE_INH	Sixteen flags for Downlist indicating whether each site is eligible for selection by the Antenna Management Sequence. ON = Site is not eligible. OFF = Site is eligible. Corresponds to CSMB_SITE_INH in COT. Units - None. Initial value - HEX '0001'	BIT(6)

TABLE NAME:

A.2.11.7 ICC Input Buffers and Communications   Compool: CSZ_ICC_CMT

This compool contains ICC buffers and communications flags needed by Antenna Management and SCM.

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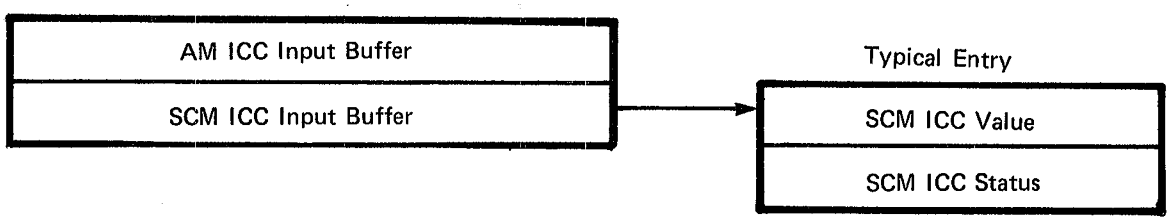

Figure A.2.11.7-1. ICC Input Buffers And Communications

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	AM ICC Input Buffer	CSMV_AM_ICC	Data received from GNC via ICC for use by Antenna Management. Includes Orbiter state information and GNC target information. Units - None. Initial Value - 0.	ARRAY (45) BIT (16)
2	SCM ICC Input Buffer	CSCV_SCM_ICC	DATA Received from GNC VIA ICC for use by SCM. 66 Scalar values with associated status	STRUCTURES (42 copies)
3	SCM ICC Value	CSCV_ICC_VALUE	Parameter values received from GN&C via ICC	BIT (16)
4	SCM ICC Status	CSCV_ICC_STATUS	Parameter status received from GN&C via ICC	BIT (16)

TABLE NAME: ICC INB

A.2.12 Constants Tables

The Constants Tables contain information associated with Table Maintenance constants. The Constant Values Table contains values used by the various special processes and RMS. The Constant ID's Table contains parameter ID's needed by Table Maintenance to update the constant values.

A.2.12.1 Constant Values Table (COT) Compool: CSS_COT

The Constants Values Table contains the Table Maintenance updateable constant values used by the Special Processes and RMS. These values are divided into subsections by parameter type: integer, scalar, and discrete. The constant values are defined for easy use by the Special Processes. Table Maintenance overlays the values with a different template which allows indexing into the value to be updated.

Helium Mass Tank	
APU Temperature Constant	
Power Level 1	
Power Level 2	
Hydraulic System GN2 Quantity	
Y Minute Time - Fuel Cell Purge	
X Time - Standby H20 Coolant	
Y Time - Standby H20 Coolant	
Attitude Compensation Delay Time	
Inclination of TDRS's Orbital Planes	
Longitudes of TDRS's Ascending Nodes	
A.M. Site 16 Vector	
TDRS Visibility Above Horizon	
Ku-Band Bias Correction Matrix	
X-Second Delay	Scalar Section
Site Visibility Above Horizon	
X Minute Times - Hydraulic System	
Z Minute Time - Hydraulic System	
Hydraulic System Temperature Low Limits	
Hydraulic System Temperature High Limits	
Hydraulic System Pressure Low Limits	
P/L Max Translational Rate-Coarse (RMS)	
P/L Max Rotational Rate-Coarse (RMS)	
P/L Max Translational Rate-Vernier (RMS)	
APU Pressure Flag	
APU Pressure Out Flag	Discrete Section
APU Temperature Out Flag	
Site Inhibit Flags	
(None currently defined)	Integer Section
Times of TDRS's Ascending Node Crossings	Double Scalar Section
TDRS's Position Vector Magnitudes	

Figure A.2.12.1-1 Constant Values Table (COT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	Helium Mass Tank	CSQV_APU_HELIUM_MASS_TANK	The mass of helium loaded into each APU tank. It is calculated prior to each flight by ground software and must be entered into the sequence via the Table Maintenance SPEC in order to produce a correct calculation for APU fuel quantity. Initial value - level C dependent.	ARRAY(3) SCALAR
2	APU Temperature Constant	CSQV_APU_TEMP_CONSTANT	A best predicted temperature that is used when the APU fuel tank temperature degrades. It is used in conjunction with the "APU temp out flag" to allow the APU fuel tank temperature to be bypassed. Initial value - level C dependent	ARRAY(3) SCALAR
3	Power Level 1	CSFV_POWER_LEVEL_1	First of two power levels which define the break points between three ranges. When the total power is computed, it is compared against each of the two power levels to determine which power range it lies in. Initial value - level C dependent.	SCALAR
4	Power Level 2	CSFV_POWER_LEVEL_2	Second of two power levels which define the break points between three ranges. Initial value - level C dependent.	SCALAR
5	Hydraulic System GN2 Quantity	CSHV_N2_QUANTITY	Hydraulic water boiler systems GN2 Quantity . Units - PVT Initial values - level C dependent.	ARRAY(3) SCALAR
6	Y Minute Time - Fuel Cell Purge	CSUV_Y_MIN_TIME	Elapsed time to leave a purge valve open. Initial value - level C dependent	SCALAR
7	X Time (coolant loop cycle time) - Standby H20 Coolant	CSLV_OFF_TIME	The elapsed time for the Standby Water Coolant loop pumps to remain OFF. Units - minutes. Initial value - level C dependent.	SCALAR
8	Y Time (coolant loop pump on time) - Standby H20 Coolant	CSLV_ON_TIME	The elapsed time for the Standby Water Coolant loop pumps to remain ON. Units - minutes. Initial value - level C dependent.	SCALAR
9	Attitude Compensation Delay Time	CSMV_ATT_COMP_TIME	Time delay used to compensate for delays involved in attitude data transfers other than GNC to SM delays (e.g., in the KU-Band electronics assembly). Units - seconds. Initial value - level C dependent.	SCALAR
10	Inclinations of TDRS's Orbital Planes	CSMV_TDRS_INCL	Inclination of orbital plane for West TDRS (subscript 1) and East TDRS (subscript 2). Units - Radians. Initial value - (.07, .07)	ARRAY(2) SCALAR
11	Longitudes of TDRS's Ascending Nodes	CSMV_TDRS_LONG_ASC_NODE	Longitude of Ascending node crossing for West TDRS (subscript 1) and East TDRS (subscript 2). Units - Radians. Initial value - (3.3, 5.6)	ARRAY(2) SCALAR
12	Antenna Management Site 16 Vector	CSMV_SITE_16_POS	Variable which contains the position of the 16th ground site in Greenwich True of date Coordinate System. Units - Feet. Initial value = (2975987, -18160107, 9928190).	ARRAY(3) SCALAR
13	TDRS Visibility Above Horizon	CSMV_TDRS_VIS	Angle above horizon at which TDRS is visible. Units - Degrees. Initial value - level C dependent.	SCALAR

TABLE NAME: COT

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
14	Ku-Band Bias Correction Matrix	CSMV_KUBAND_BIAS_MATRIX	Bias Correction matrix for the Ku-Band antenna line-of-sight vector from Orbiter Body Coordinates. Units - None. Initial value - level C dependent.	MATRIX(3,3)
15	X-Second Delay	CSMV_KUBAND_X_SEC_DELAY	Time between issuance of a TDRS Select Discrete and issuance of the Search-Initiate Discrete during a Ku-Band antenna acquisition sequence. Units - Seconds. Initial value - level C dependent.	SCALAR
16	Site Visibility Above Horizon	CSMV_SITE_VIS_ABOVE_HORIZON	Angle above site's horizon at which orbiter is visible. Units - Degrees. Initial Value - level C dependent.	SCALAR
17	X Minute Times - Hydraulic System	CSOV_COT_XMIN_TIME	Hydraulic circulation pump run times. Units - Minutes. Initial value - level C dependent.	ARRAY(3) SCALAR
18	Z Minute Time. - Hydraulic System	CSOV_COT_ZMIN_TIME	Hydraulic circulation pump start delay time. Units - Minutes. Initial value - level C dependent.	SCALAR
19	Hydraulic System Temperature Low Limits	CSOV_COT_LOLIM_TEMP	Low limit values against which the hydraulic systems input temperatures are compared to determine when to assign a priority pump. Units - Deg F. Initial values - level C dependent.	ARRAY(3,16) SCALAR
20	Hydraulic System Temperature High Limits	CSOV_COT_HILIM_TEMP	High limit values against which the hydraulic systems input temperatures are compared to determine when to turn off circulation pump. Units - Deg F. Initial values - level C dependent.	ARRAY(3,16) SCALAR
21	Hydraulic System Pressure Low Limits	CSOV_COT_LOLIM_PRESS	Low limit values against which the hydraulic systems input pressures are compared to determine whether the system's circulation pump is on. Units - PSIA. Initial values - level C dependent.	ARRAY(3) SCALAR
22	PIL Max Translational Rate-Coarse	CRSS_TRANS_RATE_PYLD_SEL_COARSE	An I-LOADed array specifying the maximum coarse translational resultant EE rate, dependent on which payload is captured.	ARRAY(5) SCALAR
23	P/L Max Rotational Rate-Coarse	CRSS_ROTE_RATE_PYLD_SEL_COARSE	An I-LOADed array specifying the maximum coarse rotational resultant EE rate, dependent on which payload is captured.	ARRAY(5) SCALAR
24	P/L Max Translational Rate-Vernier	CRSS_TRANS_RATE_PYLD_SEL_VERN	An I-LOADed array specifying the maximum vernier translational resultant EE rate, dependent on which payload is captured.	ARRAY(5) SCALAR
25	P/L Max Rotational Rate-Vernier	CRSS_ROTE_RATE_PYLD_SEL_VERN	An I_LOADed array specifying the maximum vernier rotational resultant EE rate, dependent on which payload is captured.	ARRAY(5) SCALAR
26	APU Pressure Flag	CSQB_APU_PRES_FLAG	A flag used in conjunction with the "APU Pressure Out Flag" to allow the APU sequence to use in the computation the APU Fuel Tank Outlet Pressure instead of the APU Fuel Tank Pressure. Initial value - level C dependent.	ARRAY(3) BIT(1)
27	APU Pressure Out Flag	CSQB_APU_PRES_OUT_FLAG	A flag used in conjunction with the "APU Pressure Flag" to allow the APU sequence to use in the computation the APU Fuel Tank Outlet Pressure instead of the APU Fuel Tank Pressure. Initial value - level C dependent.	ARRAY(3) BIT(1)

TABLE NAME: COT (Cont'd)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
28	APU Temperature Out Flag	CSQB_APU_TEMP_OUT_FLAG	A flag that allows the APU sequence to bypass using the APU Fuel Tank Temperature but instead using a best predicted value. Initial value - level C dependent.	ARRAY(3) BIT(1)
29	Site Inhibit Flags	CSMB_SITE_INH	Flags indicating whether each site is eligible for selection by the Antenna Management sequence. ON = site is not eligible. OFF = site is eligible. The possible subscript numbers and the corresponding sites are given below. Subscript — Ground Site 1 — Mahe, Seychelles 2 — Madrid, Spain 3 — Goldstone, California 4 — Greenbelt, Maryland 5 — Bermuda 6 — Merritt Island, Florida 7 — Kauai, Hawaii 8 — Guam 9 — Quito, Ecuador 10 — Ascension Island 11 — Santiago, Chile 12 — Orroral, Australia 13 — New Smyrna Beach, Florida 14 — Flight Research Center California 15 — Bangor, Maine 16 — Spare Units-none. Inital value - level C dependent	ARRAY(16) BIT(1)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
30	Times of TDRS's Ascending Node Crossings	CSMV_TDRS_TIME_ASC_NODE	Greenwich Mean Time of ascending node crossing for West TDRS (subscript 1) and East TDRS (subscript 2). Units - Seconds. Initial value (31,500,000, 12,345,678).	ARRAY(2) SCALAR DOUBLE
31	TDRS's position Vector Magnitudes	CSMV_TDRS_POS_MAG	Magnitude of position vector for West TDRS (subscript 1) and East TDRS (subscript 2). Units - Feet. Initial value - (138,776,000, 138,776,000).	ARRAY(2) SCALAR DOUBLE

TABLE NAME:

BOOK: OFT SM Detailed Design Specification

A.2.12.2 Constant ID's Table (TM COT) Compool: CSS_TM_COT

The Constant ID's Table contains parameter ID's needed by Table Maintenance to update the values in the COT. These parameter ID's are divided in subsections corresponding to the sections into which the COT is divided. The parameter ID's also are defined similarly to the corresponding values to ensure that each parameter ID is the same relative position as its value. Table Maintenance overlays the parameter ID's in the same way as the values to allow an indexed search for the input ID.

Helium Mass Tank ID's	Scalar Section
APU Temperature Constant ID's	
Power Level 1 ID	
Power Level 2 ID	
Hydraulic System GN2 Quantity	
Y Minute Time ID - Fuel Cell Purge	
X Time ID - Standby H20 Coolant	
Y Time ID - Standby H20 Coolant	
Attitude Compensation Delay Time ID	
Inclinations of TDRS's Orbital Planes ID's	
Longitudes of TDRS's Ascending Nodes ID's	
Antenna Management Site 16 Vector	
TDRS Visibility Above Horizon ID	
Ku-Band Bias Correction Matrix ID's	
X-Second Delay ID	
Site Visibility Above Horizon ID	
X Minute Time ID's - Hydraulic System	
Z Minute Time ID - Hydraulic System	
Hydraulic System Temperature Low Limits ID's	
Hydraulic System Temperature High Limits ID's	
Hydraulic System Pressure Low Limits ID's	
P/L Max Translational Rate - Coarse ID's (RMS)	
P/L Max Rotational Rate - Coarse ID's (RMS)	
P/L Max Translational Rate - Vernier ID's (RMS)	
P/L Max Rotational Rate - Vernier ID's (RMS)	
APU Pressure Flag ID's	Discrete Section
APU Pressure Out Flag ID's	
APU Temperature Out Flag ID's	
Site Inhibit Flags ID's	
(none currently defined)	Integer Section
Times of TDRS's Ascending Node Crossings ID's	Double Scalar Section
TDRS's Position Vector Magnitudes ID's	

Figure A.2.12.2-1. Constant ID's Table (TM COT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			The entries in this table are INTEGER DOUBLE parameter ID's which correspond to the entries in the Constant Values Table. The ID's are listed below.	
1.	Helium Mass Tank ID's		922024,922026,922028	
2.	APU Temperature Constant ID's		922140,922240,922340	
3.	Power Level 1 ID		920630	
4.	Power Level 2 ID		920631	
5.	Hydraulic System GN2 Quantity ID's		920650,920651,920652	
6.	Y Minute Time ID - Fuel Cell Purge		920635	
7.	X Time ID - Standby H2O Coolant		920640	
8.	Y Time ID - Standby H2O Coolant		920641	
9.	Attitude Compensation Delay Time ID		921013	
10.	Inclinations of TDRS's Orbital Planes ID's		921025, 921017	
11.	Longitudes of TDRS's Ascending Nodes ID's		921023, 921015	
12.	Antenna Management Site 16 Vector ID		985061, 985062, 985063	
13.	TDRS Visibility Above Horizon ID			
14.	Ku-Band Bias Correction Matrix ID's		921034, 921035, 921036, 921040, 921041, 921042, 921045, 921046, 921047	
15.	X-Second Delay ID		921010	
16.	Site Visibility Above Horizon ID		921005	
17.	X Minute Time ID's - Hydraulic System		921744, 921745, 921746	
18.	Z Minute Time ID-Hydraulic System		921676	

TABLE NAME: TM COT

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
19.	Hydraulic System Temperature Low Limits ID's		921700,921702,921704,921706,921708,921710,921712,921714,921718, 921720,921722,921724,921728,921730,921736,921738,921800,921802, 921804,9218406,921812,921814,921816,921818,921820,921822,921830, 921832, 0, 0, 0 , 0 , 921900,921902,921904,921906,921912, 921914,921916,921918,921920,921922,921928,921930, 0 , 0 , 0 , 0	
20.	Hydraulic System Temperature High Limits ID's		921701,921703,921705,921707,921709,921711,921713,921715,921719, 921721,921723,921725,921729,921731,921737,921739,921801,921803, 921805,921807,921813,921815,921817,921819,921821,921823,921831, 921833, 0 , 0 , 0,0 , 921901,921903,921905,921907,921913, 921915,921917,921919,921921,921923,921929,921931, 0 , 0 , 0 , 0 .	
21.	Hydraulic System Pressure Low Limits ID's		921742,921842,921942	
22.	P/L Max Translational Rate-Coarse ID's		not currently defined	
23.	P/L Max Rotational Rate-Coarse ID's		not currently defined	
24.	P/L Max Translational Rate-Vernier ID's		not currently defined	
25.	P/L Max Rotational Rate-Coarse ID's		not currently defined	
26.	APU Pressure Flag ID's		922150,922250,922350	
27.	APU Pressure Out Flag ID's		922152,922252,922352	
28.	APU Temperature Out Flag ID's		922160,922260,922360	
29.	Site Inhibit Flag ID's		920976,920977,920978,920979,920980,920981,900982,920983,920984, 920985,920986,920987,920988,920989,920990,920991	
30.	Times of TDRS's Ascending Node Crossings ID's		921027, 921020	
31.	TDRS's Position Vector Magnitude ID's		921003, 921001	

TABLE NAME: TM COT

A.2.13 Scaling Cross-Reference Table (SXT) Compool: CSA_SXT (Basic)
CSS_SXT (SP Processes)

The Scaling Cross-Reference Table (SXT) contains information required by Analog Scaling to scale EU parameters (designated analog parameters converted to EU for SM processing). A unique SXT exists for Basic Data Acquisition and SP Data Acquisition. The Basic Data Acquisition SXT is mission dependent and therefore build by the SM offline preprocessor. The Special Processes Data Acquisition is not mission dependent and is hand generated. When called, Analog Scaling is passed an address pointer into an SXT and the number of parameters to be scaled. Parameters in the Basic SM Data Acquisition SXT which have dual limit sets specified will have two SXT entries defined so that each of these parameters will have its scaled value placed in two contiguous locations in the PPB.

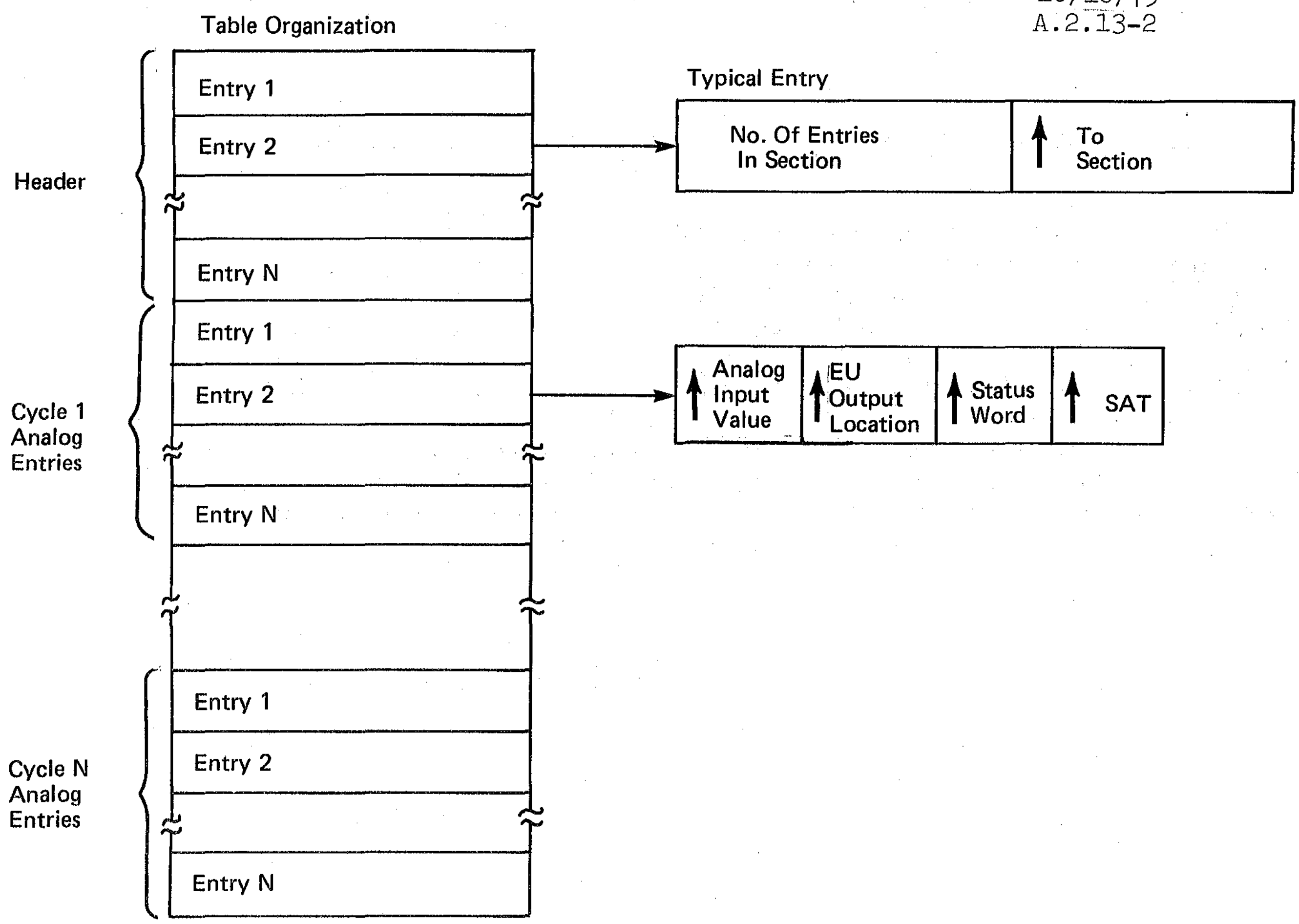

Figure A.2.13-1. Scaling Cross-Reference Table (SXT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	Typical SXT Entry			
1	Pointer to Analog Input Value	CSAS_SXT_ANA_VAL	Address of value to be scaled. Initial Value - Level C Dependent	NAME INTEGER
2	Pointer to E.U. Output Location	CSAS_SXT_EU_VAL	The scaled E.U. value is placed at this location. Initial Value - Level C Dependent	NAME SCALAR
3	Pointer to Coefficients	CSAS_SXT_SAT_PTR	Points to the position in the scaling table where the coefficients needed to convert this PCM to engineering units can be found. Initial Value - Level C Dependent	NAME SCALAR
4	Pointer to Status Word	CSAS_SXT_STATUS	Status of the current value including the I/O validity, offscale high, and offscale low indicators. Initial Value - Level C Dependent	NAME BIT(16)
	SXT Header			
1	# of Entries in Section	CSAS_SXT_NUM_ENTRIES	Number of analog entries in section. Initial Value - Level C Dependent	INTEGER
2	Pointer to Section	CSAS_SXT_INDEX	Relative location of first entry for the section. Initial Value - Level C Dependent	INTEGER

TABLE NAME: SXT

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BOOK: OFT SM Detailed Design Specification

A.2.14 Subsystem Configuration Management List (SCML) Compool: CSC_XX_SCML*

The Subsystem Configuration Management list provides the information required by the SCM process to compare specified analog, E.U., and discrete parameters with predefined configurations. This information includes parameter ID, limit values, value or pointer to value to be compared, pointers to text for discrepancy message, and switch position for discretes.

*XX - List Number

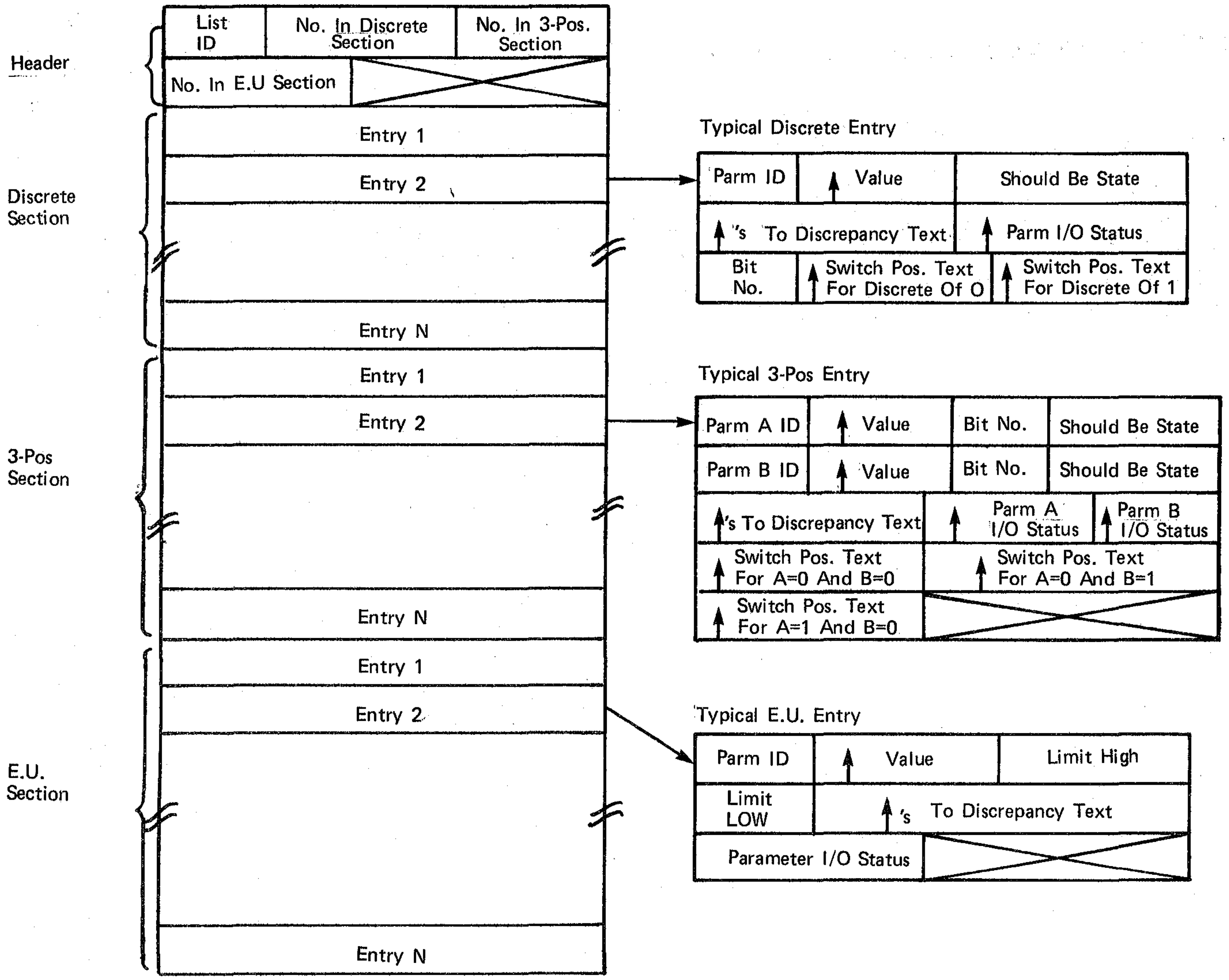

Figure A.2.14-1. Subsystem Configuration Management (SCML)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	SCML Header			
1	List ID	CSCS_LIST_ID	Unique ID used to identify each list. Initial Value - Level C Dependent	INTEGER
2	Number of Discretes Entries	CSCS_NUM_DISC	Total number of discrete entries. Initial Value - Level C Dependent	INTEGER
3	Number of 3-POS Entries	CSCS_NUM_3POS	Total number of 3-POS entries. Initial Value - Level C Dependent	INTEGER
4	Number of E.U. Entries	CSCS_NUM_EU	Total number of E.U. entries. Initial Value - Level C Dependent	INTEGER
	Discrete Section			
1	Parm ID	CSCS_DISC_PARMID	Seven character parameter ID reduced to an integer. Initial Value - Level C Dependent	Bit (24)
2	Value	CSCS_DISC_PARVAL	Address pointer to the value location. Initial Value - Level C Dependent	NAME BIT (24)
3	Should Be State	CSCS_DISC_STATE	Discrete state to be compared against parameter value. Initial Value - Level C Dependent	BIT (1)
4	↑'s to Discrepancy Text	CSCS_DISC_TXT1-5	Five text location in the SCMT used to build the discrepancy message. Initial Value - Level C Dependent	BIT (8)'s
5	Parameter I/O Status	CSCS_DISC_STATUS	Parameter status associated with corresponding parameter value. Initial Value - 0	NAME BIT (16)
6	↑Switch Position Text for Discrete of 0	CSCS_DISC_SW0	Location in SCMT of switch position text for discrete of 0. Initial Value - Level C Dependent	BIT (8)
7	↑Switch Position Text for Discrete of 1	CSCS_DISC_SW1	Location in SCMT of switch position text for discrete of 1. Initial Value - Level C Dependent	BIT (8)
8	BIT NO.	CSCS_DISC_BITNO	BIT Position in parent Initial Value - Level C Dependent	BIT (5)
	E.U. Section			
1	Parm ID	CSCS_EU_PARMID	Seven character parameter ID reduced to an integer. Initial Value - Level C Dependent	BIT (24)
2	Value	CSCS_EU_VALUE	Pointer to the location of the parameter value. Initial Value - Level C Dependent	NAME SCALAR
3	Limits	CSCS_EU_HI_LIM CSCS_EU_LOW_LIM	Upper and lower limits to be compared against parameter value. Initial Value - Level C Dependent	SCALAR SCALAR
4	↑s to Discrepancy Text	CSCS_EU_TXT1-5	Text locations in the SCMT used to build the discrepancy message. Initial Value - Level C Dependent	BIT (8)'s
5	Parameter I/O Status	CSCS_EU_STATUS	Parameter status associated with corresponding parameter value. Initial Value - 0	NAME BIT (16)

TABLE NAME: SCML

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
	3-POS Section			
1	Parm A ID	CSCS_3POS_PARMIDA	Seven character parmeter A ID reduced to an integer. Initial Value - Level C Dependent	BIT (24)
2	Param B ID	CSCS_3POS_PARMIDB	Seven character parameter B ID reduced to an integer. Initial Value - Level C Dependent	BIT (24)
3	Value A	CSCS_3POS_PARVALA	Pointer to the location of value for A. Initial Value - Level C Dependent	NAME BIT (24)
4	Value B	CSCS_3POS_PARVALB	Pointer to the location of value for B. Initial Value - Level C Dependent	NAME BIT (24)
5	A BIT NO	CSCS_3POS_BITNOA	BIT position in parent. Initial Value - Level C Dependent	BIT (5)
6	B BIT NO	CSCS_3POS_BITNOB	BIT position in parent. Initial value - Level C Dependent	BIT (5)
7	A Should Be STATE	CSCS_3POS_STATEA	Discrete State to be compared against value. Initial Value - Level C Dependent	BIT (1)
8	B Should Be STATE	CSCS_3POS_STATEB	Discrete State to be compared against value. Initial Value - Level C Dependent	BIT (1)
9	↑'s To Discrepancy Text	CSCS_3POS_TXT1-5	5 Text locations in SCMT used to build discrepancy message. Initial Value - Level C Dependent	BIT (8)'s
10	PARM A I/O STATUS	CSCS_3POS_STATUSA	Parameter status associated with corresponding parameter value. Initial Value - 0	NAME BIT (16)
11	PARM B I/O STATUS	CSCS_3POS_STATUSB	Parameter status associated with corresponding parameter value. Initial Value - 0	NAME BIT (16)
12	↑Switch POS text for discrete of A=0 and B=0	CSCS_3POS_SWA0B0	Location in SCMT of switch position text for discretes of A=0, B=0. Initial Value - Level C Dependent	BIT (8)
13	↑Switch Position text for discretes A=0 and B=1	CSCS_3POS_SWA0B1	Location in SCMT of Switch position text for discretes of A=0 and B=1. Initial Value - Level C Dependent	BIT (8)
14	↑Switch Position text for discretes A=1 and B=0	CSCS_3POS_SWA1B0	Location in SCMT of Switch position text for discretes of A=1 and B=0. Initial Value - Level C Dependent	BIT (8)

TABLE NAME: SCML (cont'd)

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A.2.15 SCM Text Dictionary (SCMT) Compool: CSC_SCMT

The SCM Text Dictionary table contains the text information required to construct the SCM Display Discrepancy Messages and the desired state text messages. Each element of the table is a four (4) character text field.

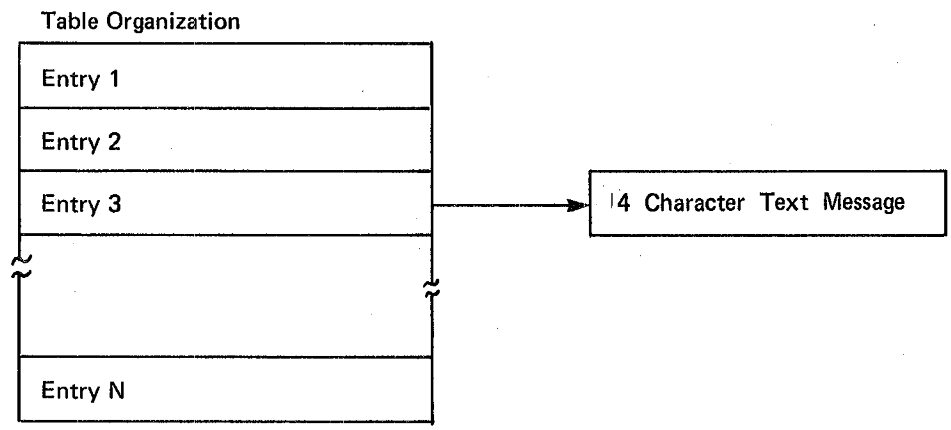

Figure A.2.15-1. SCM Text Dictionary (SCMT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	4 character text message	CSCS_TEXT (I)	Either: 1. A minor field portion of SCM text discrepancy messages - (each SCM message is made up of 5 minor fields). Initial Value - Level C Dependent or 2. A desired state text message Initial value - Level C Dependent	CHARACTER (4)

TABLE NAME: SCMT

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A.2.16 Special Processes Output Buffer (SPOB) Compool: CSS_SPOB

The Special Processes Output Buffer (SPOB) is the collection and storage area for all special processes data that is to be output to payload MDMs. Discrete indicators used to annunciate error conditions from the Special Processes and parents used to merge output commands for downlist are also in this buffer. The SPOB format is rigid and does not change from mission to mission. All data contained in the SPOB is available for Downlist. The SPOB contains four sections: 1. Payload Bay Door output section, 2. Cyclic output section, 3. Downlist Merge Section and 4. Annunciation section.

Sections 1 and 2 contain one or more of the following:

1. Analog PCM count parameters from the Antenna Management, the APU Fuel Quantity and the Hydraulic Water Boiler Quantity special processes.

2. Reset and Set masks for discrete outputs associated with the following special processes: Antenna Management, Fuel Cell Purge, Hydraulic Fluid on-Orbit Temperature Control, Standby Water Coolant Loop Temperature Control and Payload Bay Doors. These special processes set up the Set masks and SP Data Out sets up the Reset masks and causes both masks to be output.

3. Applicable bit masks associated with each Set mask that tells which bits are to be output. These 2 masks are used in the creation of the Reset masks.

The Downlist Merge section contains a parent for each output parent that is common to both PBD and non-PBD special processes. These output parents are merged into the Downlist parent for downlist only and are not used by any other routine.

The Annunciation section contains current annunciation indicators that are set (and reset) by various special processes that require annunciation outputs for specific error conditions. Each indicator also has a previous annunciation indicator associated with it. The previous annunciation indicator is used by Special Processes Data Out to compare to the current indicator to determine if there is a change in status that needs annunciation. There is also a table of FMPT entries needed to issue the annunciation Macro.

The SP Data Out function does not clear the buffer after an output operation. This means SPOB integrity is the responsibility of the associated special processes.

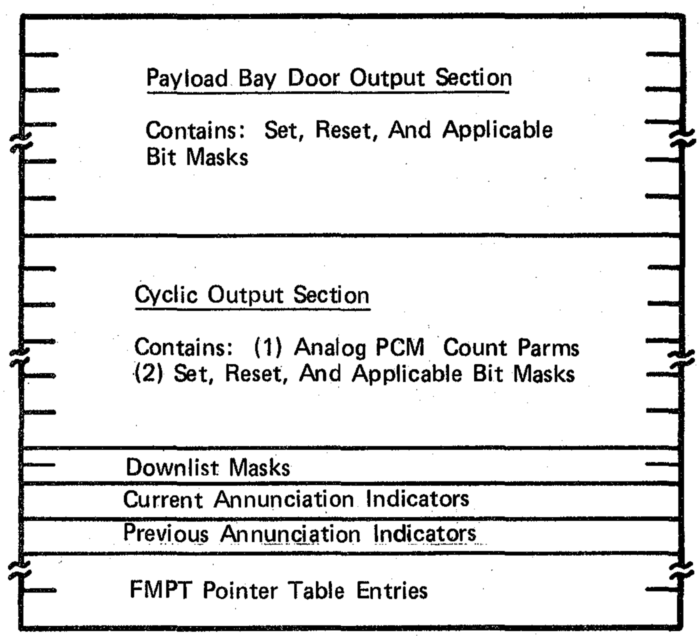

Figure A.2.16-1. Special Processes Output Buffer (SPOB)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	Analog Output Parameters		Analog PCM Count Parameters from the APU Fuel Quantity, Antenna management, and Hydraulic Water Boiler Quantity special process.	Bit (16)
2	Reset Masks		Reset masks for the following special processes: o Fuel Cell Purge o Hydraulic Fluid On-Orbit Temperature Control o Standby Water Coolant Loop Temperature Control o Payload Bay Doors o Antenna Management Bit on=turn off bit in output location	Bit (16)
3	Set Masks		Set masks for the special processes listed above. Bit on=turn on bit in output location	Bit (16)
4	Applicable bit masks		Used to determine which bits in masks are to be output. Bit on=applicable	Bit (16)
5	Current annunciation indicator parent	CSSB_CUR_ANN	Discrete indicators set when annunciation of specific error conditions is requested by the following Special Processes: o Fuel Cell Purge o Payload Bay Doors	Bit (16)
6	Previous annunciation indicator parent	CSSB_PREV_ANN	Image of previous cycle's current annunciation indicator parent. Used to determine if indicator has just changed.	Bit (16)
7	FMPT Pointer	CSSV_ANNUN_PNTR	Pointers to FMPT Entry to annunciate	Integer
8	Downlist Mask		AND of discrete parent outputs common to both PBD and other processes	Bit (16)

TABLE NAME: SPOB

A.2.17 Special Processes Input Buffer (SPINB) Compool: CSS_SPINB

All data acquired by Special Processes Data Acquisition is read into the Special Processes Input Buffer (SPINB). The SPINB consists of three sections:

1. A PMU/PLMDM data section consisting of (1) the I/O operation status associated with each Dart entry (for PMU data) or BCE Element (for PLMDM data) (2) the acquired parameters.

2. A parameter status section (IOB) consisting of a status associated with each parameter (set by General acquisition).

3. A user section used for storage of parameters that have been scaled or for which the last value with valid I/O status is to be saved, by the individual Special Processes.

A Transaction Status Word preceeds the input buffer for FCOS use.

All data in sections 1 and 2 are named using the following naming conventions:

1. Data section CSSV_SPINB_XXXX where XXXX=D + input address for all discretes or XXXX = parmid for all analogs.

2. Parameters status section CSSV_INSTAT_XXXX where XXXX = same as above.

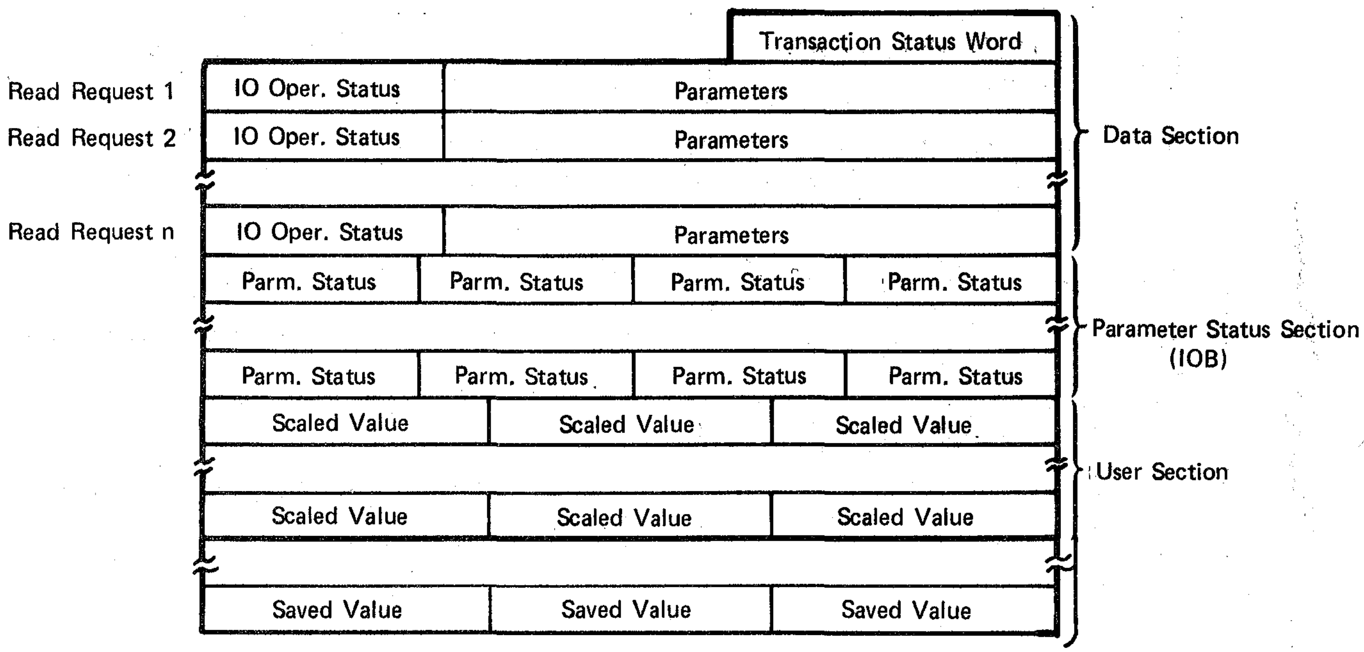

Figure A.2.17-1. Special Processes Input Buffer (SPINB)

TABLE ENTR . CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	Transaction Status Word		Transaction Status word as returned from FCOS Initial value - 0	Bit 16
2	IO Status Indicators		IO status as returned from FCOS for PMU data or as set by General Data Acquisition for PLMDM data initial value - 0	Bit 16
3	Parameters		Parameters transfered by FCOS from the PMU or PLMDM as a result of a read request initial value - 0	Bit 16
4	IOB		Parameter status section containing status associated with each parameter as set by General Acquisition initial values - Hex '4000'	Bit 16
5	Scaled Values		EU Parms as scaled by Forward Scaling initial value - 0	Scalar
6	Saved Values		Last value with valid I/O status as saved by the individual Spec. process routines. Initial values = 0	Bit 16

TABLE NAME: SPINB

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BOOK: OFT SM Detailed Design Specification

A.2.18 Display/Downlist Table (DDT) Compool: CSS_DDT

The Display/Downlist Table (DDT) contains parameters that are for display only or parameters that are to be downlisted.

APU Fuel Quantity Variables
Fuel Cell Computation Variables
Hydraulic Water Boiler Quantity Variables
O_2N_2 Quantity Variables
H_2O Pump Delta Pressure Variables
Recorder Tape Position Variables
Antenna Management Variables

Figure A.2.18-1. Display/Downlist Table (DDT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	APU fuel quantity array	CSQV_APU_FUEL_DISP	Array containing the percent remaining of fuel for each APU fuel tank. Initial Value - (0,0,0).	ARRAY (3) SCALAR
2	APU fuel quantity status array	CSQB_APU_FUEL_STAT	Array containing output status for the fuel quantity of each fuel tank. Initial Value - (HEX'4000', HEX'4000', HEX'4000').	ARRAY (3) BIT (16)
3	Total fuel cell current	CSFV_TOTAL_FC_CURRENT	The total current from all the three fuel cells in amps. Initial Value - 0.	SCALAR
4	Total fuel cell current status	CSFB_TOTAL_FC_CURRENT_STATUS	The output status for the total fuel cell current. Initial Value - HEX'4000'.	BIT (16)
5	Total fuel cell power	CSFV_TOTAL_FC_POWER	The total power for all three fuel cells in kilowatts. Initial Value - 0.	SCALAR
6	Total fuel cell power status	CSFB_TOTAL_FC_POWER_STATUS	The output status for the total fuel cell power. Initial Value - HEX'4000'.	
7	Precondition discrete arrays	CSFB_FC_PRECON-1 CSFB_FC_PRECON-2 CSFB_FC_PRECON-3	Arrays containing the three precondition settings for each of three fuel cell power levels. Initial Value - (HEX'0000', HEX'0000', HEX'0000').	ARRAY (3) BIT (16)
8	Precondition discrete status array	CSFB_FC_PRECON_STAT	Array containing output status for the precondition settings for each fuel cell. Initial Value - (HEX'4000', HEX'40000', HEX'4000').	ARRAY (3) BIT (16)
9	Water boiler quantity	CSHV_QUANT_CRT	Water boiler quantity remaining in each of 3 water boiler tanks. Initial Value - (0,0,0).	ARRAY (3) SCALAR
10	Water Boiler quantity status	CSHB_QUANT_OUT_STAT	Array containing output status for the water boiler quantity remaining. Initial Value - (HEX'4000', HEX'4000', HEX'4000').	ARRAY (3) BIT (16)
11	Emergency 02 quantity status	CSNB_02_QTY_STATUS	Status of quantity of 02 remaining. Initial Value - HEX'4000'.	BIT (16)
12	Emergency 02 quantity	CSNV_02_QTY_VALUE	Quantity of 02 remaining in pounds. Output by 02/N2 computation. Initial Value - 0.	SCALAR
13	N2 quantity output values	CSNV_N2_QTY	Array of output values obtained as a result of performing the N2 quantity computation. Initial Value - (0,0).	ARRAY (2)
14	N2 quantity output status	CSNB_N2_QTY_STAT	Array of output status obtained as a result of performing (or attempting to perform) the N2 quantity computation. Initial Value - (HEX'4000', HEX'4000').	ARRAY (2) BIT (16)
15	LOOP 1 pump delta pressure	CSWV_DELTA_PRESS1	Set by pump delta pressure process. Indicates difference in outlet and inlet pressures of water coolant loop 1 pump. Initial Value - 0.	SCALAR
16	LOOP 2 pump delta pressure	CSWV_DELTA_PRESS2	Set by pump delta pressure process. Indicates difference in outlet and inlet pressures of water coolant loop 2 pump. Initial Initial Value - 0.	SCALAR

TABLE NAME: Display/Downlist Table (DDT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
17	Loop 1 pump delta pressure status	CSWB_DELTA_PRESS1_STATUS	Set by pump delta pressure process for display. Indicates status of loop 1 pump delta pressure. Initial Value - HEX'4000'.	BIT (16)
18	Loop 2 pump delta pressure	CSWB_DELTA_PRESS2-STATUS	Set by pump delta pressure process for display. Indicates status of loop 2 pump delta pressure. Initial Value - HEX'4000'.	BIT (16)
19	Recorder tape position	CSRV_TAPE_POS	Set by Recorder tape position to indicate the amount of tape remaining for each of three tapes. Initial Value - (0,0,0).	ARRAY (3) INTEGER
20	Recorder Tape Position status	CSRB_POS_OUT_STAT	Output status for each of the three recorder tape positions. Initial Value - (HEX'4000', HEX'4000', HEX'4000').	ARRAY (3) BIT (16)
21	Line-of-Sight Roll to TDRS's-Rasters	CSMV_TDRS_LOS_ROLL_RAS	Line-of-Sight Roll Angles to TDRS's - Degrees converted to raster units required to drive dynamic symbols on the Antenna Management Display. Includes Line-of-Sight Roll Angle to West TDRS-Rasters (subscript 1) and Line-of-Sight Roll Angle to East TDRS-Raster (subscript 2). Units - Rasters. Initial Value - (0,0).	ARRAY (2) SCALAR
22	Line-of-Sight Pitch Angles to TDRS's-Rasters	CSMV_TDRS_LOS_PTCH_RAS	Line-of-Sight Pitch Angles to TDRS's - Degrees converted to raster units required to drive dynamic symbols on the Antenna Management Display. Includes Line-of-Sight Pitch Angle to West TDRS (subscript 1) and Line-of-Signt Pitch Angle to East TDRS (subscript 2). Units - Rasters. Initial Value - (0,0).	ARRAY (2) SCALAR
23	TDRS Position Vectors	CSMV_TDRS_POS	TDRS position vectors in Greenwich True of Date Coordinates System. Includes West TDRS Position Vector (array subscript 1) and East TDRS Position Vector (array subscript 2). Units - Feet. Initial Value - $\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$.	ARRAY (2) VECTOR (3)
24	TDRS In View Indicators	CSMB_TDRS_IN_VIEW	Indications of whether the TDRS's are in view. ON= TDRS in view. OFF= TDRS not in view. Includes West TDRS In View Indicator (subscript 1) and East TDRS In View Indicator (subscript 2). Units - None. Initial Value - (OFF,OFF).	ARRAY (2) BOOLEAN
25	Line-of-Sight Roll Angles to TDRS's-Degrees	CSMV_TDRS_LOS_ROLL_DEG	Roll look angles to TDRS's from Orbiter-Z-body axis measured positively around the -X-axis. Includes Line-of-Sight Roll Angle to West TDRS (subscript 1) and Line-of-Sight Roll Angle to East TDRS (subscript 2). Units-Degree. Initial Value - (0,0).	ARRAY (2) SCALAR
26	Line-of-Sight Pitch Angles to RDRS's-Degrees	CSMV_TDRS_LOS_PTCH_DEG	Pitch look angles to TDRS's from Orbiter-Y-axis. Includes Line-of-Sight Pitch Angle to West TDRS (subscript 1) and Line-of-Sigth Pitch Angle to East TDRS (subscript 2). Units-Degrees. Initial Value - (0,0).	ARRAY (2) SCALAR
27	TDRS Selected for Ku-Band	CSMV_KUBAND_TDRS_SELECTED	TDRS selected for the Ku-Band antenna based on Ku-Band TDRS Select Item and TDRS In View Indicators (1=West, 2=East, 0=None). Units - None. Initial Value - 0.	INTEGER

TABLE NAME: Display/Downlist Table (DDT) (cont'd)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
28	Range to GNC Target	CSMV_KUBAND_RANGE	Estimate of GNC target radar range, Units-Feet, Initial Value - 0.	SCALAR
29	Ku-Band Roll Look Angle to Target	CSMV_KUBAND_ROLL	Roll look angle to Ku-Band target (TDRS or GNC target) measured from the -Z-axis positively around the -X-axis in antenna coordinates. Units-Degrees. Initial Value - 0.	SCALAR
30	Ku-Band Pitch Look Angle to Target	CSMV_KUBAND_PTCH	Pitch look angle to Ku-Band target (TDRS or GNC target) measured from the -Z-axis positively around the -Y-axis in antenna coordinates. Units-Degrees. Initial Value - 0.	SCALAR
31	TDRS Selected for S-Band	CSMV_SBAND_TDRS_SELECTED	TDRS selected for the S-Band antennas based on S-Band TDRS Select Item and RDRS In View Indicators (1=West, 2=East,0=None) Unit-None. Initial Value - 0.	INTEGER
32	S-Band Quad Selected	CSMV_SBAND_QUAD_SELECTED	S-Band Quad antenna selected at the RF switches (1=Upper Right, 2=Lower Right, 3=Lower Left, 4= Upper Left). Units-None. Initial Value - 1.	INTEGER
33	S-Band Quad Selected Status	CSMV_SBAND_QUAD_SELECTED STATUS	Status of S-Band Quad Selected Indicator. Units-None. Initial Value - HEX'4000' (Invalid I/O).	BIT (16)
34	S-Band Hemi Selected	CSMV_SBAND_HEMI_SELECTED	S-Band Hemi antenna selected at the RF switches (1=Upper, 2=Lower). Units-None, Initial Value - 1.	INTEGER
35	S-Band Hemi Selected Status	CSMV_SBAND_HEMI_SELECTED STATUS	Status of S-Band Hemi Selected Indicator. Units-None. Initial Value - HEX '4000' (Invalid I/O).	BIT (16)
36	Current Ground Site	CSMV_CURRENT_GROUND_SITE	Ground site currently selected based on S-Band Site Select Item, Site Inhibit Flags, and Site Vectors. Possible values and corresponding sites are given below.	INTEGER

Value	Ground Site
0	None
1	Mahe, Seychelles
2	Madrid, Spain
3	Goldstone, California
4	Greenbelt, Maryland
5	Bermuda
6	Merritt Island, Florida
7	Kauai, Hawaii
8	Guam
9	Quito, Ecuador
10	Ascension Island
11	Santiago, Chile
12	Orroral, Australia
13	New Smyrna Beach, Florida
14	Flight Research Center California-Buckhorn
15	Bangor, Maine
16	Spare

Units-none. Initial Value - 0.

TABLE NAME: Display/Downlist Table (DDT) (cont'd)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
37	Line-of-Sight Roll Angle to Current Site-Degrees	CSMV_SITE_LOS_ROLL_DEG	Roll look angle to current site from Orbiter -Z-body axis measured positively around the -X-axis. Units-Degrees. Initial Value - 0.	SCALAR
38	Line-of-Sight Pitch Angle to Current Site-Degrees	CSMV_SITE_LOS_PTCH_DEG	Pitch look angle to current site from Orbiter -Z-body axis measured positively around the -X-axis, Units-Degrees. Initial Value - 0.	SCALAR
39	Line-of-Sight Roll Angle To Current Site-Rasters	CSMV_SITE_LOS_ROLL_RAS	Line-of-Sight Roll Angle to Current Site-Degrees converted to raster units required to drive dynamic symbol on the Antenna Management Display. Units-Rasters. Initial Value - 0.	SCALAR
40	Line-of-Sight Pitch Angle to Current Site-Rasters	CSMV_SITE_LOS_PTCH_RAS	Line-of-Sight Pitch Angle to Current Site-Degrees converted to raster units required to drive dynamic symbol on the Antenna Management Display. Units-Rasters. Initial Value - 0.	SCALAR
41	Ku-Band Actual Roll Angle -Degrees	CSMV_KUBAND_ACT_ROLL_DEG	Ku-Band Feedback Roll Angle converted from analog format (as obtained from the antenna) to scalar format for computations. Units-Degrees Initial Value - 0.	SCALAR
42	Ku-Band Actual Roll Angle -Rasters	CSMV_KUBAND_ACT_ROLL_RAS	Ku-Band Actual Roll Angle-Degrees converted scalar to rasters for display. Units-Rasters Initial Value - 0.	SCALAR
43	Ku-Band Actual Pitch Angle-Degrees	CSMV_KUBAND_ACT_PTCH_DEG	Ku-Band Feedback Pitch Angle converted from analog format (as obtained from the antenna) to scalar, format for computations. Units-Degrees Initial Value - 0.	SCALAR
44	Ku-Band Actual Pitch Angle-Rasters	CSMV_KUBAND_ACT_PTCH_RAS	Ku-Band Pitch Angle-Degrees converted to rasters for display. Units-Rasters. Initial Value - 0.	SCALAR
45	Site in View Indicator	CSMB_SITE_IN_VIEW	Indicates if any non-inhibited site is in view of the orbiter. ON=Site in view. Units = none. Initial value - OFF.	Boolean
46	OPS Downlist Buffer (Each structure contains	CSRV_DL_BUFFER	Three deep pushdown list containing 3 latest readings of the tape position and active tract for OPS1 and OPS2 recorder and GMT time tag.	STRUCTURE (3 copies)
47	OPS1 Tape Position	CSRV_OPS1_TAPE_POS	The tape position for the OPS1 recorder	Bit 16
48	OPS2 Tape Position	CSRV_OPS2_TAPE_POS	The tape position for the OPS2 recorder	Bit 16
49	OPS1 Active Track	CSRV_OPS1_ACT_TRK	The active track for the OPS1 recorder	Bit 16
50	OPS2 Active Track	CSRV_OPS2_ACT_TRK	The active track for the OPS2 recorder	Bit 16
51	GMT Time Tag	CSRV_GMT_TIME_TAG	The GMT time tag at the time that the OPS1 and OPS2 recorder data (Items 47-50) are gathered.	SCALAR DOUBLE

TABLE NAME: Display/Downlist Table (DDT) (cont'd)

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A.2.19 General Cross Reference Table (GXT) Compool: CSP_PLC

The GXT provides the information needed to index into the appropriate information table (Discrete Information Table or Analog Information Table). There will be 200 entries in the GXT, with 50 entries for each of the four Payload Specialist Function displays. Each entry in the GXT will represent one of the 50 possible item entries on one of the four displays. Entries representing unused item entries will contain zeros. A positive index will represent an index into the DIT and a negative index will represent the negative of an index into the ANIT.

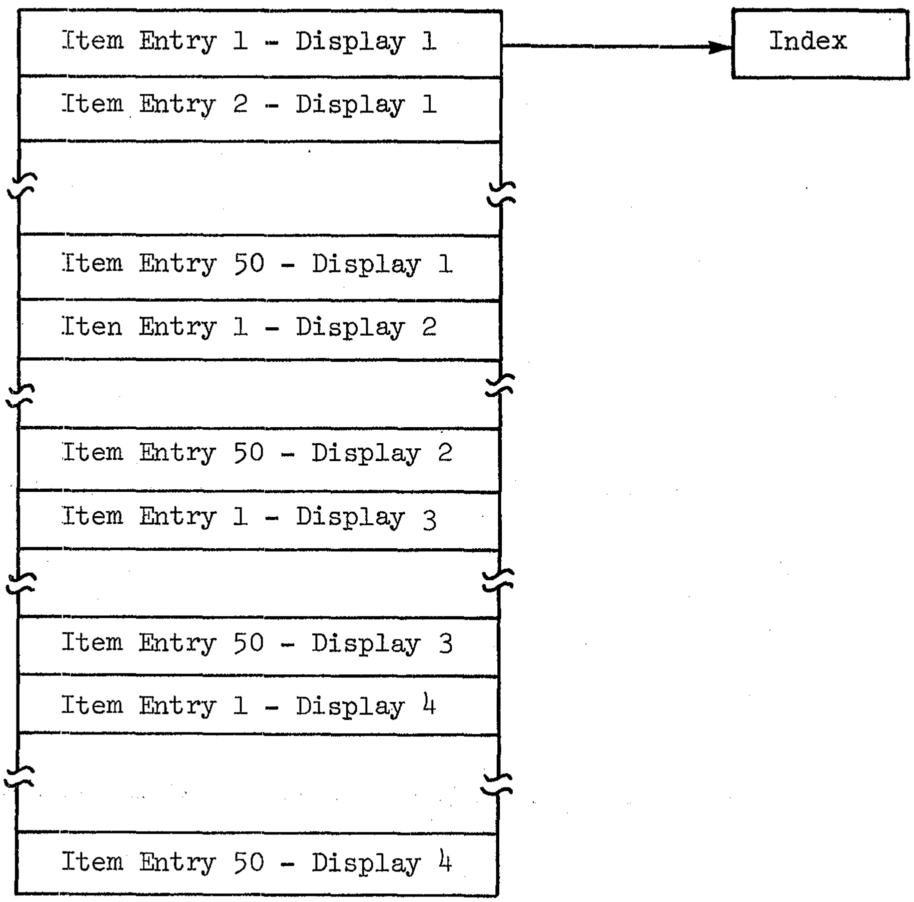

Figure A.2.19-1. General Cross Reference Table (GXT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	Index	CSPS_GXT	Index into the DIT or ANIT, dependent on the type of command for each item entry. Initial Value - Level C dependent.	Array(200) Integer

TABLE NAME: General Cross Reference Table (GXT)

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BOOK: OFT SM Detailed Design Specification

A.2.20 Discrete Information Table (DIT) Compool: CSP PLC

The DIT contains the information necessary to properly format and execute a discrete output request from a Payload Specialist Function display. The DIT contains an entry for each discrete item entry on the four Payload Specialist Function displays and is referenced using the index in the GXT. If two or more item entries have identical DIT entries, only one DIT entry is needed and the GXT entries for those item entries point to that DIT entry.

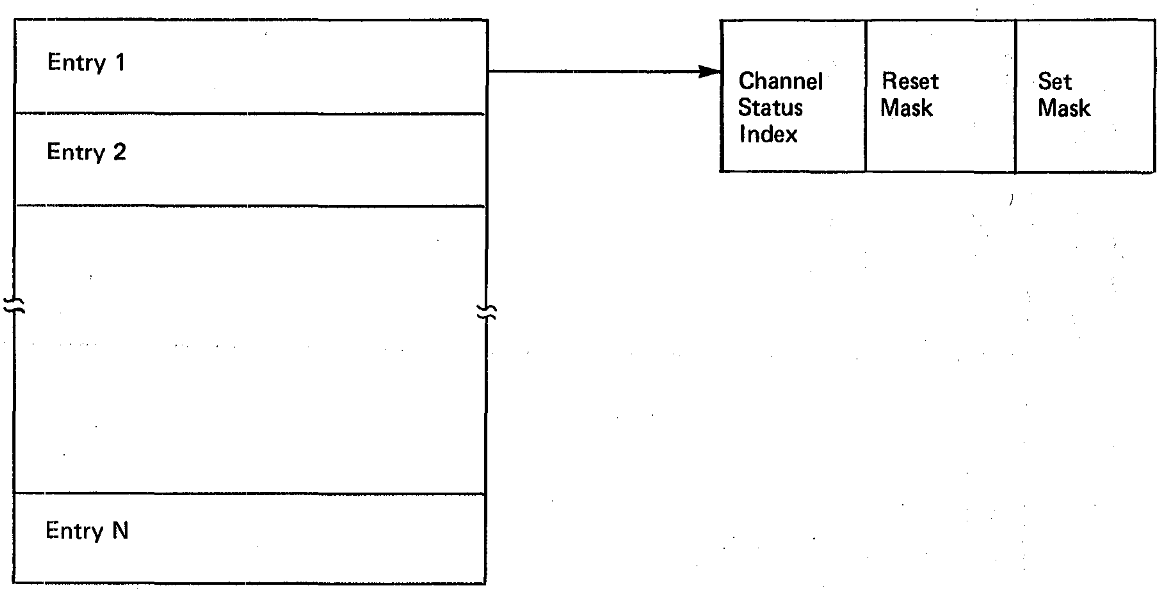

Figure A.2.20-1. Discrete Information Table (DIT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	Channel Status Index	CSPS_DIT_STAT_PTR	Index into the Channel Status Table. Initial Value - Level C Dependent	INTEGER
2	Reset Mask	CSPS_DIT_RESET	HEX value used in the reset command (from card) Initial Value - Level C Dependent	BIT (16)
3	Set Mask	CSPS_DIT_SET	HEX value used in the set command (from card) Initial Value - Level C Dependent	BIT (16)

TABLE NAME: DIT

756

A.2.21 Analog Information Table (ANIT) Compool: CSP_PLC

The ANIT contains the information necessary to properly format and execute an analog output request from a PL Specialist Function display. The ANIT contains an entry for each analog item entry on the four Payload Specialist Function displays and is referenced using the index in the GXT.

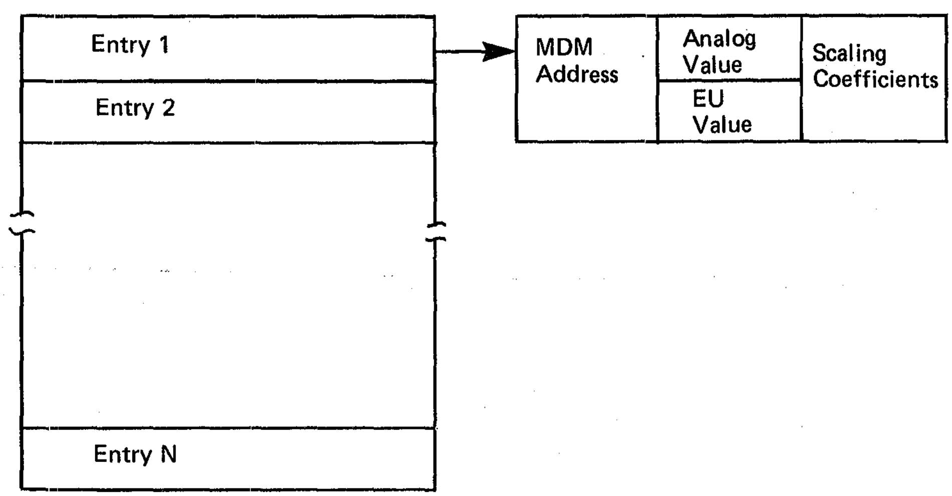

Figure A.2.21-1. Analog Information Table (ANIT)

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	MDM Address	CSPS_ANIT_MDM	Device ID, MIA, module and channel of MDM (Same format as CST) Initial Value - Level C Dependent	BIT (16)
2	Analog Value	CSPS_ANIT_PCM_COUNT	Output value in PCM count - Initialized to zero.	INTEGER
3	Scaling Coefficients	CSPS_ANIT_A1 CSPS_ANIT_AO	Coefficient used by Analog scaling to perform backward scaling of display item entry. A1 followed by AO. Initial Values - Level C Dependent	SCALAR
4	EU Value	CSPS_ANIT_EU	Value input from keyboard via item entry - Initialized to zero	SCALAR

TABLE NAME: ANIT

758

BOOK: OFT SM Detailed Design Specification

A.2.22 SM Hybrid Dispatcher Table Compool: SHD_HYB_DISPATCH

The SM Hybrid Dispatcher Table provides the information used by the Special Processing Executive (via the Hybrid Dispatcher) to cyclically call the various processes and set the full execute flag in the appropriate cycles. The table consists of a phase count, frequency, and a case number. The table is mapped and initialized as follows:

Process	Phase Count	Frequency	Case #
Set Flag Cycle 1	1	HEX '000A'	15
Set Flag Cycle 7	7	HEX '000A'	15
DA (202, 201)*	1	HEX '000A'	1
DA (201)	7	HEX '000A'	1
Set Flag Cycle 5	5	HEX '800A'	15
PBD	1	HEX '8002'	10
APU	2	HEX '000A'	2
FC Comp	2	HEX '000A'	3
O_2/N_2	4	HEX '000A'	5
H_2O Pump	4	HEX '000A'	6
Standby Water Coolant	4	HEX '000A'	11
H_2O Boiler	6	HEX '000A'	9
Rec. Pos Tape	6	HEX '000A'	8
Hydraulic Fld Temp	6	HEX '000A'	7
FCP	8	HEX '000A'	4
AM	10	HEX '000A'	12
SP Out	10	HEX '000A'	14
Dummy Entry	0	HEX '0000'	0

*In Mode 202, frequency of 2 is used. In Mode 201, frequency of 10 is used.

Figure A.2.22-1. SM Hybrid Dispatcher Table

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	Phase Count	PC	Integer value giving the number of SP Exec cycles before calling the special process. The phase count initial value is the SP Exec cycle in which the process is called.	INTEGER
2	Frequency	FREQ	Bit 1 contains the active/inactive flag (ON=Inactive, OFF= Active) and tells whether or not to call the process. Bits 2-16 give the number of executive cycles to reset the phase count to when it reaches 0.	BIT (16)
3	Case Number	CASENO	The number which corresponds to the DO CASE number in the SP executive.	INTEGER

TABLE NAME: SM Hybrid Dispatcher Table

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BOOK: OFT SM Detailed Design Specification

A.2.24 Channel Status Table (CST) Compool: CSP_PLC

The Channel Status Table contains an entry for each unique MDM Address associated with an entry in the DIT. Each entry will contain an MDM Address, Channel Status Word, and an I/O Status Word. The Channel Status Word will be initialized to represent an invalid I/O status (HEX'4000').

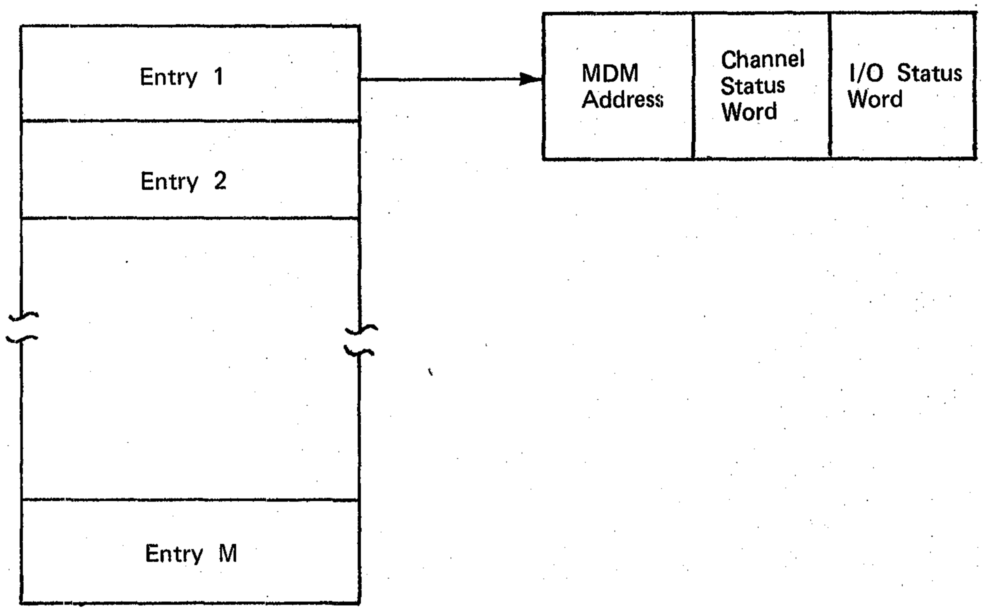

Figure A.2.24-1. Channel Status Table

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1	MDM Address	CSPS_CST_MDM	Device ID, Mia, module, channel-2 bits, 5 bits, 4 bits, 5 bits reprectively, in 16 bits (from card) Initial Value - Level C Dependent	BIT (16)
2	Channel Status Word	CSPS_CST_CHAN	ON/OFF status of each discrete for an MDM address. Initialized to HEX'0000'	BIT (16)
3	I/O Status Word	CSPS_CST_IO	I/O status of the Channel Status word. Initialized to HEX'4000'.	BIT (16)

TABLE NAME: CST

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A.2.25 Mass Memory Common Buffer (CVN_MM_UTILITY)

This buffer contains the SM MM Common Buffer and various communication flags. The Common Buffer is a buffer shared by the following processes: TM Checkpoint, TFL, SCM, MM Patch Checkpoint Restore, and PDI. These processes (except Checkpoint Restore) must contend for the buffer by checking the buffer in use flag. If the buffer is free, the process will set the flag on, thus preventing any other process from accessing the buffer at the same time. At the end of processing, the buffer is freed by resetting the flag off.

The buffer is also shared between memory configuration, i.e., MM Patch in SM2 vs. MM Patch in PL 9. Different buffer lengths are used in the processes dependent on the memory configuration for which the process is defined, e.g., MM Patch in PL9 uses an approximate buffer length of 16, 384 halfwords while MM Patch in SM2 uses an approximate buffer length of 2048 halfwords. The varying of buffer length is accomplished at link - edit time. The following buffer description refers to the shortened buffer length which is used in SM2.

Common Buffer in Use Flag
Buffer Status
LDB Response Adjustment
I/O Transaction Status Words
Residual Word Count
Error Group Code
Common Buffer
Checksum

Figure A.2.25-1 MM Common Buffer

TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
1.	Common Buffer in Use Flag	CDHB_COM_BUF_INUSE	Flag indicating the SM MM Common Buffer is in use by another process. Initial value = BIN'0'	BIT(1)
2	Buffer Status	CDHV_BUF_STAT	Area containing Common Buffer Status for display. Initial value = 'BSYRDY'	CHAR(6)
3	LDB Response Adjustment	CDHV_DGO_ADJ	LDB Response Adjustment. For use by VCO processes using Common Buffer	ARRAY(3) INTEGER
4	I/O Transaction Status Words	CDHV_RW_TSW	Transaction Status Word. Indicates a Mass Memory failure.	INTEGER DOUBLE
5	Residual Word Count	CDHV_RWCT	Number of words not transferred on an I/O operation.	INTEGER
6	Error Group Code	CDHV_ERRCD	Error Group Code. Pointer to more FCOS data on an I/O error.	BIT(16)
7	Common Buffer (Checkpoint Buffer)	CDHV_BLOCKS	SM MM Common Buffer	ARRAY (4,5,12) INTEGER
8	Checksum	CDHV_CHK_SUM	Location for Checksum generation	INTEGER

TABLE NAME: MM Common Buffer

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```
MEMBER NAME  CRBMCI
C***************************************************************************
C***************************************************************************
C**                                                                        **
C**                                                                        **
C**     A.2.30                   RAW DATA COMPOOL (CRB_MCI)                **
C**                                                                        **
C**     INPUT READ BUFFER. CONTAINS BITE AND RAW MCIU INPUT DATA          **
C**                                                                        **
C**                                                                        **
C***************************************************************************
C***************************************************************************
 CRB_MCI:
          COMPOOL RIGID;
 STRUCTURE CRB_MCIU_DATA DENSE RIGID:
  1 CRBV_FCOS_MCIU_STATUS INTEGER,
C                                           ITEM-
C                                           FSSR-MCIU_I/O_FLAG
C                                           DESC-MCIU I/O TRANSACTIONS STATUS
C                                                FLAG (1=OK)  mmL# none
  1 CRBV_FCOS_STATUS2 BIT(16),
C                                           ITEM-
C                                           FSSR-
C                                           DESC-
C                                           MML#-none
  1 CRBV_RES_WD_CT BIT(16),
C                                           ITEM-
C                                           FSSR-
C                                           DESC-
C                                           MML#-none
  1 CRBV_FCOS_PT_ERR_LOG BIT(16);
C                                           ITEM-
C                                           FSSR-
C                                           DESC-
C                                           MML#-none
 DECLARE CRB_MCIU_DATA CRB_MCIU_DATA-STRUCTURE INITIAL(0,BIN'0',BIN'0',
         BIN'0');
 STRUCTURE CRB_MCIU_SUBTREE0 DENSE RIGID:
  1 CRBV_WORD1,                              (MCIU/RCD)
C                                           DESC-BITE STATUS REGISTER
C                                           MML#- word 1            V54M3401P
C                                                 word 2            V54M3402P
C                                                 word 3            V54M3403P
C                                                 word 4            V54M3404P
    2 CRBB_GPC_COMM_FAIL BIT(1),
C                                           ITEM-
C                                           FSSR-
C                                           DESC-GPC COMMUNICATION FAILURE
C                                                1=ERROR DETECTED
C                                           MML#-                   V54X2001J
    2 CRBB_WD1_SPARE1 BIT(1),
C
    2 CRBB_DC_MCIU_COMM BIT(1),
C                                           (MCIU/RCD)
C                                           ITEM-D&C COMMUNICATION FAILURE
C                                                DISCRETE
C                                           FSSR-C_AND_C_COMM_FAIL_FLAG
C                                           DESC-D&C COMMUNICATION FAILURE
C                                                1=ERROR DETECTED
```

```
MEMBER NAME  CRBMCI
C                                              MML#-                      V54X2003J
      2 CRBB_THER_CKT_FAIL BIT(1),
C                                              ITEM-
C                                              FSSR-THERMISTOR_FAIL_BITE_FLAG
C                                              DESC-THERMISTOR CIRCUIT FAILURE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2004J
      2 CRBB_WDL_SPARE2 BIT(1),
C
      2 CRBB_MADC_OUT_TOLER BIT(1),
C                                              ITEM-
C                                              FSSR-MCIU_CONV_OUT_TOL_BITE_FLAG
C                                              DESC-MADC OUT OF TOLERANCE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2006J
      2 CRBB_MCPC_OUT_TOLER BIT(1),
C                                              ITEM-
C                                              FSSR-MCIU_PWR_OUT_TOL_BITE_FLAG
C                                              DESC-MCPC OUT OF TOLERANCE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2007J
      2 CRBB_MCIU_ABE_FAILURE BIT(1),
C                                              ITEM-
C                                              FSSR-INTFAC_CNTL_FAIL_BITE_FLAG
C                                              DESC-INTERFACE CONTROL FAILURE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2008J
      2 CRBB_EE_FAIL BIT(1),
C                                              (MCIU/RCD)
C                                              ITEM-END-EFFECTOR FAILURE DISCRETE
C                                              FSSR-EE_FAIL_BITE_FLAG
C                                              DESC-END-EFFECTOR FAILURE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2009J
      2 CRBB_TACHOMETER_FAILURE BIT(1),
C                                              ITEM-
C                                              FSSR-
C                                              DESC-TACHOMETER FAILURE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2010J
      2 CRBB_MCIU_ABE_COMM_FAILURE BIT(1),
C                                              ITEM-
C                                              FSSR-MCIU_ABE_COMM_FAIL_BITE_FLAG
C                                              DESC-MCIU-ABE COMM FAILURE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2011J
      2 CRBB_MDA_FAILURE BIT(1),
C                                              ITEM-
C                                              FSSR-
C                                              DESC-MDA FAILURE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2012J
      2 CRBB_JPC_FAILURE BIT(1),
C                                              ITEM-
C                                              FSSR-
C                                              DESC-JPC FAILURE
C                                                   1=ERROR DETECTED
C                                              MML#-                      V54X2013J
```

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```
MEMBER NAME  CRBMCI
    2 CRBB_SPA_28V_POWER_FAILURE BIT(1),
C                                          ITEM-
C                                          FSSR-
C                                          DESC-SPA+28V POWER FAILURE
C                                               1=ERROR DETECTED
C                                          MML#-
C                                                                 V54X2014J
    2 CRBB_SPA_COMMUTATOR_FAILURE BIT(1),
C                                          ITEM-
C                                          FSSR-
C                                          DESC-SPA COMMUTATOR FAILURE
C                                               1=ERROR DETECTED
C                                          MML#-                  V54X2015J
    2 CRBB_WDL_SPARE3 BIT(1);
 DECLARE CRB_MCIU_SUBTREE0 CRB_MCIU_SUBTREE0-STRUCTURE(4) INITIAL(16#
        BIN'0');
 EQUATE EXTERNAL  TFIVMCI1 TO CREV_WORD1$(1;);
C    EQUATE FOR FCOS TO USE AS I/O BUFFER
 STRUCTURE CRB_MCIU_SUBTREE1 DENSE RIGID:
  1 CRBV_RAW_ENCOD BIT(16),
C                                          (MCIU/RCD)
C                                          ITEM-JOINT POSITION ENCODER SIGNAL
C                                          FSSR-JOINT_POS_ENCODER
C                                          DESC-WORD5-SHOULDER YAW ENCODER
C                                               WORD8-SHOULDER PITCH ENCODER
C                                               WORD11-ELBOW PITCH ENCODER
C                                               WORD14-WRIST PITCH ENCODER
C                                               WORD17-WRIST YAW ENCODER
C                                               WORD20-WRIST ROLL ENCODER
C                                          MML#-                  V54H2205J
C                                                                 V54H2305J
C                                                                 V54H2405J
C                                                                 V54H2505J
C                                                                 V54H2605J
C                                                                 V54H2705J
  1 CRBV_WORD6,
C                                          DESC-WORD6-SHOULDER YAW TACH DATA
C                                               WORD9-SHOULDER PITCH TACH DATA
C                                               WORD12-ELBOW PITCH TACH DATA
C                                               WORD15-WRIST PITCH TACH DATA
C                                               WORD18-WRIST YAW TACH DATA
C                                               WORD21-WRIST ROLL TACH DATA
C                                          MML#-                  V54M3406P
C                                                                 V54M3409P
C                                                                 V54M3412P
C                                                                 V54M3415P
C                                                                 V54M3418P
C                                                                 V54M3421P
    2 CRBV_RAW_TACH BIT(12),
C                                          (MCIU/RCD)
C                                          ITEM-RAW TACHOMETER SIGNAL
C                                          FSSR-TACH_OP
C                                          DESC-SHOULDER YAW TACH OUTPUT
C                                               SHOULDER PITCH TACH OUTPUT
C                                               ELBOW PITCH TACH OUTPUT
C                                               WRIST PITCH TACH OUTPUT
C                                               WRIST YAW TACH OUTPUT
C                                               WRIST ROLL TACH OUTPUT
```


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```
MEMBER NAME  CRBMCI
C                                          MML#-                        V54L2201J  017600AB
C                                                                       V54L2301J  017700AB
C                                                                       V54L2401J  017800AB
C                                                                       V54L2501J  017900AB
C                                                                       V54L2601J  018000AB
C                                                                       V54L2701J  018100AB
     2 CRBB_WD6_DUMMY1 BIT(1),                                                     018200AB
C                                          ITEM-                                   018300AB
C                                          FSSR-NONE                               018400AB
C                                               NONE                               018500AB
C                                               NONE                               018600AB
C                                               TBC                                018700AB
C                                               EE_RIGIDIZED_FLAG                  018800AB
C                                               TBD                                018900AB
C                                          DESC-NONE                               019000AB
C                                               NONE                               019100AB
C                                               NONE                               019200AB
C                                               END-EFFECTOR EXTENDED FLAG         019300AB
C                                               1=EXTENDED                         019400AB
C                                               END-EFFECTOR RIGIDIZED FLAG        019500AB
C                                               1=RIGIDIZED                        019600AB
C                                               END-EFFECTOR CLOSED FLAG           019700AB
C                                               1=CLOSED                           019800AB
C                                          MML#-                        NONE       019900AB
     2 CRBB_WD6_DUMMY2 BIT(1),                                                     020500AB
C                                          ITEM-                                   020600AB
C                                          FSSR-NONE                               020700AB
C                                               NONE                               020800AB
C                                               NONE                               020900AB
C                                               PL_CAPTURE                         021000AB
C                                               TBD                                021100AB
C                                               EE_DERIGID                         021200AB
C                                          DESC-NONE                               021300AB
C                                               NONE                               021400AB
C                                               NONE                               021500AB
C                                               PAYLOAD CAPTURED FLAG              021600AB
C                                               1=REQUESTED                        021700AB
C                                               END-EFFECTOR OPEN FLAG             021800AB
C                                               1=OPEN                             021900AB
C                                               END-EFFECTOR DERIGIDIZED FLAG      022000AB
C                                               1=DERIGIDIZED                      022100AB
C                                          MML#-                        NONE       022200AB
     2 CRBB_CRNT_SAT BIT(1),                                                       022800AB
C                                          ITEM-                                   022900AB
C                                          FSSR-JNT_CURRENT_SAT_FLAG               023000AB
C                                          DESC-SHOULDER YAW CURRENT SAT. FLAG     023100AB
C                                               SHOULDER PITCH CURRENT SAT. FLAG023200AB
C                                               ELBOW PITCH CURRENT SAT. FLAG      023300AB
C                                               WRIST PITCH CURRENT SAT. FLAG      023400AB
C                                               WRIST YAW CURRENT SAT. FLAG        023500AB
C                                               WRIST ROLL CURRENT SAT. FLAG       023600AB
C                                               1=SATURATED                        023700AB
C                                          MML#-                        V54X2211J  023800AB
C                                                                       V54X2311J  023900AB
C                                                                       V54X2411J  024000AB
C                                                                       V54X2511J  024100AB
C                                                                       V54X2611J  024200AB
C                                                                       V54X2711J  024300AB
```

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```
MEMBER NAME  CRBMCI
    2 CRBB_BKDRV BIT(1),
C                                      ITEM-
C                                      FSSR-
C                                      DESC-SHOULDER YAW FOR/BACK DR. DET.
C                                           SHOULDER PITCH FOR/BACK DR. DET.
C                                           ELBOW PITCH FOR/BACK DR. DET.
C                                           WRIST PITCH FOR/BACK DR. DET.
C                                           WRIST YAW FOR/BACK DR. DET.
C                                           WRIST ROLL FOR/BACK DR. DET.
C                                           1=BACK DRIVE
C                                      MML#-                      V54X2215J
C                                                                 V54X2315J
C                                                                 V54X2415J
C                                                                 V54X2515J
C                                                                 V54X2615J
C                                                                 V54X2715J
  1 CRBV_WORD7,                        (mctu/RCD)
C                                      DESC-WORD7-SHOULDER YAW PACKED DATA
C                                           WORD10-SHOULDER PITCH PACKED DAT
C                                           WORD13-ELBOW PITCH PACKED DATA
C                                           WORD16-WRIST PITCH PACKED DATA
C                                           WORD19-WRIST YAW PACKED DATA
C                                           WORD22-WRIST ROLL PACKED DATA
C                                      MML#-                      V54M3407P
C                                                                 V54M3410P
C                                                                 V54M3413P
C                                                                 V54M3416P
C                                                                 V54M3419P
C                                                                 V54M3422P
     2 CRBB_EEEU_BITE_FLAG BIT(1),
C                                      (MCIU/RCD)
C                                      ITEM-TBD
C                                           TBD
C                                           TBD
C                                           TBD
C                                           TBD
C                                           EE HARDWARE BITE DISCRETE
C                                      FSSR-NONE
C                                           NONE
C                                           NONE
C                                           NONE
C                                           NONE
C                                      DESC-SHOULDER BRACE RELEASE FLAG
C                                           SHOULDER PITCH EXTERNAL FLAG
C                                           ELBOW PITCH EXTERNAL FLAG
C                                           WRIST PITCH EXTERNAL FLAG
C                                           WRIST YAW EXTERNAL FLAG
C                                           END-EFFECTOR HARDWARE BITE FLAG
C                                           1=FAILED
C                                      MML#-                      V54X2223J
C                                                                 V54X2323J
C                                                                 V54X2423J
C                                                                 V54X2523J
C                                                                 V54X2623J
C                                                                 V54X2723J
    2 CRBB_WD7_SPARE1 BIT(8),
C
    2 CRBB_TACH_FAIL BIT(1),
```

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

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```
MEMBER NAME  CRBMCI
C                                        (MCIU/RCD)
C                                        ITEM-JOINT TACHOMETER FAILURE DISC.
C                                        FSSR-TACH_FAIL_FLAG
C                                        DESC-SHOULDER YAW TACH FAIL
C                                             SHOULDER PITCH TACH FAIL
C                                             ELBOW PITCH TACH FAIL
C                                             WRIST PITCH TACH FAIL
C                                             WRIST YAW TACH FAIL
C                                             WRIST ROLL TACH FAIL
C                                             1=FAILED
C                                        MML #-                    V54X2202J
C                                                                  V54X2302J
C                                                                  V54X2402J
C                                                                  V54X2502J
C                                                                  V54X2602J
C                                                                  V54X2702J
    2 CRBB_WD7_SPARE2 BIT(1),
C
    2 CRBB_MDA_FAIL BIT(1),
C                                        ITEM-
C                                        FSSR-MDA_FAIL_FLAG
C                                        DESC-SHOULDER YAW MDA FAIL
C                                             SHOULDER PITCH MDA FAIL
C                                             ELBOW PITCH MDA FAIL
C                                             WRIST PITCH MDA FAIL
C                                             WRIST YAW MDA FAIL
C                                             WRIST ROLL MDA FAIL
C                                             1=FAILED
C                                        MML #-                    V54X2220J
C                                                                  V54X2320J
C                                                                  V54X2420J
C                                                                  V54X2520J
C                                                                  V54X2620J
C                                                                  V54X2720J
    2 CRBB_JPC_FAIL BIT(1),
C                                        ITEM-
C                                        FSSR-JPC_FAIL_FLAG
C                                        DESC-NONE
C                                             SHOULDER/ELBOW JPC FAILURE
C                                             NONE
C                                             WRIST JPC FAILURE
C                                             NONE
C                                             NONE
C                                             1=ERROR DETECTED
C                                        MML #-                    NONE
C                                                                  V54X2350J
C                                                                  NONE
C                                                                  V54X2750J
C                                                                  NONE
C                                                                  NONE
    2 CRBB_SPA_28V_PWR_FAIL BIT(1),
C                                        ITEM-
C                                        FSSR-SPA_PWR_FAIL_FLAG
C                                        DESC-SHOULDER YAW SPA FAILURE
C                                             SHOULDER PITCH SPA FAILURE
C                                             ELBOW PITCH SPA FAILURE
C                                             WRIST PITCH SPA FAILURE
C                                             WRIST YAW SPA FAILURE
```

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```
MEMBER NAME  CRBMCI
C                                               WRIST ROLL SPA FAILURE
C                                               1=FAILED
C                                          MML#-
C                                                                    V54X2221J
C                                                                    V54X2321J
C                                                                    V54X2421J
C                                                                    V54X2521J
C                                                                    V54X2621J
C                                                                    V54X2721J
     2 CRBB_SPA_COMMUTATOR_FAIL BIT(1),
C                                          ITEM-
C                                          FSSR-SPA_CCMM_FAIL_FLAG
C                                          DESC-SHOULDER YAW SPA COMM FAILURE
C                                               SHOULDER PITCH SPA COMM FAILURE
C                                               ELBOW PITCH SPA COMM FAILURE
C                                               WRIST PITCH SPA COMM FAILURE
C                                               WRIST YAW SPA COMM FAILURE
C                                               WRIST ROLL SPA COMM FAILURE
C                                               1=FAILED
C                                          MML#-
C                                                                    V54X2222J
C                                                                    V54X2322J
C                                                                    V54X2422J
C                                                                    V54X2522J
C                                                                    V54X2622J
C                                                                    V54X2722J
     2 CRBB_WD7_SPARE3 BIT(1);
 DECLARE CRB_MCIU_SUBTREE1 CRB_MCIU_SUBTREE1-STRUCTURE(6) INITIAL(
          BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
          BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0');
 STRUCTURE CRB_MCIU_SUBTREE1A DENSE RIGID:
  1 CRBV_WORD23,
C                                          DESC-2'S COMPLEMENT ANALOG CHANNELS
C                                          MML# V54U3423J
     2 CRBV_SPARE_ANALOG_CHANNEL1 BIT(8),
C                                          ITEM-
C                                          FSSR-
C                                          DESC-SPARE ANALOG CHANNEL1
C                                          MML#-                    NONE
     2 CRBV_SPARE_ANALOG_CHANNEL2 BIT(8);
C                                          ITEM-
C                                          FSSR-
C                                          DESC-SPARE ANALOG CHANNEL2
C                                          MML#-                    NONE
 DECLARE CRB_MCIU_SUBTREE1A CRB_MCIU_SUBTREE1A-STRUCTURE INITIAL(
          BIN'0',BIN'0');
 STRUCTURE CRB_MCIU_SUBTREE2 DENSE RIGID:
  1 CRBV_WORD24,
C                                          DESC-WORD24-THC X&Y DEF. VALUES
C                                               WORD25 THC Z & RHC P DEF. VALUES
C                                               WORD26 RHC YAW & R DEF. VALUES
C                                          MML#-                     V54M3424P
C                                                                    V54M3425P
C                                                                    V54M3426P
     2 CRBV_RAW_SIG1 BIT(8),
C                                          (MCIU/RCD)
C                                          ITEM-RAW HAND CONTROLLER SIGNALS
C                                          FSSR-THC_SIGNAL
C                                               THC_SIGNAL
C                                               RHC_SIGNAL
```

MEMBER NAME CRBMCI

```
C                                         DESC-2'S COMP. X VALUE
C                                              2'S COMP. Z VALUE
C                                              2'S COMP. YAW VALUE
C                                         MML#-                   V72K3030J
C                                                                 V72K3032J
C                                                                 V72K3036J
    2 CRBV_RAW_SIG2 BIT(8);
C                                         (MCIU/RCD)
C                                         ITEM-RAW HAND CONTROLLER SIGNALS
C                                         FSSR-THC SIGNAL
C                                              RHC SIGNAL
C                                              RHC SIGNAL
C                                         DESC- 2'S COMP. Y VALUE
C                                               2'S COMP. PITCH VALUE
C                                               2'S COMP. ROLL VALUE
C                                         MML#-                   V72K3031J
C                                                                 V72K3035J
C                                                                 V72K3037J
 DECLARE CRB_MCIU_SUBTREE2 CRB_MCIU_SUBTREE2-STRUCTURE(3) INITIAL(
         BIN'0',BIN'0');
 STRUCTURE CRB_MCIU_SUBTREE3 DENSE RIGID:
  1 CRBV_WORD27,
C                                         DESC-WORD27-MOST RECENT MPX THRM.
C                                              WORD28-2ND MOST RECENT MPX THRM.
C                                              WORD29-3RD MOST RECENT MPX THRM.
C                                              WORD30-4TH MOST RECENT MPX THRM.
C                                         MML#-                   V54M3427P
C                                                                 V54M3428P
C                                                                 V54M3429P
C                                                                 V54M3430P
    2 CRBV_RAW_THRM BIT(8),
C                                         (MCIU/RCD)
C                                         ITEM-RAW THERMISTER PARAMETER
C                                         FSSR-THERMISTOR DATA
C                                         DESC-MULTIPLEXED THERMISTOR DATA
C                                         MML#-                   V54T2100J
C                                                                 V54T2120J
C                                                                 V54T2140J
C                                                                 V54T2160J
    2 CRBV_WD27_SPARE1 BIT(3),
C
    2 CRBV_RAW_THRM_ID BIT(5);
C                                         (MCIU/RCD)
C                                         ITEM-RAW THERMISTER IDENTIFIER
C                                         FSSR-THERMISTOR_IDENT
C                                         DESC-THERMISTOR IDENTIFIER
C                                         MML#-                   V54T2110J
C                                                                 V54T2130J
C                                                                 V54T2150J
C                                                                 V54T2170J
 DECLARE CRB_MCIU_SUBTREE3 CRB_MCIU_SUBTREE3-STRUCTURE(4) INITIAL(
         BIN'0',BIN'0',BIN'0');
 STRUCTURE CRB_MCIU_SUBTREE4 DENSE RIGID:
  1 CRBV_WORD31,
C                                         DESC-PACKED DISCRETES FROM D&C PANEL
C                                         MML#-                   V54M3431P
    2 CRBV_DC_WDO_ADDR BIT(5),
C                                         ITEM-
```

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```
MEMBER NAME  CRBMCI
C                                    FSSR-
C                                    DESC-D&C WORD0 ADDRESS          none
C                                    MML#-                      V72K2998J
    2 CRBB_JA_REQ BIT(1),
C                                    (MCIU/RCD)
C                                    ITEM-JOINT ANGLE SELECT DISCRETE
C                                    FSSR-PARAM_SW_JOINT
C                                    DESC-JOINT ANGLE SELECT FLAG
C                                        1=SELECTED
C                                    MML#-                      V72K3003J
    2 CRBB_VEL_XYZ_REQ BIT(1),
C                                    (MCIU/RCD)
C                                    ITEM-VELOCITY X/Y/Z SELECT DISCRETE
C                                    FSSR-PARAM_SW_VEL
C                                    DESC-VELOCITY X/Y/Z SELECT FLAG
C                                        1=SELECTED
C                                    MML#-                      V72K3004J
    2 CRBB_POSITION_XYZ_REQ BIT(1),
C                                    (MCIU/RCD)
C                                    ITEM-POSITION X/Y/Z SELECT DISCRETE
C                                    FSSR-PARAM_SW_POS
C                                    DESC-POSITION X/Y/Z SELECT FLAG
C                                        1=SELECTED
C                                    MML#-                      V72K3001J
    2 CRBB_ATTITUDE_PYR_REQ BIT(1),
C                                    (MCIU/RCD)
C                                    ITEM-ATTITUDE P/YAW/R SELECT DISCRETE
C                                    FSSR-PARAM_SW_ATT
C                                    DESC-ATTITUDE P/Y/R SELECT FLAG
C                                        1=SELECTED
C                                    MML#-                      V72K3002J
    2 CRBB_RATE_PYR_REQ BIT(1),
C                                    (MCIU/RCD)
C                                    ITEM-RATE P/YAW/R SELECT DISCRETE
C                                    FSSR-PARAM_SW_RATE
C                                    DESC-RATE P/Y/R SELECT FLAG
C                                        1=SELECTED
C                                    MML#-                      V72K3005J
    2 CRBB_PARM_TEST_REQ BIT(1),
C                                    (MCIU/RCD)
C                                    ITEM-TEST PARAMETER SELECT DISCRETE
C                                    FSSR-PARAM_SW_TEST
C                                    DESC-PARAMETER TEST SELECT FLAG
C                                        1=SELECTED
C                                    MML#-                      V72K3000J
    2 CRBB_MAN_ORB_REQ BIT(1),
C                                    (MCIU/RCD)
C                                    ITEM-MANUAL AUGMENTED ORBITER MODE
C                                        SELECT DISCRETE
C                                    FSSR-MAN_AUG_ORB_UNLOADED_MODE_REQ
C                                    DESC-MANUAL ORB UNLOADED SELECT FLAG
C                                        1=SELECTED
C                                    MML#-                      V72K2975J
    2 CRBB_MAN_EE_REQ BIT(1),
C                                    (MCIU/RCD)
C                                    ITEM-MANUAL AUGMENTED EE MODE SELECT
C                                        DISCRETE
C                                    FSSR-MAN_AUG_EE_MODE_REQ
```

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```
MEMBER NAME  CRBMCI
C                        DESC-MANUAL END EFF SELECT FLAG
C                             1=SELECTED
C                        MML#-                       V72K2976J
     2 CRBB_MAN_MIX_REQ BIT(1),
C                        (MCIU/RCD)
C                        ITEM-MANUAL AUGMENTED MIXED MODE
C                             SELECT DISCRETE
C                        FSSR-MAN_AUG_ORB_LOADED_MODE_REQ
C                        DESC-MANUAL ORB LOADED SELECT FLAG
C                             1=SELECTED
C                        MML#-                       V72K2977J
     2 CRBB_MAN_PYLD_REQ BIT(1),
C                        (MCIU/RCD)
C                        ITEM-MANUAL AUGMENTED PAYLOAD MODE
C                             SELECT DISCRETE
C                        FSSR-MAN_AUG_PL_MODE_REQ
C                        DESC-MANUAL_PL_SELECT_FLAG
C                             1=SELECTED
C                        MML#-                       V72K2978J
     2 CRBB_DC_WD0_PARITY BIT(1),
C                        ITEM-
C                        FSSR-
C                        DESC-D&C WORD0 PARITY          none
C                        MML#-                       V72K2997J
   1 CRBV_WORD32,
C                        DESC-PACKED DISCRETES FROM D&C PANEL
C                        MML#-                       V54M3432P
     2 CRBV_DC_WD1_ADDR BIT(5),
C                        ITEM-
C                        FSSR-
C                        DESC-D&C WORD1 ADDRESS         none
C                        MML#-                       V72K2986J
     2 CRBB_BRAKES_ON_CMD BIT(1),
C                        ITEM-
C                        FSSR-
C                        DESC-BRAKES ON COMMAND
C                             1=COMMANDED
C                        MML#-                       V72K2985J
     2 CRBB_JNT_REQ_SHY BIT(1),
C                        (MCIU/RCD)
C                        ITEM-SHOULDER YAW JOINT SELECT DISC.
C                        FSSR-JNT_SW_SHY
C                        DESC-SHOULDER YAW JOINT SELECT
C                             1=SELECTED
C                        MML#-                       V72K3010J
     2 CRBB_JNT_REQ_SHP BIT(1),
C                        (MCIU/RCD)
C                        ITEM-SHOULDER PITCH JOINT SELECT DISC
C                        FSSR-JNT_SW_SHP
C                        DESC-SHOULDER PITCH JOINT SELECT
C                             1=SELECTED
C                        MML#-                       V72K3011J
     2 CRBB_JNT_REQ_ELP BIT(1),
C                        (MCIU/RCD)
C                        ITEM-ELBOW PITCH JOINT SELECT DISC.
C                        FSSR-JNT_SW_ELP
C                        DESC-ELBOW PITCH JOINT SELECT
C                             1=SELECTED
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MEMBER NAME  CRBMCI
C                                    MML#-                   V72K3012J  059200AB
     2 CRBB_JNT_REQ_WRP BIT(1),                                         059300AB
C                                    (MCIU/RCD)                         059400AB
C                                    ITEM-WRIST PITCH JOINT SELECT DISC. 059500AB
C                                    FSSR-JNT_SW_WRP                    059600AB
C                                    DESC-WRIST PITCH JOINT SELECT      059700AB
C                                         1=SELECTED                    059800AB
C                                    MML#-                   V72K3013J  059900AB
     2 CRBB_JNT_REQ_WRY BIT(1),                                         060000AB
C                                    (MCIU/RCD)                         060100AB
C                                    ITEM-WRIST YAW JOINT SELECT DISC.  060200AB
C                                    FSSR-JNT_SW_WRY                    060300AB
C                                    DESC-WRIST YAW JOINT SELECT        060400AB
C                                         1=SELECTED                    060500AB
C                                    MML#-                   V72K3014J  060600AB
     2 CRBB_JNT_REQ_WRR BIT(1),                                         060700AB
C                                    (MCIU/RCD)                         060800AB
C                                    ITEM-WRIST ROLL JOINT SELECT DISC. 060900AB
C                                    FSSR-JNT_SW_WRR                    061000AB
C                                    DESC-WRIST ROLL JOINT SELECT       061100AB
C                                         1=SELECTED                    061200AB
C                                    MML#-                   V72K3015J  061300AB
     2 CRBB_SINGL_DIR_POS BIT(1),                                       061400AB
C                                    (MCIU/RCD)                         061500AB
C                                    ITEM-SINGLE DIRECT DRIVE POSITIVE  061600AB
C                                         DISCRETE                      061700AB
C                                    FSSR-SINGL_DIR_DRIVE_POS_FLAG      061800AB
C                                    DESC-SINGLE DIRECT DRIVE POSITIVE  061900AB
C                                         1=SELECTED                    062000AB
C                                    MML#-                   V72K3020J  062100AB
     2 CRBB_SINGL_DIR_NEG BIT(1),                                       062200AB
C                                    (MCIU/RCD)                         062300AB
C                                    ITEM-SINGLE DIRECT DRIVE NEGATIVE  062400AB
C                                         DISCRETE                      062500AB
C                                    FSSR-SINGL_DIR_DRIVE_NEG_FLAG      062600AB
C                                    DESC-SINGLE_DIRECT_DRIVE_NEGATIVE  062700AB
C                                         1=SELECTED                    062800AB
C                                    MML#-                   V72K3021J  062900AB
     2 CRBB_EE_TEMP_REQ BIT(1),                                         063000AB
C                                    (MCIU/RCD)                         063100AB
C                                    ITEM-END EFFECTOR TEMP JOINT SELECT 063200AB
C                                         DISCRETE                      063300AB
C                                    FSSR-JNT_SW_EE_TEMP                063400AB
C                                    DESC-END EFFECTOR TEMP JOINT SELECT 063500AB
C                                         1=SELECTED                    063600AB
C                                    MML#-                   V72K3016J  063700AB
     2 CRBB_DC_WD1_PARITY BIT(1),                                       063800AB
C                                    ITEM-                              063900AB
C                                    FSSR-                   none       064000AB
C                                    DESC-D&C WORD1 PARITY              064100AB
C                                    MML#-                   V72K2987J  064200AD
   1 CRBV_WORD33,                                                       064300AB
C                                    DESC-PACKED DISCRETES FROM D&C PANEL 064400AB
C                                    MML#-                   V54M3433P  064500AB
     2 CRBV_DC_WD2_ADDR BIT(5),                                         064600AB
C                                    ITEM-                              064700AB
C                                    FSSR-                              064800AB
C                                    DESC-D&C WORD2 ADDRESS             064900AB
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                                                    nonE
C                                  MML#-            ~~V72K2969J~~
    2 CRBB_SINGL_JNT_REQ BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-SINGLE JOINT MODE SELECT
C                                       DISCRETE
C                                  FSSR-SINGLE_JOINT_MODE_REQ
C                                  DESC-SINGLE MODE SELECT
C                                       1=SELECTED
C                                  MML#-            V72K2979J
    2 CRBB_DIRECT_REQ BIT(1),
C                                  ITEM-
C                                  FSSR-
C                                  DESC-DIRECT_MODE_SELECT
C                                       1=SELECTED
C                                  MML#-            V72K2980J
    2 CRBB_OPR_CMD_REQ BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-OPERATOR COMMAND MODE SELECT
C                                       DISCRETE
C                                  FSSR-OPR_CMD_MODE_REQ
C                                  DESC-OPR CMD SELECT
C                                       1=SELECTED
C                                  MML#-            V72K2970J
    2 CRBB_AUTO_1_REQ BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-AUTO SEQUENCE 1 MODE SELECT
C                                       DISCRETE
C                                  FSSR-AUTO_SEQ_MODE_SEL
C                                  DESC-AUTOMATIC SEQUENCE MODE SELECT
C                                       1=SELECTED
C                                  MML#-            V72K2971J
    2 CRBB_AUTO_2_REQ BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-AUTO SEQUENCE 2 MODE SELECT
C                                       DISCRETE
C                                  FSSR-AUTO_SEQ_MODE_SEL
C                                  DESC-AUTOMATIC SEQUENCE MODE SELECT
C                                       1=SELECTED
C                                  MML#-            V72K2972J
    2 CRBB_AUTO_3_REQ BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-AUTO SEQUENCE 3 MODE SELECT
C                                       DISCRETE
C                                  FSSR-AUTO_SEQ_MODE_SEL
C                                  DESC-AUTOMATIC SEQUENCE MODE SELECT
C                                       1=SELECTED
C                                  MML#-            V72K2973J
    2 CRBB_AUTO_4_REQ BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-AUTO SEQUENCE 4 MODE SELECT
C                                       DISCRETE
C                                  FSSR-AUTO_SEQ_MODE_SEL
C                                  DESC-AUTOMATIC SEQUENCE MODE SELECT
C                                       1=SELECTED
C                                  MML#-            V72K2974J
    2 CRBB_TEST_REQ BIT(1),
C                                  (MCIU/RCD)
C                                  ITEM-TEST MODE SELECT DISCRETE
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MEMBER NAME  CRBMCI
C                                        FSSR-TEST_MODE_REQ                   070800AB
C                                        DESC-TEST MODE REQUESTED             070900AB
C                                            1=REQUESTED                      071000AB
C                                        MML#-                    V72K2981J   071100AB
    2 CRBB_CONTROL_MODE_ENTER BIT(1),                                         071200AB
C                                        (MCIU/RCD)                           071300AB
C                                        ITEM-CONTROL MODE ENTER DISCRETE     071400AB
C                                        FSSR-CONTROL_MODE_ENTER              071500AB
C                                        DESC-CONTROL MODE ENTERED            071600AB
C                                            1=ENTERED                        071700AB
C                                        MML#-                    V72K2982J   071800AB
    2 CRBB_CRIT_TEMP_REQ BIT(1),                                              071900AB
C                                        (MCIU/RCD)                           072000AB
C                                        ITEM-CRITICAL TEMP SELECT DISCRETE   072100AB
C                                        FSSR-JNT_SW_CRIT_TEMP                072200AB
C                                        DESC-CRITICAL TEMP JOINT SELECT      072300AB
C                                            1=SELECTED                       072400AB
C                                        MML#-                    V72K3017J   072500AB
    2 CRBB_DC_WD2_PARITY BIT(1),                                              072600AB
C                                        ITEM-                                072700AB
C                                        FSSR-                    none        072800AB
C                                        DESC-D&C WORD2 PARITY                072900AB
C                                        MML#-                    V72K2960J   073000AD
  1 CRBV_WORD34,                                                              073100AB
C                                        DESC-PACKED DISCRETES FROM D&C PANEL 073200AB
C                                        MML#-                    V54M3434P   073300AB
    2 CRBV_DC_WD3_ADDR BIT(5),                                                073400AB
C                                        ITEM-                                073500AB
C                                        FSSR-                    none        073600AB
C                                        DESC-D&C WORD3 ADDRESS               073700AB
C                                        MML#                     V72K2967J   073800AD
    2 CRBB_SEQ_PROCEED BIT(1),                                                073900AB
C                                        (MCIU/RCD)                           074000AB
C                                        ITEM-AUTO SEQUENCE PROCEED DISCRETE  074100AB
C                                        FSSR-SEQ_PROCEED_REQ                 074200AB
C                                        DESC-AUTO SEQUENCE PROCEED           074300AB
C                                            1=PROCEED                        074400AB
C                                        MML#-                    V72K2983J   074500AB
    2 CRBB_SEQ_STOP BIT(1),                                                   074600AB
C                                        (MCIU/RCD)                           074700AB
C                                        ITEM-AUTO SEQUENCE STOP DISCRETE     074800AB
C                                        FSSR-SEQ_STOP_REQ                    074900AB
C                                        DESC-AUTO SEQUENCE STOP              075000AB
C                                            1=STOP                           075100AB
C                                        MML#-                    V72K2984J   075200AB
    2 CRBB_WD34_SPARE1 BIT(1),                                                075300AB
C                                                                             075400AB
    2 CRBB_RMS_MASTER_ALARM_RESET BIT(1),                                     075500AB
C                                        ITEM-                                075600AB
C                                        FSSR-                                075700AB
C                                        DESC-RMS MASTER ALARM RESET          075800AB
C                                            1=RESET                          075900AB
C                                        MML#-                    V72K2916J   076000AB
    2 CRBB_SAFING_INITIATE BIT(1),                                            076100AB
C                                        ITEM-                                076200AB
C                                        FSSR-                                076300AB
C                                        DESC-SAFING INITIATE                 076400AB
C                                            1=CN                             076500AB
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MEMBER NAME  CRBMCI
C                                                       MML#-                        V72K2988J  076600AB
      2 CRBB_SAFING_CANCEL BIT(1),                                                              076700AB
C                                                       ITEM-                                   076800AB
C                                                       FSSR-                                   076900AB
C                                                       DESC-SAFING CANCEL                      077000AB
C                                                            1=ON                               077100AB
C                                                       MML#-                        V72K2989J  077200AB
      2 CRBB_VERNIER_RATE_REQ BIT(1),                                                           077210AD
C                   (MCIU/RCD)                                                                  077220AD
C                ITEM - VERNIER RATE SELECT DISCRETE                                            077230AD
C                                                       FSSR-VERNIER_SCALING_REQ                077300AB
C                                                       DESC-VERNIER RATE SELECT                077400AB
C                                                            1=VERNIER                          077500AB
C                                                       MML#-                        V72K3027J  077600AB
      2 CRBB_RATE_HOLD_REQ BIT(1),                                                              077700AB
C                                                       (MCIU/RCD)                              077800AB
C                                                       ITEM-RATE HOLD SELECT DISCRETE          077900AB
C                                                       FSSR-RATE_HOLD_REQ                      078000AB
C                                                       DESC-RATE HOLD SELECT                   078100AB
C                                                            1=REQUESTED                        078200AB
C                                                       MML#-                        V72K3028J  078300AD
      2 CRBB_PORT_TEMP_REQ BIT(1),                                                              078400AB
C                                                       (MCIU/RCD)                              078500AB
C                                                       ITEM-PORT TEMP LED/ABE/ID DISCRETE      078600AB
C                                                       FSSR-PARAM_SW_PORT_TEMP                 078700AB
C                                                       DESC-PORT TEMP LED/ABE/ID SELECT        078800AB
C                                                            1=SELECTED                         078900AB
C                                                       MML#-                        V72K3006J  079000AB
      2 CRBB_STBD_TEMP_REQ BIT(1),                                                              079100AB
C                                                       (MCIU/RCD)                              079200AB
C                                                       ITEM-STBD TEMP LED/ABE/ID DISCRETE      079300AB
C                                                       FSSR-PARAM_SW_STRBD_TEMP                079400AB
C                                                       DESC-STBD TEMP LED/ABE/ID SELECT        079500AB
C                                                            1=SELECTED                         079600AB
C                                                       MML#-                        V72K3007J  079700AB
      2 CRBB_DC_WD3_PARITY BIT(1),                                                              079800AB
C                                                       ITEM-                                   079900AB
C                                                       FSSR-                                   080000AB
C                                                       DESC-D&C WORD3 PARITY        none       080100AB
C                                                       MML#-                        ~~TBD~~    080200AB
   1 CRBV_WORD35,                                                                               080300AB
C                                                       DESC-PACKED DISCRETES FROM D&C PANEL    080400AB
C                                                       MML#-                        V54M3435P  080500AB
      2 CRBV_DC_WD4_ADDR BIT(5),                                                                080600AB
C                                                       ITEM-                                   080700AB
C                                                       FSSR-                                   080800AB
C                                                       DESC-D&C WORD4 ADDRESS        none      080900AB
C                                                       MML#-                        ~~V72K3038J~~  081000AD
      2 CRBB_CAPTURE_SELECT BIT(1),                                                             081100AB
C                                                       ITEM-                                   081200AB
C                                                       FSSR-                                   081300AB
C                                                       DESC-CAPTURE SELECT                     081400AB
C                                                            1=ON                               081500AB
C                                                       MML#-                        V72K3025J  081600AB
      2 CRBB_REL_SEL BIT(1),                                                                    081700AB
C                                                       ITEM-                                   081800AB
C                                                       FSSR-                                   081900AB
C                                                       DESC-RELEASE SELECT                     082000AB
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MEMBER NAME  CRBMCI
C                                                   1=CN                                   082100AB
C                                                MML#-                      V72K3026J    082200AB
    2 CRBB_WD35_SPARE1 BIT(1),                                                           082300AB
C                                                                                        082400AB
    2 CRBB_PORT_SHOULDER_BRACE_SEL BIT(1),                                               082500AB
C                                                ITEM-                                   082600AB
C                                                FSSR-                                   082700AB
C                                                DESC-PORT SHOULDER BRACE SELECT         082800AB
C                                                    1=ON                                082900AB
C                                                MML#-                      TBD          083000AB
    2 CRBB_STBD_SHOULDER_BRACE_SEL BIT(1),                                  V72K3039J    083100AB
C                                                ITEM-                                   083200AB
C                                                FSSR-                                   083300AB
C                                                DESC-STARBOARD SHOULDER BRACE SELECT    083400AB
C                                                    1=CN                                083500AB
C                                                MML#-                      V72K3040J    083600AD
    2 CRBB_EE_AUTO_MODE_SEL BIT(1),(mcIu/RCD)                                            083700AD
C                                                ITEM-EE AUTO                            083800AD
C                                                FSSR-EE_AUTO_FLAG                       083900AD
C                                                DESC-EE AUTO MODE SELECT   V72K2990J    084000AD
C                                                MML#-                      TBD          084300AD
    2 CRBB_EE_MANUAL_MODE_SEL BIT(1),(mcIu/RCD)                                          084400AD
C                                                ITEM-EE MANUAL                          084410AD
C                                                FSSR-EE_MAN_FLAG                        084420AD
C                                                DESC-EE MANUAL MODE SELECT              084430AD
C                                                MML#-                      TBD          084440AD
C                                                                           V72K2991J    084500AB
    2 CRBB_MAN_CONTROL_RIGIDIZE_SEL BIT(1),                                              084600AB
C                                                ITEM-                                   084700AB
C                                                FSSR-                                   084800AB
C                                                DESC-MANUAL CONTROL RIGIDIZE SELECT     084900AB
C                                                    1=CN                                085000AB
C                                                MML#-                      V72K2992J    085100AB
    2 CRBB_MAN_CONTROL_DERIGIDIZE_SEL BIT(1),                                            085200AB
C                                                ITEM-                                   085300AB
C                                                FSSR-                                   085400AB
C                                                DESC-MANUAL CONTROL DERIGIDIZE SELECT085500AB
C                                                    1=CN                                085600AB
C                                                MML#-                      V72K2993J    085700AB
    2 CRBB_WD35_SPARE3 BIT(1),                                                           085800AB
C                                                                                        085900AB
    2 CRBB_DC_WD4_PARITY BIT(1),                                                         086000AB
C                                                ITEM-                                   086100AB
C                                                FSSR-                      none         086200AB
C                                                DESC-D&C WORD4 PARITY                   086300AB
C                                                MML#-                      V72K3041J    086400AD
  1 CRBV_WORD36,                                                                         086500AB
C                                                DESC-D&C WORD5 ADDRESS AND PARITY       086600AB
C                                                MML#-                      V54MB444P    086700AD
    2 CRBV_DC_WD5_ADDR BIT(5),                                              V54U3436J    086800AB
C                                                ITEM-                                   086900AB
C                                                FSSR-                                   087000AB
C                                                DESC-D&C WORD5 ADDRESS                  087100AB
C                                                MML#-                      V72K3042J    087200AD
    2 CRBV_WORD36_SPARE1 BIT(10),                                           none         087300AB
C                                                                                        087400AB
    2 CRBB_DC_WD5_PARITY BIT(1),                                                         087500AB
C                                                ITEM-                                   087600AB
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MEMBER NAME  CRBMCI
C                                          FSSR-                                 nonE        087700AB
C                                          DESC-D&C WORD5 PARITY                             087800AB
C                                          MML#-                              V72K3043J      087900AD
  1 CRBV_WORD37,                                                                             088000AB
C                                          DESC-D&C WORD6 ADDRESS AND PARITY                 088100AB
C                                          MML#-                              V54M3445P      088200AD
    2 CRBV_DC_WD6_ADDR BIT(5),                                               nonE            088300AB
C                                          ITEM-                                             088400AB
C                                          FSSR-                                             088500AB
C                                          DESC-D&C WORD6 ADDRESS              nonE          088600AB
C                                          MML#-                              V72K3044J      088700AD
    2 CRBV_DC_TO_MCIU_TEST_WORD BIT(10),                                                     088800AD
C                                          ITEM                                              088810AD
C                                          FSSR                                              088820AD
C                                          DESC-D&C TO MCIU TEST WORD                        088830AD
C                                          MML#-                              V72K3045J      088840AD
C                                                                          V54U3437J         088900AB
    2 CRBB_DC_WD6_PARITY BIT(1),                                                             089000AB
C                                          ITEM-                                             089100AB
C                                          FSSR-                                             089200AB
C                                          DESC-D&C WORD6 PARITY               nonE          089300AB
C                                          MML#-                              V72K3046J      089400AD
  1 CRBV_WORD38,                                                                             089500AB
C                                          DESC-TEST ADDRESSES                               089600AB
C                                          MML#-                              V54M3446P      089700AD
    2 CRBB_COMBINED_RAM BIT(1),                                           V54M3438P          089800AB
C                                          ITEM-                                             089900AB
C                                          FSSR-                                             090000AB
C                                          DESC-COMBINED RAM BIT                             090100AB
C                                          MML#-                              V72K3047J      090200AD
    2 CRBV_WD38_SPARE1 BIT(2),                                                               090300AB
C                                                                          V54X2850J         090400AB
    2 CRBB_CPU_TEST BIT(1),                                                                  090500AB
C                                          ITEM-                                             090600AB
C                                          FSSR-                                             090700AB
C                                          DESC-CPU TEST                      V54K2853J      090800AB
C                                          MML#-                              V72K3048J      090900AD
    2 CRBB_RAM_TEST_ADDR_300_3FF BIT(1),                                                     091000AB
C                                          ITEM-                                             091100AB
C                                          FSSR-                                             091200AB
C                                          DESC-RAM TEST ADDRESS 300 TO 3FF                  091300AB
C                                          MML#-                              V72K3049J      091400AD
    2 CRBB_RAM_TEST_ADDR_200_2FF BIT(1),                                  V54X2854J          091500AB
C                                          ITEM-                                             091600AB
C                                          FSSR-                                             091700AB
C                                          DESC-RAM TEST ADDRESS 200 TO 2FF                  091800AB
C                                          MML#-                              V72K3051J      091900AD
    2 CRBB_RAM_TEST_ADDR_100_1FF BIT(1),                                                     092000AB
C                                          ITEM-                              V54X2855J      092100AB
C                                          FSSR-                                             092200AB
C                                          DESC-RAM TEST ADDRESS 100 TO 1FF                  092300AB
C                                          MML#-                              V72K3052J      092400AD
    2 CRBB_RAM_TEST_ADDR_000_0FF BIT(1),                                                     092500AB
C                                          ITEM-                              V54X2856J      092600AB
C                                          FSSR-                                             092700AB
C                                          DESC-RAM TEST ADDRESS 000 TO 0FF                  092800AB
C                                          MML#-                              V72K3053J      092900AD
    2 CRBB_ROM_TEST_ADDR_E00_FFF BIT(1),                                  V54V2857J          093000AB
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MEMBER NAME  CRBMCI
                                            ITEM-                                          093100AB
                                            FSSR-                                          093200AB
                                            DESC-ROM TEST ADDRESS E00 TO FFF               093300AB
                                            MML#-                         V72K3054J        093400AD
   2 CRBB_ROM_TEST_ADDR_C00_DFF BIT(1),                                   V54V2858J        093500AB
                                            ITEM-                                          093600AB
                                            FSSR-                                          093700AB
                                            DESC-ROM TEST ADDRESS C00 TO DFF               093800AB
                                            MML#-                         V72K3055J        093900AD
   2 CRBB_ROM_TEST_ADDR_A00_BFF BIT(1),                                   V54V2859J        094000AB
                                            ITEM-                                          094100AB
                                            FSSR-                                          094200AB
                                            DESC-ROM TEST ADDRESS A00 TO BFF               094300AB
                                            MML#-                         V72K3056J        094400AD
   2 CRBB_ROM_TEST_ADDR_800_9FF BIT(1),                                   V54V2860J        094500AB
                                            ITEM-                                          094600AB
                                            FSSR-                                          094700AB
                                            DESC-ROM TEST ADDRESS 800 TO 9FF               094800AB
                                            MML#-                         V72K3057J        094900AD
   2 CRBB_ROM_TEST_ADDR_600_7FF BIT(1),                                   V54V2861J        095000AB
                                            ITEM-                                          095100AB
                                            FSSR-                                          095200AB
                                            DESC-ROM TEST ADDRESS 600 TO 7FF               095300AB
                                            MML#-                         V72K3058J        095400AD
   2 CRBB_ROM_TEST_ADDR_400_5FF BIT(1),                                   V54V2862J        095500AB
                                            ITEM-                                          095600AB
                                            FSSR-                                          095700AB
                                            DESC-ROM TEST ADDRESS 400 TO 5FF               095800AB
                                            MML#-                         V72K3059J        095900AD
   2 CRBB_ROM_TEST_ADDR_200_3FF BIT(1),                                   V54V2863J        096000AB
                                            ITEM-                                          096100AB
                                            FSSR-                                          096200AB
                                            DESC-ROM TEST ADDRESS 200 TO 3FF               096300AB
                                            MML#-                         V72K3060J        096400AD
   2 CRBB_ROM_TEST_ADDR_000_1FF BIT(1),                                   V54V2864J        096500AB
                                            ITEM-                                          096600AB
                                            FSSR-                                          096700AB
                                            DESC-ROM TEST ADDRESS 000 TO 1FF               096800AB
                                            MML#-                         V72K3061J        096900AD
 1 CRBV_WORD39,                                                           V54V2865J        097000AB
                                            DESC-UNASSIGNED; CONTENT ARBITRARY             097100AB
                                            MML#-                         V54M3439P        097200AB
   2 CRBV_WORD39_SPARE1 BIT(16),                                                           097300AB
                                                                                           097400AB
 1 CRBV_WORD40,                                                                            097500AB
                                            DESC-UNASSIGNED; CONTENT ARBITRARY             097600AB
                                            MML#-                         V54M3440P        097700AB
   2 CRBV_WORD40_SPARE1 BIT(16),                                                           097800AB
                                                                                           097900AB
 1 CRBV_WORD41,                                                                            098000AB
                                            DESC-UNASSIGNED; CONTENT ARBITRARY             098100AB
                                            MML#-                         V54M3441P        098200AB
   2 CRBV_WORD41_SPARE1 BIT(16),                                                           098300AB
                                                                                           098400AB
 1 CRBV_WORD42,                                                                            098500AB
                                            DESC-HARDWARE STATUS DATA FROM MCIU            098600AB
                                            MML#-                         V54M3442P        098700AB
   2 CRBB_MCIU_FAIL BIT(1),                                                                098800AB
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REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

MEMBER NAME CRBMCI

```
C                                   (MCIU/RCD)                                   098900AB
C                                   ITEM-MCIU FAILURE WARNING DISCRETE           099000AB
C                                   FSSR-                                        099100AB
C                                   DESC-MCIU FAILURE WARNING                    099200AB
C                                       1=WARNING                                099300AB
C                                   MML#-                      V54X2020J         099400AB
    2 CRBB_WD42_SPARE1 BIT(2),                                                   099500AD
C                                                                                099600AB
    2 CRBB_PORT_ARM_ACT BIT(1),                                                  099700AB
C                                   (MCIU/RCD)                                   099800AB
C                                   ITEM-PORT ARM SELECTED                       099900AB
C                                   FSSR-PORT_ARM_SEL                            100000AB
C                                   DESC-PORT ARM SELECT                         100100AB
C                                       1=SELECTED                               100200AB
C                                   MML#                       V54X2025J         100300AB
    2 CRBB_STBD_ARM_ACT BIT(1),                                                  100400AB
C                                   (MCIU/RCD)                                   100500AB
C                                   ITEM-STBD ARM SELECTED                       100600AB
C                                   FSSR-STRBD_ARM_SEL                           100700AB
C                                   DESC-STARBOARD ARM SELECT                    100800AB
C                                       1=SELECTED                               100900AB
C                                   MML#-                      V54X2026J         101000AB
    2 CRBB_GPC_FAIL BIT(1),                                                      101100AB
C                                   (MCIU/RCD)                                   101200AB
C                                   ITEM-GPC DATA FAILURE WARNING                101300AB
C                                       DISCRETE                                 101400AB
C                                   FSSR-                                        101500AB
C                                   DESC-GPC DATA FAILURE WARNING                101600AB
C                                       1=WARNING                                101700AB
C                                   MML#-                      V54X2022J         101800AB
    2 CRBB_SAFING_IN_PROG BIT(1),                                                101900AB
C                                   (MCIU/RCD)                                   102000AB
C                                   ITEM-SAFING IN PROGRESS DISCRETE             102100AB
C                                   FSSR-SAFING_IN_PROGRESS_FLAG                 102200AB
C                                   DESC-SAFING IN PROGRESS                      102300AB
C                                       1=ON                                     102400AB
C                                   MML#-                      V54X2023J         102500AB
    2 CRBB_ALL_BRAKES_ON BIT(1),                                                 102600AB
C                                   (MCIU/RCD)                                   102700AB
C                                   ITEM-ALL BRAKES ON DISCRETE                  102800AB
C                                   FSSR-ALL_BRAKES_ON_FLAG                      102900AB
C                                   DESC-ALL BRAKES ON                           103000AB
C                                       1=ON                                     103100AB
C                                   MML#-                      V54X2024J         103200AB
    2 CRBB_EE_EXTEND BIT(1),                                                     103300AB
C                                   ITEM-                                        103400AB
C                                   FSSR-TBD                                     103500AB
C                                   DESC-END-EFFECTOR EXTENDED FLAG              103600AB
C                                       1=EXTENDED                               103700AB
C                                   MML#-                      V54X2030J         103800AB
    2 CRBB_PYLD_CAPTURED BIT(1),                                                 103900AB
C                                   (MCIU/RCD)                                   104000AB
C                                   ITEM-PAYLOAD CAPTURED DISCRETE               104100AB
C                                   FSSR-PL_CAPTURE                              104200AB
C                                   DESC-PAYLOAD CAPTURED FLAG                   104300AB
C                                       1=REQUESTED                              104400AB
C                                   MML#-                      V54X2027J         104500AB
    2 CRBB_EE_RIG BIT(1),                                                        104600AB
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C                                          (MCIU/RCD)                                104700AB
C                                          ITEM-EE RIGIDIZED FLAG                    104800AB
C                                          FSSR-EE_RIGIDIZED_FLAG                    104900AB
C                                          DESC-END-EFFECTOR RIGIDIZED FLAG          105000AB
C                                               1=RIGIDIZED                          105100AB
C                                          MML#-                      V54X2031J      105200AB
    2 CRBB_EE_OPEN BIT(1),                                                           105300AB
C                                          (MCIU/RCD)                                105400AB
C                                          ITEM-                                     105500AB
C                                          FSSR-TBD                                  105600AB
C                                          DESC-END-EFFECTOR OPEN FLAG               105700AB
C                                               1=OPEN                               105800AB
C                                          MML#-                      V54X2033J      105900AB
    2 CRBB_EE_CLOSED BIT(1),                                                         106000AB
C                                          ITEM-                                     106100AB
C                                          FSSR-TBD                                  106200AB
C                                          DESC-END-EFFECTOR CLOSED FLAG             106300AB
C                                               1=CLOSED                             106400AB
C                                          MML#-                      V54X2034J      106500AB
    2 CRBB_EE_DERIG BIT(1),                                                          106600AB
C                                          (MCIU/RCD)                                106700AB
C                                          ITEM-EE DERIGIDIZED FLAG                  106800AB
C                                          FSSR-EE_DERIGID                           106900AB
C                                          DESC-END-EFFECTOR DERIGIDIZED FLAG        107000AB
C                                               1=DERIGIDIZED                        107100AB
C                                          MML#-                      V54X2032J      107200AB
    2 CRBB_ABE_FAIL BIT(1),                                                          107300AB
C                                          (MCIU/RCD)                                107400AB
C                                          ITEM-ABE FAILURE WARNING DISCRETE         107500AB
C                                          FSSR-                                     107600AB
C                                          DESC-ABE FAILURE WARNING                  107700AB
C                                               1=WARNING                            107800AB
C                                          MML#-                      V54X2021J      107900AB
    2 CRBB_WD42_SPARE2 BIT(1),                                                       108000AB
C                                                                                    108100AB
  1 CRBV_WORD43,                                                                     108200AB
C                                          DESC-HARDWARE COMMAND DATA FROM D&C       108300AB
C                                               PANEL                                108400AB
C                                          MML#-                      V54M3443P      108500AB
    2 CRBB_CAPTURE_CMD BIT(1),                                                       108600AB
C                                          (MCIU/RCD)                                108700AB
C                                          ITEM-CAPTURE COMMAND                      108800AB
C                                          FSSR-CAPTURE_CMD                          108900AB
C                                          DESC-CAPTURE COMMAND                      109000AB
C                                               1=COMMANDED                          109100AB
C                                          MML#-                      V54X2035J      109200AB
    2 CRBB_RELEASE_CMD BIT(1),                                                       109300AB
C                                          (MCIU/RCD)                                109400AB
C                                          ITEM-RELEASE COMMAND                      109500AB
C                                          FSSR-RELEASE_CMD                          109600AB
C                                          DESC-PAYLOAD RELEASE COMMAND              109700AB
C                                               1=COMMANDED                          109800AB
C                                          MML#-                      V54X2036J      109900AB
    2 CRBB_RIG_CMD BIT(1),                                                           110000AB
C                                          (MCIU/RCD)                                110100AB
C                                          ITEM-RIGIDIZE COMMAND                     110200AB
C                                          FSSR-RIGID_CMD                            110300AB
C                                          DESC-RIGIDIZE COMMAND                     110400AB
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MEMBER NAME  CRBMCI
C                                                    1=COMMANDED
C                                               MML#-                      V54X2037J
     2 CRBB_DERIG_CMD BIT(1),
C                                               (MCIU/RCD)
C                                               ITEM-DERIGIDIZE COMMAND
C                                               FSSR-DERIGIDIZE_CMD
C                                               DESC-DERIGIDIZE COMMAND
C                                                    1=COMMANDED
C                                               MML#-                      V54X2038J
     2 CRBV_WD43_SPARE1 BIT(12),
C
   1 CRBV_WORD44,
C                                               DESC-TIMING AND COMMAND CONSISTENCY
C                                                    DATA
C                                               MML#-                      V54M3444P
     2 CRBV_RATE_DMD_ID_RET BIT(7),
C                                               (MCIU/RCD)
C                                               ITEM-RETURNED RATE DEMAND IDENTIFIER
C                                               FSSR-RATE_DMD_ID_RET
C                                               DESC-RATE DEMAND IDENTIFIER FROM ARM
C                                               MML#-                      V54J2810J
     2 CRBV_WD44_SPARE1 BIT(1),
C
     2 CRBV_MCIU_FRAME_ID BIT(7),
C                                               (MCIU/RCD)
C                                               ITEM-MCIU_FRAME_ID
C                                               FSSR-MCIU_FRAME_IDENT
C                                               DESC-VALUE OF MCIU FRAME IDENTIFIER
C                                               MML#-                      V54J2040J
     2 CRBB_WD44_SPARE2 BIT(1),
C
   1 CRBV_WORD45,
C                                               DESC-TEST WORD ECHO        none
C                                               MML#-                      ~~TBD~~
     2 CRBV_TEST_WORD_ECHO BIT(16);
C                                               (MCIU/RCD,RQC)
C                                               ITEM-TEST WORD ECHO
C                                               FSSR-TEST_WORD_ECHO
C                                               DESC-REFLECTED TEST WORD FROM MCIU
C                                               MML#-                      V54U2045J
 DECLARE CRB_MCIU_SUBTREE4 CRB_MCIU_SUBTREE4-STRUCTURE INITIAL(
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',
 BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0',BIN'0');
C**********************************************************************
C****                     DOWNLIST COMMENT CARDS                  ****
C**********************************************************************
C **** WORD1 ****
C   M=V54M3401P N=CRBV_WORD1.CRBB_GPC_COMM_FAIL$(1;)  T=9
C****  WORD2  ****
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MEMBER NAME  CRBMCI
C                                                                              116200AB
C  M=V54M3402P N=CRBV_WORD1.CRBB_GPC_COMM_FAIL$(2;)  T=9                       116300AE
C                                                                              116400AB
C  M=V54X2001J N=CRBB_GPC_COMM_FAIL$(2;)                T=9                    116500AD
C  M=V54X2003J N=CRBB_DC_MCIU_COMM$(2;)                 T=9                    116600AD
C  M=V54X2004J N=CRBB_THER_CKT_FAIL$(2;)                T=9                    116700AD
C  M=V54X2006J N=CRBB_MADC_OUT_TOLER$(2;)               T=9                    116800AD
C  M=V54X2007J N=CRBB_MCPC_OUT_TOLER$(2;)               T=9                    116900AD
C  M=V54X2008J N=CRBB_MCIU_ABE_FAILURE$(2;)             T=9                    117000AD
C  M=V54X2009J N=CRBB_EE_FAIL$(2;)                      T=9                    117100AD
C  M=V54X2010J N=CRBB_TACHOMETER_FAILURE$(2;)           T=9                    117200AD
C  M=V54X2011J N=CRBB_MCIU_ABE_COMM_FAILURE$(2;)        T=9                    117300AD
C  M=V54X2012J N=CRBB_MCA_FAILURE$(2;)                  T=9                    117400AD
C  M=V54X2013J N=CRBB_JPC_FAILURE$(2;)                  T=9                    117500AD
C  M=V54X2014J N=CRBB_SPA_28V_POWER_FAILURE$(2;)        T=9                    117600AD
C  M=V54X2015J N=CRBB_SPA_COMMUTATOR_FAILURE$(2;)       T=9                    117700AD
C                                                                              117800AB
C****  WORD3   ****                                                            118300AB
C                                                                              118400AB
C  M=V54M3403P N=CRBV_WORD1.CRBB_GPC_COMM_FAIL$(3;)                  T=9       118500AD
C                                                                              118600AD
C****  WORD4   ****                                                            118700AB
C                                                                              118800AB
C  M=V54M3404P N=CRBV_WORD1.CRBB_GPC_COMM_FAIL$(4;)                 T=9        118900AD
C                                                                              119000AD
C****  WORD5   ****                                                            119100AB
C                                                                              119200AB
C  M=V54H2205J N=CRBV_RAW_ENCOD$(1;)                    T=9                    119300AB
C                                                                              119400AB
C****  WORD6   ****                                                            119500AB
C                                                                              119600AB
C  M=V54M3406P N=CRBV_WORD6.CRBV_RAW_TACH$(1;)                     T=9         119700AD
C                                                                              119800AB
C  M=V54L2201J N=CRBV_RAW_TACH$(1;)                     T=9                    119900AB
C  M=V54X2211J N=CRBB_CRNT_SAT$(1;)                     T=9                    120000AB
C  M=V54X2215J N=CRBB_BKDRV$(1;)                        T=9                    120100AB
C                                                                              120200AB
C****  WORD7   ****                                                            120300AB
C                                                                              120400AB
C  M=V54M3407P N=CRBV_WORD7.CRBB_EEEU_BITE_FLAG$(1;)                T=9        120500AD
C                                                                              120600AB
C  M=V54X2223J N=CRBB_EEEU_BITE_FLAG$(1;)               T=9                    120700AB
C  M=V54X2202J N=CRBB_TACH_FAIL$(1;)                    T=9                    120800AB
C  M=V54X2220J N=CRBB_MCA_FAIL$(1;)                     T=9                    120900AB
C  M=V54X2221J N=CRBB_SPA_28V_PWR_FAIL$(1;)             T=9                    121000AB
C  M=V54X2222J N=CRBB_SPA_COMMUTATOR_FAIL$(1;)          T=9                    121100AB
C                                                                              121200AB
C****  WORD8   ****                                                            121300AB
C                                                                              121400AB
C  M=V54H2305J N=CRBV_RAW_ENCOD$(2;)                    T=9                    121500AB
C                                                                              121600AB
C****  WORD9   ****                                                            121700AB
C                                                                              121800AB
C  M=V54M3409P N=CRBV_WORD6.CRBV_RAW_TACH$(2;)                     T=9         121900AD
C                                                                              122000AB
C  M=V54L2301J N=CRBV_RAW_TACH$(2;)                     T=9                    122100AB
C  M=V54X2311J N=CRBB_CRNT_SAT$(2;)                     T=9                    122200AB
C  M=V54X2315J N=CRBB_BKDRV$(2;)                        T=9                    122300AB
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MEMBER NAME CRBMCI

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C                                                                          122400AB
C****  WORD10 ****                                                         122500AB
C                                                                          122600AB
C  M=V54M3410P N=CRBV_WORD7.CRBE_EEEU_BITE_FLAG$(2;)              T=9      122700AD
C                                                                          122800AB
C  M=V54X2323J N=CRBE_EEEU_BITE_FLAG$(2;)               T=9                122900AB
C  M=V54X2302J N=CRBB_TACH_FAIL$(2;)                    T=9                123000AB
C  M=V54X2320J N=CRBB_MCA_FAIL$(2;)                     T=9                123100AB
C  M=V54X2350J N=CRBB_JPC_FAIL$(2;)                     T=9                123200AB
C  M=V54X2321J N=CRBB_SPA_28V_PWR_FAIL$(2;)             T=9                123300AB
C  M=V54X2322J N=CRBB_SPA_COMMUTATOR_FAIL$(2;)          T=9                123400AB
C                                                                          123500AB
C****  WORD11 ****                                                         123600AB
C                                                                          123700AB
C  M=V54H2405J N=CRBV_RAW_ENCOD$(3;)                    T=9                123800AB
C                                                                          123900AB
C****  WORD12 ****                                                         124000AB
C                                                                          124100AB
C  M=V54M3412P N=CRBV_WORD6.CRBV_RAW_TACH$(3;)                   T=9       124200AD
C                                                                          124300AB
C  M=V54L2401J N=CRBV_RAW_TACH$(3;)                     T=9                124400AB
C  M=V54X2411J N=CRBB_CRNT_SAT$(3;)                     T=9                124500AB
C  M=V54X2415J N=CRBB_BKDRV$(3;)                        T=9                124600AB
C                                                                          124700AB
C****  WORD13  ****                                                        124800AB
C                                                                          124900AB
C  M=V54M3413P N=CRBV_WORD7.CRBE_EEEU_BITE_FLAG$(3;)              T=9      125000AD
C                                                                          125100AB
C  M=V54X2423J N=CRBB_EEEU_BITE_FLAG$(3;)               T=9                125200AB
C  M=V54X2402J N=CRBB_TACH_FAIL$(3;)                    T=9                125300AB
C  M=V54X2420J N=CRBB_MCA_FAIL$(3;)                     T=9                125400AB
C  M=V54X2421J N=CRBB_SPA_28V_PWR_FAIL$(3;)             T=9                125500AB
C  M=V54X2422J N=CRBB_SPA_COMMUTATOR_FAIL$(3;)          T=9                125600AB
C                                                                          125700AB
C****  WORD14  ****                                                        125800AB
C                                                                          125900AB
C  M=V54H2505J N=CRBV_RAW_ENCOD$(4;)                    T=9                126000AB
C                                                                          126100AB
C****  WORD15  ****                                                        126200AB
C                                                                          126300AB
C  M=V54M3415P N=CRBV_WORD6.CRBV_RAW_TACH$(4;)                   T=9       126400AD
C                                                                          126500AB
C  M=V54L2501J N=CRBV_RAW_TACH$(4;)                     T=9                126600AB
C  M=V54X2511J N=CRBB_CRNT_SAT$(4;)                     T=9                126900AB
C  M=V54X2515J N=CRBB_BKDRV$(4;)                        T=9                127000AB
C                                                                          127100AB
C****  WORD16  ****                                                        127200AB
C                                                                          127300AB
C  M=V54M3416P N=CRBV_WORD7.CRBE_EEEU_BITE_FLAG$(4;)              T=9      127400AD
C                                                                          127500AB
C  M=V54X2523J N=CRBE_EEEU_BITE_FLAG$(4;)               T=9                127600AB
C  M=V54X2502J N=CRBB_TACH_FAIL$(4;)                    T=9                127700AB
C  M=V54X2520J N=CRBB_MCA_FAIL$(4;)                     T=9                127800AB
C  M=V54X2750J N=CRBB_JPC_FAIL$(4;)                     T=9                127900AB
C  M=V54X2521J N=CRBB_SPA_28V_PWR_FAIL$(4;)             T=9                128000AB
C  M=V54X2522J N=CRBB_SPA_COMMUTATOR_FAIL$(4;)          T=9                128100AB
C                                                                          128200AB
C****  WORD17  ****                                                        128300AB
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MEMBER NAME  CRBMCI
C                                                                                 128400AB
C  M=V54H2605J N=CRBV_RAW_ENCOD$(5;)                   T=9                        128500AB
C                                                                                 128600AB
C****   WORD18   ****                                                             128700AB
C                                                                                 128800AB
C  M=V54M3418P N=CRBV_WORD6.CRBV_RAW_TACH$(5;)                    T=9             128900AD
C                                                                                 129000AB
C  M=V54L2601J N=CRBV_RAW_TACH$(5;)                    T=9                        129100AB
C  M=V54X2611J N=CRBB_CRNT_SAT$(5;)                    T=9                        129400AB
C  M=V54X2615J N=CRBB_BKDRV$(5;)                       T=9                        129500AB
C                                                                                 129600AB
C****   WORD19   ****                                                             129700AB
C                                                                                 129800AB
C  M=V54M3419P N=CRBV_WORD7.CRBB_EEEU_BITE_FLAG$(5;)               T=9            129900AD
C                                                                                 130000AB
C  M=V54X2623J N=CRBB_EEEU_BITE_FLAG$(5;)              T=9                        130100AB
C  M=V54X2602J N=CRBB_TACH_FAIL$(5;)                   T=9                        130200AB
C  M=V54X2620J N=CRBB_MDA_FAIL$(5;)                    T=9                        130300AB
C  M=V54X2621J N=CRBB_SPA_28V_PWR_FAIL$(5;)            T=9                        130400AB
C  M=V54X2622J N=CRBB_SPA_COMMUTATOR_FAIL$(5;)         T=9                        130500AB
C                                                                                 130600AB
C****   WORD20   ****                                                             130700AB
C                                                                                 130800AB
C  M=V54H2705J N=CRBV_RAW_ENCOD$(6;)                   T=9                        130900AB
C                                                                                 131000AB
C****   WORD21   ****                                                             131100AB
C                                                                                 131200AB
C  M=V54M3421P N=CRBV_WORD6.CRBV_RAW_TACH$(6;)                    T=9             131300AD
C                                                                                 131400AB
C  M=V54L2701J N=CRBV_RAW_TACH$(6;)                    T=9                        131500AB
C  M=V54X2711J N=CRBB_CRNT_SAT$(6;)                    T=9                        131800AB
C  M=V54X2715J N=CRBB_BKDRV$(6;)                       T=9                        131900AB
C                                                                                 132000AB
C****   WORD22   ****                                                             132100AB
C                                                                                 132200AB
C  M=V54M3422P N=CRBV_WORD7.CRBB_EEEU_BITE_FLAG$(6;)               T=9            132300AD
C                                                                                 132400AB
C  M=V54X2723J N=CRBB_EEEU_BITE_FLAG$(6;)              T=9                        132500AB
C  M=V54X2702J N=CRBB_TACH_FAIL$(6;)                   T=9                        132600AB
C  M=V54X2720J N=CRBB_MDA_FAIL$(6;)                    T=9                        132700AB
C  M=V54X2721J N=CRBB_SPA_28V_PWR_FAIL$(6;)            T=9                        132800AB
C  M=V54X2722J N=CRBB_SPA_COMMUTATOR_FAIL$(6;)         T=9                        132900AB
C                                                                                 133000AB
C****   WORD23   ****                                                             133100AB
C                                                                                 133200AB
C  M=V54U3423J N=CRBV_WORD23.CRBV_SPARE_ANALOG_CHANNEL1           T=9             133300AD
C                                                                                 133400AB
C****   WORD24   ****                                                             133500AB
C                                                                                 133600AB
C  M=V54M3424P N=CRBV_WORD24.CRBV_RAW_SIG1$(1;)   T=9                             133700AD
C                                                                                 133800AB
C  M=V72K3030J N=CRBV_RAW_SIG1$(1;)                    T=9                        133900AB
C  M=V72K3031J N=CRBV_RAW_SIG2$(1;)                    T=9                        134000AB
C                                                                                 134100AB
C****   WORD25   ****                                                             134200AB
C                                                                                 134300AB
C  M=V54M3425P N=CRBV_WORD24.CRBV_RAW_SIG1$(2;)   T=9                             134400AD
C                                                                                 134500AB
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MEMBER NAME   CRBMCI
C  M=V72K3032J N=CRBV_RAW_SIG1$(2;)                  T=9                     134600AB
C  M=V72K3035J N=CRBV_RAW_SIG2$(2;)                  T=9                     134700AB
C                                                                            134800AB
C****  WORD26   ****                                                         134900AB
C                                                                            135000AB
C  M=V54M3426P N=CRBV_WORD24.CRBV_RAW_SIG1$(3;)   T=9                        135100AD
C                                                                            135200AB
C  M=V72K3036J N=CRBV_RAW_SIG1$(3;)                  T=9                     135300AB
C  M=V72K3037J N=CRBV_RAW_SIG2$(3;)                  T=9                     135400AB
C                                                                            135500AB
C****  WORD27   ****                                                         135600AB
C                                                                            135700AB
C  M=V54M3427P N=CRBV_WORD27.CRBV_RAW_THRM$(1;)   T=9                        135800AD
C                                                                            135900AB
C  M=V54T2100J N=CRBV_RAW_THRM$(1;)                  T=9                     136000AB
C  M=V54T2110J N=CRBV_RAW_THRM_ID$(1;)               T=9                     136100AB
C                                                                            136200AB
C****  WORD28   ****                                                         136300AB
C                                                                            136400AB
C  M=V54M3428P N=CRBV_WORD27.CRBV_RAW_THRM$(2;)   T=9                        136500AD
C                                                                            136600AB
C  M=V54T2120J N=CRBV_RAW_THRM$(2;)                  T=9                     136700AB
C  M=V54T2130J N=CRBV_RAW_THRM_ID$(2;)               T=9                     136800AB
C                                                                            136900AB
C****  WORD29   ****                                                         137000AB
C                                                                            137100AB
C  M=V54M3429P N=CRBV_WORD27.CRBV_RAW_THRM$(3;)   T=9                        137200AD
C                                                                            137300AB
C  M=V54T2140J N=CRBV_RAW_THRM$(3;)                  T=9                     137400AB
C  M=V54T2150J N=CRBV_RAW_THRM_ID$(3;)               T=9                     137500AB
C                                                                            137600AB
C****  WORD30   ****                                                         137700AB
C                                                                            137800AB
C  M=V54M3430P N=CRBV_WORD27.CRBV_RAW_THRM$(4;)   T=9                        137900AD
C                                                                            138000AB
C  M=V54T2160J N=CRBV_RAW_THRM$(4;)                  T=9                     138100AB
C  M=V54T2170J N=CRBV_RAW_THRM_ID$(4;)               T=9                     138200AB
C                                                                            138300AB
C****  WORD31   ****                                                         138400AB
C                                                                            138500AB
C  M=V54M3431P N=CRBV_WORD31.CRBV_DC_WDO_ADDR     T=9                        138600AD
C                                                                            138700AB
C  M=V72K2998J N=CRBV_DC_WDO_ADDR                    T=9                     138800AD
C  M=V72K3003J N=CRBB_JA_REQ                         T=9                     138900AB
C  M=V72K3004J N=CRBB_VEL_XYZ_REQ                    T=9                     139000AB
C  M=V72K3001J N=CRBB_POSITION_XYZ_REQ               T=9                     139100AB
C  M=V72K3002J N=CRBB_ATTITUDE_PYR_REQ               T=9                     139200AB
C  M=V72K3005J N=CRBB_RATE_PYR_REQ                   T=9                     139300AB
C  M=V72K3000J N=CRBB_PARM_TEST_REQ                  T=9                     139400AB
C  M=V72K2975J N=CRBB_MAN_ORB_REQ                    T=9                     139500AB
C  M=V72K2976J N=CRBB_MAN_EE_REQ                     T=9                     139600AB
C  M=V72K2977J N=CRBB_MAN_MIX_REQ                    T=9                     139700AB
C  M=V72K2978J N=CRBB_MAN_PYLD_REQ                   T=9                     139800AB
C  M=V72K2997J N=CRBB_DC_WDO_PARITY                  T=9                     139900AD
C                                                                            140000AB
C****  WORD32   ****                                                         140100AB
C                                                                            140200AB
C  M=V54M3432P N=CRBV_WORD32.CRBV_DC_WD1_ADDR     T=9                        140300AD
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MEMBER NAME  CRBMCI
C                                                                                 140400AB
C  M=V72K2986J N=CRBV_DC_WD1_ADDR                         T=9                     140500AD
C  M=V72K2985J N=CRBB_BRAKES_ON_CMD                       T=9                     140600AB
C  M=V72K3010J N=CRBB_JNT_REQ_SHY                         T=9                     140700AB
C  M=V72K3011J N=CRBB_JNT_REQ_SHP                         T=9                     140800AB
C  M=V72K3012J N=CRBB_JNT_REQ_ELP                         T=9                     140900AB
C  M=V72K3013J N=CRBB_JNT_REQ_WRP                         T=9                     141000AB
C  M=V72K3014J N=CRBB_JNT_REQ_WRY                         T=9                     141100AB
C  M=V72K3015J N=CRBB_JNT_REQ_WRR                         T=9                     141200AB
C  M=V72K3020J N=CRBB_SINGL_DIR_POS                       T=9                     141300AB
C  M=V72K3021J N=CRBB_SINGL_DIR_NEG                       T=9                     141400AB
C  M=V72K3016J N=CRBB_EE_TEMP_REQ                         T=9                     141500AB
C  M=V72K2987J N=CRBB_DC_WD1_PARITY                       T=9                     141600AD
C                                                                                 141700AB
C****  WORD33  ****                                                              141800AB
C                                                                                 141900AB
C  M=V54M3433P N=CRBV_WORD33.CRBV_DC_WD2_ADDR          T=9                        142000AD
C                                                                                 142100AB
C  M=V72K2969J N=CRBV_DC_WD2_ADDR                         T=9                     142200AD
C  M=V72K2979J N=CRBB_SINGL_JNT_REQ                       T=9                     142300AB
C  M=V72K2980J N=CRBB_DIRECT_REQ                          T=9                     142400AB
C  M=V72K2970J N=CRBB_OPR_CMD_REQ                         T=9                     142500AB
C  M=V72K2971J N=CRBB_AUTO_1_REQ                          T=9                     142600AB
C  M=V72K2972J N=CRBB_AUTO_2_REQ                          T=9                     142700AB
C  M=V72K2973J N=CRBB_AUTO_3_REQ                          T=9                     142800AB
C  M=V72K2974J N=CRBB_AUTO_4_REQ                          T=9                     142900AB
C  M=V72K2981J N=CRBB_TEST_REQ                            T=9                     143000AB
C  M=V72K2982J N=CRBB_CONTROL_MODE_ENTER                  T=9                     143100AB
C  M=V72K3017J N=CRBB_CRIT_TEMP_REQ                       T=9                     143200AB
C  M=V72K2968J N=CRBB_DC_WD2_PARITY                       T=9                     143300AD
C                                                                                 143400AB
C****  WORD34  ****                                                              143500AB
C                                                                                 143600AB
C  M=V54M3434P N=CRBV_WORD34.CRBV_DC_WD3_ADDR          T=9                        143700AD
C                                                                                 143800AB
C  M=V72K2967J N=CRBV_DC_WD3_ADDR                         T=9                     143900AD
C  M=V72K2983J N=CRBB_SEQ_PROCEED                         T=9                     144000AB
C  M=V72K2984J N=CRBB_SEQ_STOP                            T=9                     144100AB
C  M=V72K2916J N=CRBB_RMS_MASTER_ALARM_RESET              T=9                     144200AB
C  M=V72K2988J N=CRBB_SAFING_INITIATE                     T=9                     144300AB
C  M=V72K2989J N=CRBB_SAFING_CANCEL                       T=9                     144400AB
C  M=V72K3027J N=CRBB_VERNIER_RATE_REQ                    T=9                     144500AB
C  M=V72K3028J N=CRBB_RATE_HOLD_REQ                       T=9                     144600AB
C  M=V72K3006J N=CRBB_PORT_TEMP_REQ                       T=9                     144700AB
C  M=V72K3007J N=CRBB_STBD_TEMP_REQ                       T=9                     144800AB
C              N=CRBB_DC_WD3_PARITY                       T=9                     144900AB
C                                                                                 145000AB
C****  WORD35  ****                                                              145100AB
C                                                                                 145200AB
C  M=V54M3435P N=CRBV_WORD35.CRBV_DC_WD4_ADDR          T=9                        145300AD
C                                                                                 145400AB
C  M=V72K3038J N=CRBV_DC_WD4_ADDR                         T=9                     145500AD
C  M=V72K3025J N=CRBB_CAPTURE_SELECT                      T=9                     145600AB
C  M=V72K3026J N=CRBB_REL_SEL                             T=9                     145700AB
C  M=V72K3039J N=CRBB_PORT_SHOULDER_BRACE_SEL             T=9                     145800AB
C  M=V72K3040J N=CRBB_STBD_SHOULDER_BRACE_SEL             T=9                     145900AD
C  M=V72K2990J N=CRBB_EE_AUTO_MODE_SEL                    T=9                     146000AE
C  M=V72K2991J N=CRBB_EE_MANUAL_MODE_SEL    T=9                                   146010AE
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MEMBER NAME  CRBMCI
C  M=V72K2992J N=CRBB_MAN_CONTROL_RIGIDIZE_SEL      T=9                               146100AB
C  M=V72K2993J N=CRBB_MAN_CONTROL_DERIGIDIZE_SEL    T=9                               146200AB
C  M=V72K3041J N=CRBB_DC_WD4_PARITY                 T=9                               146300AD
C                                                                                     146400AB
C****  WORD36   ****                                                                  146500AB
C        u3436●J                                                                      146600AB
C  M=V54M3444P N=CRBV_WORD36.CRBV_DC_WD5_ADDR       T=9                               146700AD
C                                                                                     146800AB
C  M=V72K3042J N=CRBV_DC_WD5_ADDR  none             T=9                               146900AD
C  M=V72K3043J N=CRBB_DC_WD5_PARITYnone             T=9                               147000AD
C                                                                                     147100AB
C****  WORD37   ****                                                                  147200AB
C      none                                                                           147300AB
C  M=V54M3445P N=CRBV_WORD37.CRBV_DC_WD6_ADDR       T=9                               147400AD
C       none                                                                          147500AB
C  M=V72K3044J N=CRBV_DC_WD6_ADDR                   T=9                               147600AD
C  M=V72K3045J N=CRBV_DC_TO_MCIU_TEST_WORDV54U3437J T=9                               147610AD
C  M=V72K3046J N=CRBB_DC_WD6_PARITY NONE            T=9                               147700AD
C                                                                                     147800AB
C****  WORD38   ****                                                                  147900AB
C     v54m3438P                                                                       148000AB
C  M=V54M3446P N=CRBV_WORD38.CRBB_COMBINED_RAM      T=9                               148100AD
C                                                                                     148200AB
C  M=V72K3047J N=CRBB_COMBINED_RAM V54X2860J        T=9                               148300AD
C  M=V72K3048J N=CRBB_CPU_TEST V54K2858J            T=9                               148400AD
C  M=V72K3049J N=CRBB_RAM_TEST_ADDR_300_3FFV54X2854J T=9                              148500AD
C  M=V72K3051J N=CRBB_RAM_TEST_ADDR_200_2FFV54X2855J T=9                              148600AD
C  M=V72K3052J N=CRBB_RAM_TEST_ADDR_100_1FFV54X2856J T=9                              148700AD
C  M=V72K3053J N=CRBB_RAM_TEST_ADDR_000_0FFV54V2857J T=9                              148800AD
C  M=V72K3054J N=CRBB_ROM_TEST_ADDR_E00_EFFV54V2858J T=9                              148900AD
C  M=V72K3055J N=CRBB_ROM_TEST_ADDR_C00_DFFV54V2859J T=9                              149000AD
C  M=V72K3056J N=CRBB_ROM_TEST_ADDR_A00_BFFV54V2860J T=9                              149100AD
C  M=V72K3057J N=CRBB_ROM_TEST_ADDR_800_9FFV54V2861J T=9                              149200AD
C  M=V72K3058J N=CRBB_ROM_TEST_ADDR_600_7FFV54V2862J T=9                              149300AD
C  M=V72K3059J N=CRBB_ROM_TEST_ADDR_400_5FFV54V2863J T=9                              149400AD
C  M=V72K3060J N=CRBB_ROM_TEST_ADDR_200_3FFV54V2864J T=9                              149500AD
C  M=V72K3061J N=CRBB_ROM_TEST_ADDR_C00_1FFV54X2865J T=9                              149600AD
C                                                                                     149700AB
C****  WORD39   ****                                                                  149800AB
C                                                                                     149900AB
C  M=V54M3439P N=CRBV_WORD39.CRBV_WORD39_SPARE1     T=9                               150000AD
C                                                                                     150100AB
C****  WORD40   ****                                                                  150200AB
C                                                                                     150300AB
C  M=V54M3440P N=CRBV_WORD40.CRBV_WORD40_SPARE1     T=9                               150400AD
C                                                                                     150500AB
C****  WORD41   ****                                                                  150600AB
C                                                                                     150700AB
C  M=V54M3441P N=CRBV_WORD41.CRBV_WORD41_SPARE1     T=9                               150800AD
C                                                                                     150900AB
C****  WORD42   ****                                                                  151000AB
C                                                                                     151100AB
C  M=V54M3442P N=CRBV_WORD42.CRBB_MCIU_FAIL         T=9                               151200AD
C                                                                                     151300AB
C  M=V54X2020J N=CRBB_MCIU_FAIL                     T=9                               151400AB
C  M=V54X2025J N=CRBB_PORT_ARM_ACT                  T=9                               151500AB
C  M=V54X2026J N=CRBB_STBD_ARM_ACT                  T=9                               151600AB
C  M=V54X2022J N=CRBB_GPC_FAIL                      T=9                               151700AB
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MEMBER NAME  CRBMCI
C  M=V54X2023J N=CRBB_SAFING_IN_PRCG                  T=9                       151800AB
C  M=V54X2024J N=CRBB_ALL_BRAKES_ON                   T=9                       151900AB
C  M=V54X2030J N=CRBB_EE_EXTEND                       T=9                       152000AB
C  M=V54X2027J N=CRBB_PYLD_CAPTURED                   T=9                       152100AB
C  M=V54X2031J N=CRBB_EE_RIG                          T=9                       152200AB
C  M=V54X2033J N=CRBB_EE_CPEN                         T=9                       152300AB
C  M=V54X2034J N=CRBB_EE_CLOSED                       T=9                       152400AB
C  M=V54X2032J N=CRBB_EE_DERIG                        T=9                       152500AB
C  M=V54X2021J N=CRBB_ABE_FAIL                        T=9                       152600AB
C                                                                               152700AB
C****  WORD43  ****                                                             152800AB
C                                                                               152900AB
C  M=V54M3443P N=CRBV_WORD43.CRBB_CAPTURE_CMD         T=9                       153000AD
C                                                                               153100AB
C  M=V54X2035J N=CRBB_CAPTURE_CMD                     T=9                       153200AB
C  M=V54X2036J N=CRBB_RELEASE_CMD                     T=9                       153300AB
C  M=V54X2037J N=CRBB_RIG_CMD                         T=9                       153400AB
C  M=V54X2038J N=CRBB_DERIG_CMD                       T=9                       153500AB
C                                                                               153600AB
C****  WORD44  ****                                                             153700AB
C                                                                               153800AB
C  M=V54M3447P N=CRBV_WORD44.CRBV_RATE_DMD_ID_RET     T=9                       153900AD
C                                                                               154000AB
C  M=V54J2810J N=CRBV_RATE_DMD_ID_RET                 T=9                       154100AB
C  M=V54J2040J N=CRBV_MCIU_FRAME_ID                   T=9                       154200AB
C                                                                               154300AB
C****  WORD45  ****                                                             154400AB
C                                       NONE                                    154500AB
C              N=CRBV_WORD45.CRBV_TEST_WORD_ECHO      T=9                       154600AD
C                                                                               154700AB
C  M=V54U2045J N=CRBV_TEST_WORD_ECHO                  T=9                       154800AB
C                                                                               154900AB
C**********************************************************************155000AB
C**********************************************************************155100AB
 CLOSE CRB_MCI;                                                                 155200AB
```

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MEMBER NAME  CRILVC
C**************************************************************************
C*                                                                        *
C*      A.2.31       CRI_LVC    RMS CONSTANTS                             *
C*      THIS COMPOOL CONTAINS CONSTANTS WHICH ARE MISSION DEPENDENT       *
C*      BUT NOT TM SPEC CHANGABLE                                         *
C*                                                                        *
C*                                                                        *
C**************************************************************************
 CRI_LVC_DUMMY: EXTERNAL COMPOOL;
C
D INCLUDE CSSCOTR
C
 CLOSE CRI_LVC_DUMMY;
C
 CRI_LVC:
 COMPOOL RIGID;
C
                    DECLARE
 CRIS_PL_JNT_RATE_LIM_COARSE ARRAY(6,6) SCALAR
                    INITIAL(CSSS_COT_985200,CSSS_COT_985201,
                            CSSS_COT_985202,CSSS_COT_985203,
                            CSSS_COT_985204,CSSS_COT_985205,
                            CSSS_COT_985206,CSSS_COT_985207,
                            CSSS_COT_985208,CSSS_COT_985209,
                            CSSS_COT_985210,CSSS_COT_985211,
                            CSSS_COT_985212,CSSS_COT_985213,
                            CSSS_COT_985214,CSSS_COT_985215,
                            CSSS_COT_985216,CSSS_COT_985217,
                            CSSS_COT_985218,CSSS_COT_985219,
                            CSSS_COT_985220,CSSS_COT_985221,
                            CSSS_COT_985222,CSSS_COT_985223,
                            CSSS_COT_985224,CSSS_COT_985225,
                            CSSS_COT_985226,CSSS_COT_985227,
                            CSSS_COT_985228,CSSS_COT_985229,
                            CSSS_COT_965030,CSSS_COT_965031,
                            CSSS_COT_965032,CSSS_COT_965033,
                            CSSS_COT_965034,CSSS_COT_965035);
C                   (RYE/)
C               ITEM-JOINT ANGLE RATE LIMIT FOR SELECTED PAYLOAD
C               DESC-PAYLOAD DEPENDENT JOINT RATE LIMITS-COARSE
C               FSSR-JRL_PL_COARSE
C                                                               V98U5200C-
C                                                               V98U5229C
C                                                               V96R5030C-
C                                                               V96R5035C
                    DECLARE
 CRIS_PL_JNT_RATE_LIM_VERN ARRAY(6,6) SCALAR
                    INITIAL(CSSS_COT_986913,CSSS_COT_986914,
                            CSSS_COT_986915,CSSS_COT_986916,
                            CSSS_COT_986917,CSSS_COT_986918,
                            CSSS_COT_986919,CSSS_COT_986920,
                            CSSS_COT_986921,CSSS_COT_986922,
                            CSSS_COT_986923,CSSS_COT_986924,
                            CSSS_COT_986925,CSSS_COT_986926,
                            CSSS_COT_986927,CSSS_COT_986928,
                            CSSS_COT_986929,CSSS_COT_986930,
                            CSSS_COT_986931,CSSS_COT_986932,
                            CSSS_COT_986933,CSSS_COT_986934,
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                         CSSS_COT_986935,CSSS_COT_986936,
                         CSSS_COT_986937,CSSS_COT_986938,
                         CSSS_COT_986939,CSSS_COT_986940,
                         CSSS_COT_986941,CSSS_COT_986942,
                         CSSS_COT_965070,CSSS_COT_965071,
                         CSSS_COT_965072,CSSS_COT_965073,
                         CSSS_COT_965074,CSSS_COT_965075);
C                (RSC/)
C            ITEM-JRL PYLD VERNIER
C            DESC-PAYLOAD DEPENDENT JOINT RATE LIMITS-VERNIER
C            FSSR-JRL_PL_VERNIER
C                                                              V98U6913C-
C                                                              V98U6942C,
C                                                              V96R5070C-
C                                                              V96R5075C
                 DECLARE
 CRIS_PL_TO_EE_OP_SEL ARRAY(6) MATRIX(3,3)
                 INITIAL(CSSS_COT_985308,CSSS_COT_985309,
                         CSSS_COT_985310,CSSS_COT_985311,
                         CSSS_COT_985312,CSSS_COT_985313,
                         CSSS_COT_985314,CSSS_COT_985315,
                         CSSS_COT_985316,CSSS_COT_985317,
                         CSSS_COT_985318,CSSS_COT_985319,
                         CSSS_COT_985320,CSSS_COT_985321,
                         CSSS_COT_985322,CSSS_COT_985323,
                         CSSS_COT_985324,CSSS_COT_985325,
                         CSSS_COT_985326,CSSS_COT_985327,
                         CSSS_COT_985328,CSSS_COT_985329,
                         CSSS_COT_985330,CSSS_COT_985331,
                         CSSS_COT_985332,CSSS_COT_985333,
                         CSSS_COT_985334,CSSS_COT_985335,
                         CSSS_COT_985336,CSSS_COT_985337,
                         CSSS_COT_985338,CSSS_COT_985339,
                         CSSS_COT_985340,CSSS_COT_985341,
                         CSSS_COT_985342,CSSS_COT_985343,
                         CSSS_COT_985344,CSSS_COT_985345,
                         CSSS_COT_985346,CSSS_COT_985347,
                         CSSS_COT_985348,CSSS_COT_985349,
                         CSSS_COT_985350,CSSS_COT_985351,
                         CSSS_COT_985352,CSSS_COT_966707,
                         CSSS_COT_966708,CSSS_COT_966709,
                         CSSS_COT_966710,CSSS_COT_966711,
                         CSSS_COT_966712,CSSS_COT_966713,
                         CSSS_COT_966714,CSSS_COT_966715);
C                (RKG,RPO/)
C            ITEM-TRANSFORMATION MATRIX FROM PAYLOAD OPERATING
C                FRAME TO END EFFECTOR OPERATING FRAME
C            FSSR-PL_TO_EE_OP_SEL
C                                                   V98U5308C - 352C
C                                                   V96U6707C - 715C
C
                 DECLARE
 CRIS_L_EEAP_EET ARRAY(2) SCALAR
                 INITIAL(CSSS_COT_985254,CSSS_COT_985255);
C                (RKG,RPO/)
C            ITEM-LENGTH FROM END-EFFECTOR ATTACH POINT TO TIP
C            FSSR-L_EEAP_EET
C                                                              V98U5254C-
```

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MEMBER NAME  CRILVC
C                                                                         V98U5255C
C
                   DECLARE
 CRIS_ARM_AVAIL  INTEGER   INITIAL(CSSS_CCT_985100);
C                  (RCD/)
C              ITEM-ARM AVAILABILITY INDICATOR
C              DESC-C = PORT,1 = STRBD,2 = BOTH
C              FSSR-ARM_AVAIL_INDICATOR
C                                                                         V98U5100C
C
C
                   DECLARE
 CRIS_PYLD_ID_VALID ARRAY(6) INTEGER
                   INITIAL(CSSS_CCT_966990,CSSS_COT_966991,
   CSSS_COT_966992,CSSS_COT_966993,CSSS_CCT_966994,CSSS_COT_966995);
C                  (REX,RUD7)
C              ITEM-PL ID
C              DESC-TABLE OF VALID PAYLOAD ID
C              FSSR-VALID_PL_ID
C                                                                    V96J6990C-995C
C
                   DECLARE
 CRIS_EE_ID_VALID ARRAY(2) INTEGER INITIAL(CSSS_COT_966988,
   CSSS_COT_966989);
C                  (REXRUD/)
C              ITEM-EE ID
C              DESC-TABLE OF VALID EE ID
C              FSSR-VALID_EE_ID
C                                                                    V96J6988C-989C
C
C
                   DECLARE
 CRIS_V_EE_POR_SEL  ARRAY(6) VECTOR(3)
                   INITIAL(CSSS_COT_966770,CSSS_CCT_966771,
                           CSSS_COT_966772,CSSS_COT_966773,
                           CSSS_COT_966774,CSSS_COT_966775,
                           CSSS_CCT_966776,CSSS_COT_966777,
                           CSSS_CCT_966778,CSSS_COT_966779,
                           CSSS_COT_966780,CSSS_COT_966781,
                           CSSS_COT_966782,CSSS_COT_966783,
                           CSSS_COT_966784,CSSS_CCT_966785,
                           CSSS_COT_966786,CSSS_COT_966787);
C                  (RKG,RPO/)
C              ITEM-VECTOR FROM END EFFECTOR TIP TO POINT OF
C                   RESOLUTION IN PAYLOAD FRAME
C              FSSR-V_EE_POR_SEL
C                                                                         V96U6770C-
C                                                                         V96U6787C
                   DECLARE
  CRIS_F          ARRAY(6)
                   INITIAL(CSSS_CCT_987061,CSSS_COT_987062,
                           CSSS_CCT_987063,CSSS_COT_987C64,
                           CSSS_CCT_987C65,CSSS_COT_966730);
C                  (RHM/)
C              ITEM-F
C              DESC-PAYLOAD CONSISTENCY CHECK FACTOR
C              FSSR-F
C                                                                         V98U7061C-
```

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```
MEMBER NAME  CRILVC                                  V98U7065C, 032000AB
C                                                    V96U6730C  032100AB
C                                                               032200AB
 CLOSE CRI_LVC;
```

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REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

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```
MEMBER NAME  CRATE
C**********************************************************************
C*                                                                    *
C*     A.2.32   WORKING DATA COMPOOL (CRA_TE)                         *
C*                                                                    *
C*                                                                    *
C*     VARIABLES AND FLAGS PASSED WITHIN RMS                          *
C*     HARDWARE AND MISSION AND PAYLOAD INDEPENDENT                   *
C*                                                                    *
C*     MEMBERS OF THIS COMPOOL ARE INITIALIZED EITHER TO ZERO         *
C*     OR TO INITIALIZATION SPECIFICATIONS                            *
C*                                                                    *
C*                                                                    *
C*                                                                    *
C**********************************************************************
 CRA_TE: COMPOOL RIGID;
C
C
                   DECLARE
 CRAB_RIT_ALARM BIT(1)    INITIAL(OFF);
C                  (RDD/RIT)
C             ITEM-RIT ALARM FLAG
C             FSSR-TPF_ALARM_FLAG
C                                                      MML# NONE
C
                   DECLARE
 CRAB_TRANS_FLAG   BOOLEAN INITIAL(OFF);
C                  (RTV/RXY)
C              ITEM-TRANSLATION INVERSION FLAG
C              FSSR-TRANS_FLAG
C                                                      V92X2425X
C
C
                   DECLARE
 CRAV_POR_XLT_RSLT_ATL SCALAR    INITIAL(0);
C
C  M=V92R3326C N=CRAV_POR_XLT_RSLT_ATL T=1 U=FT/S
C                  (RDD,DL/RXY,RTV)
C              ITEM-ACTUAL RESULTANT POR TRANSLATION RATE
C              FSSR-ACT_RESULTANT_POR_TRANS_RATE
C                                                      V92R3326C
C
                   DECLARE
 CRAV_POR_XLT_RSLT_CMD SCALAR    INITIAL(0);
C
C  M=V92R3270C N=CRAV_POR_XLT_RSLT_CMD T=1 U=FT/S
C                  (RDD,DL/RXY,RTV)
C              ITEM-COMMANDED RESULTANT POR TRANSLATION RATE
C              FSSR-CMD_RESULTANT_POR_TRANS_RATE
C                                                      V92R3270C
C
                   DECLARE
 CRAV_X_SHY_WY SCALAR     INITIAL(0);
C
C   M=V92H3338C N=CRAV_X_SHY_WY   T=1 U=FT
C              (DL,RRP,RTV/RKG)
C              ITEM-X COMPONENT OF THE ARM REF FROM THE SHOULDER
C                  YAW JOINT TO THE WRIST YAW JOINT
C              FSSR-X_SHY_WY
```

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```
MEMBER NAME  CRATE
C                                                                   V92H3338C
C
                 DECLARE
 CRAV_L_WP_EET_IP SCALAR    INITIAL(0);
C                (RRP,RTV/RKG)
C            ITEM-DISTANCE FROM WRP TO EE TIP PROJECTED X-Z
C                 PLANE OF AM
C            FSSR-L_WP_EET_IP
C                                                                   V92H3336C
C
                 DECLARE
 CRAV_L_WY_EET SCALAR     INITIAL(0);
C                (RRP,RTV/RKG)
C            ITEM-DISTANCE FROM WRY TO EE TIP
C            FSSR-L_WY_EET
C                                                                   V92H3337C
C
                 DECLARE
 CRAV_JA_SIN234 SCALAR    INITIAL(0);
C                (RRP,RTV/RKG)
C            ITEM-SINE OF THE SUM OF THE SHOULDER PITCH,ELBOW
C                 PITCH AND WRIST PITCH ANGLES
C            FSSR-S234
C                                                                   V92H3348C
C
                 DECLARE
 CRAV_JA_COS234 SCALAR    INITIAL(0);
C                (RRP,RTV/RKG)
C            ITEM-COSINE OF THE SUM OF THE SHOULDER PITCH, ELBOW
C                 PITCH AND WRIST PITCH ANGLES
C            FSSR-C234
C                                                                   V92H3358C
C
                 DECLARE
 CRAV_JA_SIN23 SCALAR     INITIAL(0);
C                (RTV/RKG)
C            ITEM-SINE OF THE SUM OF THE SHOULDER PITCH AND
C                 ELBOW PITCH ANGLES
C            FSSR-S23
C                                                                   V98U3347C
C
                 DECLARE
 CRAV_JA_COS23 SCALAR     INITIAL(0);
C                (RTV/RKG)
C            ITEM-COSINE OF THE SUM OF THE SHOULDER PITCH AND
C                 ELBOW PITCH ANGLES
C            FSSR-C23
C                                                                   V98U3350C
C
C
                 DECLARE
 CRAV_WR_TO_EE_ANGLE   SCALAR INITIAL(0);
C                (RKG/RYE)
C            ITEM-ROTATION ANGLE OF EE FROM WRR FRAME
C            FSSR-WR_TO_EE_ANGLE
C                CR12671A
C                                                                   MML# NONE
C
```

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```
MEMBER NAME  CRATE
C
                DECLARE
 CRAB_RHM_FIRST_PASS BIT(1) RXY INITIAL(OFF);
C               (RHM,RVM/RQC)
C            ITEM-RHM FIRST TIME FLAG
C            FSSR-FIRST_PASS_FLAG
C                                                          NONE
C                                                          V92X3149X
C
                DECLARE
 CRAB_HC_NULL BIT(1)      INITIAL(OFF);
C
C  M=V92X3121X N=CRAB_HC_NULL  T=6  B=16
C               (FWP,RQC,RJS,DL/RYE)
C            ITEM-HC NULL FLAG
C            FSSR-HC_NULL_FLAG
C                                                          V92X3121X
C
                DECLARE
 CRAV_RATE_CMD_ID_RET INTEGER  INITIAL(0);
C               (RVM/RCD)
C            ITEM-RATE DEMAND ID RETURN
C            FSSR-RATE_DMD_ID_RET                          NONE
C                                                          V54J2810J
C
                DECLARE
 CRAV_SCALED_POR_RSLT_ATL SCALAR INITIAL(0);
C               (RNC/RDD)
C            ITEM-SCALED ACTUAL POR RATE
C            FSSR-ACT_POR_RESULTANT_VEL
C                                                          V72L2933J
C
                DECLARE
 CRAV_SCALED_POR_RSLT_CMD SCALAR  INITIAL(0);
C               (RNC/RDD)
C            ITEM-SCALED COMMANDED POR RATE
C            FSSR-CMD_POR_RESULTANT_VEL
C                                                          V72L2934J
C
                DECLARE
 CRAB_RHM_ALARM BIT(1)    INITIAL(OFF);
C               (RDD/RXY,RHM)
C            ITEM-RHM ALARM FLAG
C            FSSR-RMS_MASTER_ALARM_WARNING
C                                                          MML# NONE
C
C
                DECLARE
 CRAB_SING_SHY    BOOLEAN INITIAL(OFF);
C
C  M=V92X3200X N=CRAB_SING_SHY  T=6  B=16
C               (RHM,DL7RXY,RRP)
C            ITEM-SHY SINGULARITY FLAG
C            FSSR-SHY_SING_FLAG
C                                                          V92X3200X
C
                DECLARE
 CRAB_SING_ELP    BOOLEAN INITIAL(OFF);
C
```

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```
MEMBER NAME  CRATE
C   M=V92X3202X N=CRAB_SING_ELP   T=6  B=16
C                (RHM,DL7RXY,RRP)
C             ITEM-ELP SINGULARITY FLAG
C             FSSR-ELP_SING_FLAG
C                                                              V92X3202X
C
                DECLARE
 CRAB_SING_WRY    BOOLEAN INITIAL(OFF);
C
C   M=V92X3201X N=CRAB_SING_WRY   T=6  B=16
C                (RHM,DL7RXY,RRP)
C             ITEM-WRY SINGULARITY FLAG
C             FSSR-WY_SING_FLAG
C                                                              V92X3201X
C
                DECLARE
 CRAB_MAX_TORQUE BIT(1)   INITIAL(OFF);
C                (RNC/RXY)
C             ITEM-MAXIMUM TORQUE FLAG
C             FSSR-NONE
C                                                              MML# NONE
C
                DECLARE
 CRAB_MAN_TO_IDLE       BOOLEAN INITIAL(OFF);
C                (RQC/RXY)
C             ITEM-MANUAL TO IDLE FLAG
C             FSSR-NONE
C                                                              MML# NONE
C
                DECLARE
 CRAV_IO_ERROR_COUNT    INTEGER INITIAL(0);
C             (RQC,REX/RQC,RXY)
C             ITEM-I/O ERROR COUNT
C             FSSR-NONE
C                                                              MML# NONE
C
                DECLARE
 CRAV_SUBMODE_ID INTEGER  INITIAL(0);
C
C   M=V92J3135C N=CRAV_SUBMODE_ID   T=4 U=ND
C                (RXY,RAS,DL/RQC)
C             ITEM-SUBMODE
C             FSSR-COORD_SYS_SEL_ID
C                                                              V92J3135C
C
                DECLARE
 CRAB_RAS_FIRST_TIME BIT(1)     INITIAL(OFF);
C                (RAS/RXY)
C             ITEM-RAS FIRST TIME FLAG
C             FSSR-FIRST_PASS_FLAG
C                                                              V92X3149X
C
                DECLARE
 CRAV_AUTO_SEQ_ACT INTEGER    INITIAL(0);
C
C   M=V92U3105C N=CRAV_AUTO_SEQ_ACT   T=4 U=ND
C                (RAS,DL7RXY)
C             ITEM-SELECTED RMS SEQUENCE
```

```
MEMBER NAME  CRATE
C              FSSR-ALTO_RMS_SEQ_ID_SEL
C                                                                  V92U3105C
C
                    DECLARE
 CRAB_POSITION_HOLD BIT(1)  INITIAL(OFF);
C
C   M=V92X3141X N=CRAB_POSITION_HOLD T=6  B=16
C                   (RWP,DL/RXY,RAS)
C               ITEM-POSITION HOLD FLAG
C               FSSR-POS_HOLD_FLAG
C                                                                  V92X3141X
C
                    DECLARE
 CRAV_TD_REF_ID INTEGER  INITIAL(0);
C                   (RJS,RAS,RTV/RXY)
C               ITEM-TD REFERENCE ID
C               FSSR-????
C                                                                  V92U3110C
C
                    DECLARE
 CRAV_RD_REF_ID INTEGER  INITIAL(0);
C                   (RJS,RAS,RTV/RXY)
C               ITEM-RD REFERENCE ID
C               FSSR-????
C                                                                  V92U3115C
C
                    DECLARE
 CRAV_DISPATCHER_POINTER_SAVED
                    INTEGER INITIAL(1);
C                   (REX/RXY)
C               ITEM-SAVED DISPATCHER TABLE POINTER
C               FSSR-NONE
C                                                                  MML# NONE
C
                    DECLARE
 CRAV_CONFIG_REQ    INTEGER INITIAL(0);
C                   (REX,RXY/REX,RCC)
C               ITEM-CONFIGURATION REQUEST
C               FSSR-NONE
C                                                                  MML# NONE
C
                    DECLARE
 CRAV_MODE_SWITCH_INDEX_LAST_PASS
                    INTEGER INITIAL(0);
C                   (REX,RQC/RED)REX,RXY)
C               ITEM-MODE SWITCH INDEX LAST PASS
C               FSSR-NONE
C                                                                  MML# NONE
C
                    DECLARE
 CRAV_CONFIG INTEGER      INITIAL(0);
C
C   M=V92U3100C N=CRAV_CONFIG  T=4 U=ND
C                   (REX,RWP,RQC,DL/REX,RQC,RXY)
C               ITEM-CONFIGURATION
C               FSSR-RMS_SOFTWARE_CONFIG_ID
C                                                                  V92U3100C
C
```

```
MEMBER NAME  CRATE
                    DECLARE
 CRAB_SOFT_STOP_ENABLE BIT(1)  INITIAL(ON);
C             (DISP;(REW/RXY,RUD)
C              ITEM-SOFT STOP LIMITS ENABLE FLAG
C              FSSR-SOFT_STOP_LIMITS_FLAG
C                                                            V92X3120X
C
                    DECLARE
 CRAB_MCIU_IO BIT(1)     INITIAL(OFF);
C             (DISP;(REX,RHM/REX,RXY,RUD)
C              ITEM-MCIU I/O FLAG
C              FSSR-MCIU_IO_ON_OFF_FLAG
C                                                            V92X3835X
C
                    DECLARE
 CRAV_JNT_PAST INTEGER    INITIAL(0);
C                   (RWP,RSC/RXY)
C              ITEM-SAVED JOINT SWITCH INDEX
C              FSSR-JOINT_LAST_PASS
C                                                            MML# NONE
C
                    DECLARE
 CRAB_RSC_FIRST_PASS  BIT(1)   INITIAL(OFF);
C                   (RSC/RXY)
C              ITEM-RSC FIRST TIME FLAG
C              FSSR-FIRST_PASS_FLAG
C                                                            V92X3149X
C
C
                    DECLARE
 CRAV_TEST_WD_DELAY     INTEGER INITIAL(0);
C                   (RCD/RXY)
C              ITEM-COUNT DOWN
C              FSSR-COUNT_DOWN
C                                                            MML# NONE
C
                    DECLARE
 CRAV_MCIU_FRAME_ID_PAST INTEGER INITIAL(128);
C                   (RCC/RQC)
C              ITEM-MCIU FRAME ID LAST PASS
C              FSSR-MCIU_FRAME_ID_LP
C                                                            MML# NONE
C
                    DECLARE
 CRAB_CONTROL_MODE_ENTER BIT(1) INITIAL(OFF);
C                   (REX,RQC/RXY,RCD)
C              ITEM-CONTROL MODE ENTER DISCRETE
C              FSSR-CONTROL_MODE_ENTER
C                                                            MML# NONE
C
                    DECLARE
 CRAV_MODE_SWITCH_INDEX INTEGER   INITIAL(0); (REX,RQC,RXY/RCD)
C                   (REX,RQC/RXY/RCD) REX,RXY)
C              ITEM-MODE SWITCH INDEX LAST PASS
C              FSSR-MAN_AUG_ORB_UNLOADED_MODE_REQ
C                   MAN_AUG_EE_MODE_REQ
C                   MAN_AUG_ORB_LOADED_MODE_REQ
C                   SINGLE_JOINT_MODE_REQ
```

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```
MEMBER NAME  CRATE
C                    CPR_CMD_MODE_REQ
C                    AUTO_SEQ_MODE_REQ
C                    TEST_MODE_REQ
C                                                                MML# NONE
C
                  DECLARE
 CRAV_EE_AUTO_MANUAL   INTEGER INITIAL(0);
C                 (Rvm/RCD)
C             ITEM-EE AUTO/MANUAL
C             FSSR-NONE
C                                                                MML# NONE
C
                  DECLARE
 CRAB_ALL_BRAKES_ON BIT(1)      INITIAL(OFF);
C             (RQC,RVM/RCD)
C             ITEM-ALL BRAKES ON FLAG
C             FSSR-ALL_BRAKES_ON_FLAG
C                                                                MML# NONE
C
                  DECLARE
 CRAV_MCIU_FRAME_ID_CHANGE INTEGER    INITIAL(0);
C             (RCD (REX,RQC,RYE,RVM/RQC)
C             ITEM-MCIU FRAME ID CHANGE
C             FSSR-MCIU_FRAME_IDENT_CHANGE
C                                                                V92J3905C
C
                  DECLARE
 CRAV_ARM_SEL  INTEGER    INITIAL(0);
C                 (REX,RQC,RXY,RCC,RYE,RKG,RAS,
C                 RAS,RNC,RCD/RCD)
C             ITEM-ARM SELECT INDEX
C             FSSR-PORT_ARM_SEL
C                    STRBD_ARM_SEL
C                                                                MML# NONE
C
                  DECLARE
 CRAB_PL_CAPTURE_PAST   BOOLEAN INITIAL(OFF);
C                 (RJS,RVM/REX,RPM)
C             ITEM-PL CAPTURE PAST
C             FSSR-PL_CAPTURE_PAST
C                                                                V92X3112X
C
                  DECLARE
 CRAB_RATE_HOLD_LP     BOOLEAN INITIAL(OFF);
C                 (RJS/REX)
C             ITEM-RATE HOLD REQ FLAG LAST PASS
C             FSSR-RATE_HOLD_REQ_LP
C                                                                V92X3104X
C
                  DECLARE
 CRAB_RATE_HOLD_REQ_FLAG    BOOLEAN INITIAL(OFF);
C                 (RJS/RXY)
C             ITEM-RATE HOLD REQUEST
C             FSSR-RATE_HOLD_REQ_FLAG
C                                                                V92X3113X
C
                  DECLARE
 CRAB_VERN_SCALE_PAST  BOOLEAN INITIAL(OFF);
```

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```
MEMBER NAME  CRATE
C                  (RJS,RVM/REX)                                                  040700AD
C              ITEM-VERNIER SCALING PAST                                          040800AB
C              FSSR-VERNIER_SCALING_PAST                                          040900AB
C                                                                   V92X3104X    041000AD
                   DECLARE                                                        041100AB
 CRAV_RIT_TEMP_CTR INTEGER  INITIAL(0);                                           041200AB
C                  (RYE,RIT/RCD)                                                  041300AB
C              ITEM-TEMP COUNTER                                                  041400AB
C              FSSR-TEMP_CAUTION_COUNTER                                          041500AB
C                                                                   MML# NONE    041600AB
C                                                                                 041700AB
                   DECLARE                                                        041800AB
 CRAV_JNT_SEL_ID INTEGER    INITIAL(0);                                           041900AB
C                  (RWP,RSC,RDC/RCD)                                              042000AB
C              ITEM-JOINT SWITCH INDEX                                            042100AB
C              FSSR-JNT_SW_SHY                                                    042200AB
C                   JNT_SW_SHP                                                    042300AB
C                   JNT_SW_ELP                                                    042400AB
C                   JNT_SW_WRP                                                    042500AB
C                   JNT_SW_WRY                                                    042600AB
C                   JNT_SW_WRR                                                    042700AB
C                   JNT_SW_EE_TEMP                                                042800AB
C                   JNT_SW_CRIT_TEMP                                              042900AB
C                                                                   MML# NONE    043000AB
C                                                                                 043100AB
                   DECLARE                                                        043200AB
 CRAV_PARM_SWITCH_INDEX INTEGER INITIAL(0);                                       043300AB
C                  (RDC/RCD)                                                      043400AB
C              ITEM-PARAMETER SWITCH INDEX                                        043500AB
C              FSSR-PARAM_SW_TEST                                                 043600AB
C                   PARAM_SW_POS                                                  043700AB
C                   PARAM_SW_ATT                                                  043800AB
C                   PARAM_SW_JOINT                                                043900AB
C                   PARAM_SW_RATE                                                 044000AB
C                   PARAM_SW_VEL                                                  044100AB
C                   PARAM_SW_PORT_TEMP                                            044200AB
C                   PARAM_SW_STRBD_TEMP                                           044300AB
C                                                                   MML# NONE    044400AB
C                                                                                 044500AB
                   DECLARE                                                        044600AB
 CRAV_EE_ID_ACT INTEGER  INITIAL(1);                                              044700AB
C                  (RKG,RAS/RCD)                                                  044800AB
C              ITEM-SELECTED EE INDEX                                             044900AB
C              FSSR-RMS_EE_SEL_PORT                                               045000AB
C                   RMS_EE_SEL_STRBD                                              045100AB
C                                                                   MML# NONE    045200AB
C                                                                                 045300AB
                   DECLARE                                                        045400AB
 CRAV_PYLD_ID_ACT INTEGER  INITIAL(0);                                            045500AB
C                  (RYE,[illegible],RSC,RJS,RAS,[illegible]/RCD)                  045600AB
C              ITEM-SELECTED PAYLOAD INDEX                                        045700AB
C              FSSR-RMS_PL_SEL_PORT                                               045800AB
C                   RMS_PL_SEL_STRBD                                              045900AB
C                                                                   MML# NONE    046000AB
C                                                                                 046100AB
                   DECLARE                                                        046200AB
 CRAB_RATE_HOLD_REQ BIT(1) INITIAL(OFF);                                          046300AB
C                  (REX,RJS/RCD)                                                  046400AB
```

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MEMBER NAME CRATE

```
C               ITEM-RATE HOLD REQUEST
C               FSSR-RATE_HOLD_SEL_FLAG
C                                                        MML# NONE
C
                   DECLARE
 CRAB_VERN_RATE_REQ BIT(1)    INITIAL(OFF);
C                  (REX,RSC,RJS,RVM/RCD)
C               ITEM-VERNIER SCALING REQUEST
C               FSSR-VERNIER_SCALING_REQ
C                                                        MML# NONE
C
                   DECLARE
 CRAB_PYLD_CAP BIT(1)    INITIAL(OFF);
C                  (REX,RSC,RJS,RAS,RHM,RVM/RCD)
C               ITEM-PAYLOAD CAPTURED
C               FSSR-PL_CAPTURE
C                                                        MML# NONE
C
                   DECLARE
 CRAB_SAFING_IN_PROG BIT(1)    INITIAL(OFF);
C                  (RQC/RCD)
C               ITEM-SAFING IN PROGRESS
C               FSSR-SAFING_IN_PROGRESS_FLAG
C                                                        MML# NONE
C
                   DECLARE
 CRAV_AUTO_GO_STOP INTEGER  INITIAL(0);
C                  (RQC,RAS/RCD)
C               ITEM-AUTO SEQUENCE PROCEED/STOP
C               FSSR-SEQ_PROCEED_REQ
C                    SEQ_STOP_REQ
C                                                        MML# NONE
C
C
                   DECLARE
 CRAV_SING_DRV_POSNEG INTEGER    INITIAL(0);
C                  (RQC,RSC/RCD)
C               ITEM-SINGLE DIRECT DRIVE POS/NEG
C               FSSR-SNGL_DIR_DRIVE_POS_FLAG
C                    SNGL_DIR_DRIVE_NEG_FLAG
C                                                        MML# NONE
C
                   DECLARE
 CRAV_ARM_SEL_PAST  INTEGER INITIAL(0);
C                        (RQC,RXY/REX)
C               ITEM-ARM SELECT INDEX LAST PASS
C               FSSR-????
C                  0 = NONE
C                  1 = PORT
C                  2 = STARBOARD
C                                                        MML# NONE
C
                   DECLARE
 CRAB_CONTROL_MODE_ENTER_PAST
                   BOOLEAN INITIAL(OFF);
C                  (RQC/REX)
C               ITEM-CONTROL MODE ENTER DISCRETE
C               FSSR-CONTROL_MODE_ENTER_LAST_PASS
```


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```
MEMBER NAME  CRATE
C                                                              MML# NONE
C
                DECLARE
 CRAB_EEEU_BITE_FLAG   BIT(1)    INITIAL(OFF);
C               (RHM/RCD)
C            ITEM-EEEU BITE FLAG
C            FSSR-EEEU_BITE_FLAG
C               CR12585A
C                                                              MML# NONE
C
                DECLARE
 CRAB_EE_FAIL BIT(1) INITIAL(OFF);
C               (RHM/RCD)
C            ITEM-EE FAIL BITE FLAG
C            FSSR-EE_FAIL_BITE_FLAG
C               CR 12585
C                                                              MML# NONE
C
                DECLARE
 CRAV_EE_RIG_DERIG  INTEGER       INITIAL(0);
C               (RHM,RVM,RNC/RCD)
C            ITEM-EE RIGIDIZED/DERIGIDIZED
C            FSSR-EE_RIGIDIZED_FLAG
C                                                              MML# NONE
C
                DECLARE
 CRAV_RIG_DERIG_CMD INTEGER       INITIAL(0);
C               (RHM,RVM,RNC/RCD)
C            ITEM-RIGIDIZE/DERIGIDIZE COMMAND
C            FSSR-RIGID_CMD
C                DERIGIDIZE_CMD
C                                                              MML# NONE
C
                DECLARE
 CRAV_CAP_REL_CMD INTEGER         INITIAL(0);
C               (RHM,RVM,RNC/RCD)
C            ITEM-CAPTURE/RELEASE COMMAND
C            FSSR-RELEASE_CMD
C                                                              MML# NONE
C
                DECLARE
 CRAB_DC_COMM_FAIL BIT(1)    INITIAL(OFF);
C               (DISP/RCD)
C            ITEM-D AND C COMMUNICATION FAILURE
C            FSSR-DANDC_COMM_FAIL_FLAG
C                                                              MML# NONE
C
C
                DECLARE
 CRAV_DISPLAY_WORD2 BIT(16) INITIAL(HEX'0000');
C               (DISP/RCD)
C               RCD/DISP
C            ITEM-NONE
C            FSSR-NONE
C             BIT      POSITION & ITEM
C             3        D&C COMMUNICATIONS FAILURE
C             4        THERMISTER CIRCUIT FAILURE
C             6        MADC OUT OF TOLERANCE
```

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```
MEMBER NAME  CRATE
C                 7        MCPC OUT OF TOLERANCE
C                 8        INTERFACE CONTROL FAILURE
C                 9        END EFFECTOR FAILURE
C                11        ABE COMMUNICATIONS FAILURE
C                                                            MML# NONE
C
               DECLARE
 CRAV_DISPLAY_WORD7 BIT(16) INITIAL(HEX'0000');
C              (DISP/RCD)
C               RCD/DISP
C            ITEM-NONE
C            FSSR-NONE
C             BIT      POSITION & ITEM
C             10       TACH FAILURE
C             12       MDA FAILURE
C             13       JPC FAILURE
C             14       28 V SPA POWER FAILURE
C             15       SPA COMMUNICATOR FAILURE
C                                                            MML# NONE
C
               DECLARE
 CRAV_DISPLAY_WORD10 BIT(16) INITIAL(HEX'0000');
C              (DISP,RCD)
C               RCD/DISP
C            ITEM-NONE
C            FSSR-NONE
C             BIT      ITEM
C             10       TACH FAILURE
C             12       MDA FAILURE
C             13       JPC FAILURE
C             14       28 V SPA POWER FAILURE
C             15       SPA COMMUNICATOR FAILURE
C                                                            MML# NONE
C
               DECLARE
 CRAV_DISPLAY_WORD13 BIT(16) INITIAL(HEX'0000');
C              (DISP/RCD)
C               RCD/DISP
C            ITEM-NONE
C            FSSR-NONE
C             BIT      ITEM
C             10       TACH FAILURE
C             12       MDA FAILURE
C             13       JPC FAILURE
C             14       28 V SPA POWER FAILURE
C             15       SPA COMMUNICATOR FAILURE
C                                                            MML# NONE
C
               DECLARE
 CRAV_DISPLAY_WORD16 BIT(16) INITIAL(HEX'0000');
C              (DISP/RCD)
C               RCD/DISP
C            ITEM-NONE
C            FSSR-NONE
C             BIT           ITEM
C             10       TACH FAILURE
C             12       MDA FAILURE
C             13       JPC FAILURE
```

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```
MEMBER NAME  CRATE
C               14       28 V SPA POWER FAILURE
C               15       SPA COMMUNICATOR FAILURE
C                                                        MML# NONE
C
                   DECLARE
 CRAV_DISPLAY_WORD19 BIT(16) INITIAL(HEX'0000');
C                  (DISP/RCD)
C                  RCD DISP
C             ITEM-NONE
C             FSSR-NONE
C              BIT             ITEM
C              10       TACH FAILURE
C              12       MDA FAILURE
C              13       JPC FAILURE
C              14       28 V SPA POWER FAILURE
C              15       SPA COMMUNICATOR FAILURE
C                                                        MML# NONE
C
C
                   DECLARE
 CRAV_DISPLAY_WORD22 BIT(16) INITIAL(HEX'0000');
C                  (DISP/RCD)
C                  RCD DISP
C             ITEM-NONE
C             FSSR-NONE
C              BIT              ITEM
C              10       TACH FAILURE
C              12       MDA FAILURE
C              13       JPC FAILURE
C              14       28 V SPA POWER FAILURE
C              15       SPA COMMUNICATOR FAILURE
C                                                        MML# NONE
C
C
                   DECLARE
 CRAB_RMS_SPEC_INIT BIT(1)     INITIAL(OFF);
C                  (REX/RMC,REX)
C             ITEM-RMS SPEC INITIALIZATION FLAG
C             FSSR-????
C                                                                 MML# NONE
C
                   DECLARE
 CRAB_ITEM_ENTRY BIT(1)  INITIAL(OFF);
C                  (REX/RMC,REX)
C             ITEM-ITEM ENTRY FLAG
C             FSSR-????
C                                                                 MML# NONE
C
C
                   DECLARE
 CRAV_AUTO_SEQ_STR_PT INTEGER    INITIAL(1);
C
C  M=V93J7550C N=CRAV_AUTO_SEQ_STR_PT  T=4 U=ND
C                  (RAS,DISP,DL/RUD)
C             ITEM-AUTO SEQUENCE START POINT
C             FSSR-AUTO_SEQ_START_POINT
C                                                                 V93J7550C
C
```

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```
MEMBER NAME  CRATE
                 DECLARE                                                      069700AB
 CRAB_AUTO_SEQ_FLAG BIT(1)   INITIAL(OFF);                                    069800AB
C                (RAS/RUD)                                                    069900AB
C             ITEM-AUTO SEQUENCE FLAG                                         070000AB
C             FSSR-AUTO_SEQ_START_POINT_FLAG                                  070100AB
C                                                          V93X7551X          070200AB
C                                                                             070300AB
                 DECLARE                                                      070400AB
 CRAV_GOOD_PL_INIT    INTEGER INITIAL(1);                                     070500AB
C                (RAS/RPO)                                                    070600AB
C             ITEM-GOOD PL INIT                            V92J3677C          070700AB
C             FSSR-????                                                       070800AB
C                                                          ~~MML#~~ NONE      070900AD
C                                                                             071000AB
C                                                                             071100AB
                 DECLARE                                                      071200AB
 CRAV_GOOD_ARM_INIT INTEGER INITIAL(0);                                       071300AB
C                (RAS/RPO)                                                    071400AB
C             ITEM-GOOD ARM INIT                                              071500AB
C             FSSR-????                                                       071600AB
C                                                          V92X3830X          071700AB
C                                                                             071800AB
                 DECLARE                                                      071900AB
 CRAV_GOOD_EE_SEL INTEGER     INITIAL(0);                                     072000AB
C                (RAS/RPO)                                                    072100AB
C             ITEM-GOOD EE SELECTED                                           072200AB
C             FSSR-????                                                       072300AB
C                                                          MML# NONE          072400AB
C                                                                             072500AB
                 DECLARE                                                      072600AB
 CRAV_AUTO_SEQ_LAST_POINT INTEGER   INITIAL(0);                               072700AB
C                                                                             072800AB
C  M=V92J3241C N=CRAV_AUTO_SEQ_LAST_POINT   T=4 U=ND                          072900AB
C                (DISP,DL/RAS)                                                073000AB
C             ITEM-AUTO SEQUENCE LAST POINT                                   073100AB
C             FSSR-AUTO_SEQ_LAST_POINT                                        073200AB
C                                                          V92J3241C          073300AB
C                                                                             073400AB
                 DECLARE                                                      073500AB
 CRAV_ITEM_NO INTEGER       INITIAL(0);                                       073600AB
C                (RUD/RMC)                                                    073700AB
C             ITEM-KEYBOARD ITEM NUMBER                                       073800AB
C             FSSR-????                                                       073900AB
C                                                          MML# NONE          074000AB
C                                                                             074100AB
                 DECLARE                                                      074200AB
 CRAV_ITEM_INTEGER INTEGER INITIAL(0);                                        074300AB
C                (RUD/RMC)                                                    074400AB
C             ITEM-ITEM DATA                                                  074500AB
C             FSSR-????                                                       074600AB
C                                                          MML# NONE          074700AB
C                                                                             074800AB
                 DECLARE                                                      074900AB
 CRAV_ITEM_SCALAR SCALAR INITIAL(0);                                          075000AB
C                (RUD/RMC)                                                    075100AB
C             ITEM-ITEM DATA                                                  075200AB
C             FSSR-????                                                       075300AB
C                                                          MML# NONE          075400AB
```


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```
MEMBER NAME  CRATE
C
                DECLARE
 CRAV_OPR_CMD_CK_FLAG    INTEGER INITIAL(0);
C M=V92J3675C N=CRAV_OPR_CMD_CK_FLAG T=4 U=ND
C               (DL/RUD,RPC)
C            ITEM-OPR CMD CK FLAG
C            FSSR-OPR_CMD_CHECK_FLAG
C                                                      V92X3675C
C
                DECLARE
 CRAV_PL_INIT    INTEGER INITIAL(1);
C               (RPC,RXY/RUD)
C            ITEM-PYLD INIT ID                         V93J7541C
C            FSSR-PL_INIT_ID
C                                                      V92J3827C
C
                DECLARE
 CRAV_ARM_INIT INTEGER     INITIAL(1);
C               (RPC,DISP/RUD)
C            ITEM-ARM INITIALIZATION FLAG
C            FSSR-ARM_INIT_FLAG
C                                                      V92X3830X
C
                DECLARE
 CRAV_DISP_PL_INIT      INTEGER INITIAL(0);
C               (DISP/RUD)
C            ITEM-DISP INIT PYLD
C            FSSR-NONE
C                                                      MML# NONE
C
                DECLARE
 CRAV_DISP_PYLD_ID INTEGER  INITIAL(0);
C               (DISP/RUD)
C            ITEM-DISP PYLD ID
C            FSSR-NONE
C                                                      V92J3845C
C
                DECLARE
 CRAV_DISP_EE_ID INTEGER     INITIAL(1);
C               (DISP/RUD)
C            ITEM-DISP EE ID
C            FSSR-NONE
C                                                      V92J3846C
C
C
 STRUCTURE CRAB_ANNUN_TREE RIGID:
C
  1 CRAB_MCIU_ANNUN          BOOLEAN,
C               (RDC/RCD)
C            ITEM-MCIU FAILURE WARNING
C            FSSR-NONE
C                                                      V54[illegible]2020J
C
  1 CRAB_ABE_ANNUN           BOOLEAN,
C               (RDC/RCD)
C            ITEM-ABE FAILURE WARNING
C            FSSR-NONE
C                                                      V54[illegible]2021J
```

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```
MEMBER NAME  CRATE
C
  1 CRAB_GPC_ANNUN          BOOLEAN,
C               (RDC/RCD)
C           ITEM-GPC DATA FAILURE WARNING
C           FSSR-NONE
C                                                        ~~V92X2022J~~
C
  1 CRAB_EE_DERIG_ANNUN     BOOLEAN,
C               (RDC/RHM)
C           ITEM-EE DERIGIDIZE WARNING
C           FSSR-EE_DERIGID_WARN_FLAG
C                                                        V72X2926J
C
  1 CRAB_EE_REL_ANNUN       BOOLEAN,
C               (RDC/RHM)
C           ITEM-EE RELD ANNUN
C           FSSR-EE_RELD_WARN_FLAG
C                                                        V72X2927J
C
  1 CRAB_SING_ANNUN         BOOLEAN,
C               (RDC/RHM)
C           ITEM-SINGULARITY FAILURE
C           FSSR-SING_CAUTION_FLAG
C                                                        V72X2923J
C
  1 CRAB_CTL_ERR_ANNUN      BOOLEAN,
C               (RDC/RVM)
C           ITEM-CONTROL ERROR CAUTION
C           FSSR-CONTROL_ERR_CAUTION_FLAG
C                                                        V72X2924J
C
  1 CRAB_CHK_CRT_ANNUN      BOOLEAN,
C               (RDC/RVM)
C           ITEM-CHECK CRT CAUTION
C           FSSR-CK_CRT_CAUTION_FLAG
C                                                        V72X2929J
C
  1 CRAB_REACH_LIM_ANNUN    BOOLEAN,
C               (RDC/RHM)
C           ITEM-REACH LIMIT CAUTION
C           FSSR-REACH_LIMIT_CAUTION_FLAG
C                                                        V72X2930J
C
  1 CRAB_ARM_TEMP_ANNUN   ARRAY(2) BOOLEAN;
C               (RDC/RIT)
C           ITEM-ARM TEMP CAUTION
C           FSSR-PORT_TEMP_CAUTION
C                STRBD_TEMP_CAUTION
C                                                        V72X2931J,
C                                                        V72X2925J
                DECLARE
 CRAB_ANNUN_TREE CRAB_ANNUN_TREE-STRUCTURE INITIAL(11#OFF);
C
                DECLARE
 CRAB_ENCOD_CK     ARRAY(6) BOOLEAN INITIAL(6#OFF);
C
C   M=V92X3530X N=CRAE_ENCOD_CK$(1:)    T=6   B=16
C   M=V92X3531X N=CRAE_ENCOD_CK$(2:)    T=6   B=16
```

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```
MEMBER NAME  CRATE
C   M=V92X3532X N=CRAB_ENCOD_CK$(3:)    T=6   B=16                                    087100AB
C   M=V92X3533X N=CRAB_ENCOD_CK$(4:)    T=6   B=16                                    087200AB
C   M=V92X3534X N=CRAB_ENCOD_CK$(5:)    T=6   B=16                                    087300AB
C   M=V92X3535X N=CRAB_ENCOD_CK$(6:)    T=6   B=16                                    087400AB
C              (DISP,RVM,RNC) (DISP,RHM,RNC/RVM)                                      087500AD
C              ITEM-ENCOD CK FLAG                                                     087600AB
C              FSSR-ENCODER_CHECK_FLAG                                                087700AB
C                                                         V92X3530X - 535X            087800AB
C                                                                                     087900AB
                  DECLARE                                                             088000AB
 CRAB_ERRJNT ARRAY(6) BOOLEAN INITIAL(6#OFF);                                         088100AB
C                                                                                     088200AB
C   M=V92X3540X N=CRAB_ERRJNT$(1:)    T=6   B=16                                      088300AB
C   M=V92X3541X N=CRAB_ERRJNT$(2:)    T=6   B=16                                      088400AB
C   M=V92X3542X N=CRAB_ERRJNT$(3:)    T=6   B=16                                      088500AB
C   M=V92X3543X N=CRAB_ERRJNT$(4:)    T=6   B=16                                      088600AB
C   M=V92X3544X N=CRAB_ERRJNT$(5:)    T=6   B=16                                      088700AB
C   M=V92X3545X N=CRAB_ERRJNT$(6:)    T=6   B=16                                      088800AB
C          (DISP,RVM(DL/RHM,RNC)                                                      088900AD
C              ITEM-ERRJNT                                                            089000AB
C              FSSR-ERRJNT                                                            089100AB
C                                                         V92X3540X - 545X            089200AB
C                                                                                     089300AB
                  DECLARE                                                             089400AB
 CRAB_JNT_TACH_FAIL  ARRAY(6) BIT(1) INITIAL(6#OFF);                                  089500AB
C                 (RVM/RCD)                                                           089600AD
C              ITEM-JOINT TACH FAILURE                                                089700AB
C              FSSR-TACH_FAIL_FLAG                                                    089800AB
C                                                              MML# NONE              089900AB
C                                                                                     090000AB
                  DECLARE                                                             090100AB
 CRAB_REACH_LIM_NEG   ARRAY(6)   BIT(16) INITIAL(6#BIN'0');                           090200AB
C                                                                                     090300AB
C   M=V92X3560X N=CRAB_REACH_LIM_NEG$(1:)    T=6   B=16                               090400AB
C   M=V92X3561X N=CRAB_REACH_LIM_NEG$(2:)    T=6   B=16                               090500AB
C   M=V92X3562X N=CRAB_REACH_LIM_NEG$(3:)    T=6   B=16                               090600AB
C   M=V92X3563X N=CRAB_REACH_LIM_NEG$(4:)    T=6   B=16                               090700AB
C   M=V92X3564X N=CRAB_REACH_LIM_NEG$(5:)    T=6   B=16                               090800AB
C   M=V92X3565X N=CRAB_REACH_LIM_NEG$(6:)    T=6   B=16                               090900AB
C             (DISP,(DL/RHM)                                                          091000AB
C                 NEGATIVE REACH LIMITS                                               091100AB
C              ITEM-REACH LIM NEG FLAG                                                091200AB
C              FSSR-REACH_LIMIT_NEG_FLAG                                              091300AB
C                                                                                     091400AB
C                                                                                     091500AB
C                                                                                     091600AB
                  DECLARE                                                             091700AB
  CRAB_REACH_LIM_POS    ARRAY(6)   BIT(16)  INITIAL(6#BIN'0');                        091800AB
C                                                                                     091900AB
C   M=V92X3550X N=CRAB_REACH_LIM_POS$(1:)    T=6   B=16                               092000AB
C   M=V92X3551X N=CRAB_REACH_LIM_POS$(2:)    T=6   B=16                               092100AB
C   M=V92X3552X N=CRAB_REACH_LIM_POS$(3:)    T=6   B=16                               092200AB
C   M=V92X3553X N=CRAB_REACH_LIM_POS$(4:)    T=6   B=16                               092300AB
C   M=V92X3554X N=CRAB_REACH_LIM_POS$(5:)    T=6   B=16                               092400AB
C   M=V92X3555X N=CRAB_REACH_LIM_POS$(6:)    T=6   B=16                               092500AB
C            (DISP,(DL/RHM)                                                           092600AB
C                 POSITIVE REACH LIMITS                                               092700AB
C              ITEM-REACH LIM POS FLAG                                                092800AB
```

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```
MEMBER NAME  CRATE
C            FSSR-REACH_LIMIT_POS_FLAG
C
                DECLARE
 CRAD_RMS_FAULT_BLANK  BIT(16) INITIAL(HEX'0000');
C               (DISP/RXY)
C            ITEM-FAULT BLANKING WORD
C            FSSR-????
C                                                            MML# NONE
C
                DECLARE
 CRAD_RMS_SEL_CRT CHARACTER(4) INITIAL('    M');
C               (DISP/RXY)
C            ITEM-ARM SELECTED FOR CRT
C            FSSR-????
C                                                            MML# NONE
C
                DECLARE
 CRAV_ACT_RATE_POS_ATD_BM               BIT(16)
                INITIAL(HEX'0000');
C               (DISP/RXY)
C            ITEM-RATE POS & ATD BLANKING WORD
C            FSSR_????
C               ITEM 1 -- CRAV_POR_XLT_ATL_TD$(1)
C               ITEM 4 -- CRAV_POR_ROT_ATL_RD$(1)
C               ITEM 7 -- CRAV_POR_POS_DISP$(1)
C               ITEM 10 -- CRAV_POR_ATD_CS$(1)
C                                                            MML# NONE
C
                DECLARE
 CRAV_ARM_INIT_DISP BIT(16) INITIAL(HEX'1');
C               (DISP/RUD)
C            ITEM-ARM INIT FOR DISPLAY
C            FSSR-????
C                                                            MML# NONE
C
                DECLARE
 CRAV_AUTO_SEQ_ID    ARRAY(4) INTEGER INITIAL(4#1);
C           (DISP (RXY/RUD)
C            ITEM-RMS AUTO SEQUENCE ID
C            FSSR-RMS_AUTO_SEQ_ID
C                                                            V93J7510C-
C                                                            V93J7513C
                DECLARE
 CRAV_AUTO_SEQ_LAST_PT_BM BIT(16) INITIAL(HEX'0000');
C               (DISP/RAS,RXY)
C            ITEM-AUTO SEQ LAST POINT BLANKING WORD
C            FSSR-????
C                                                            MML# NONE
C
                DECLARE
 CRAV_CMD_RATE_BLNK            BIT(16)  INITIAL(HEX'0000');
C               (DISP/RXY)
C            ITEM-COMMAND RATE BLANKING WORD
C            FSSR-????
C               ITEM 1 -- CRAV_POR_XLT__CMD_TD$(1)
C               ITEM 4 -- CRAV_POR_ROT_CMD_RD$(1)
C                                                            MML# NONE
C
```

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REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

```
MEMBER NAME  CRATE
                 DECLARE
 CRAV_CCND_RHC_SIG   ARRAY(3) SCALAR   INITIAL(3#0);
C
C   M=V92H3132C N=CRAV_CCND_RHC_SIG$(1)            T=1 U=CNT
C   M=V92H3130C N=CRAV_CCND_RHC_SIG$(2)            T=1 U=CNT
C   M=V92H3131C N=CRAV_CCND_RHC_SIG$(3)            T=1 U=CNT
C                (RJS,DL7RYE)
C            ITEM-ROTATIONAL HAND CENTRCLLER COMMANDS
C            FSSR-RHC
C                1 - ROLL                                              V92H3132C
C                2 - PITCH                                             V92H3130C
C                3 - YAW                                               V92H3131C
C
                 DECLARE
 CRAV_COND_THC_SIG   ARRAY(3) SCALAR INITIAL(3#0);
C
C   M=V92H3125C N=CRAV_CCND_THC_SIG$(1)            T=1 U=CNT
C   M=V92H3126C N=CRAV_CCND_THC_SIG$(2)            T=1 U=CNT
C   M=V92H3127C N=CRAV_COND_THC_SIG$(3)            T=1 U=CNT
C                (RJS,DL7RYE)
C            ITEM-TRANSLATICNAL HAND CENTRCLLER COMMANDS
C            FSSR-THC
C                1 - X                                                 V92H3125C
C                2 - Y                                                 V92H3126C
C                3 - Z                                                 V92H3127C
C
                 DECLARE
 CRAV_CRIT_TEMP_INDEX    ARRAY(2) INTEGER  INITIAL(2#0);
C
C   M=V92U3700C N=CRAV_CRIT_TEMP_INDEX$(1)   T=4 U=ND
C   M=V92U3701C N=CRAV_CRIT_TEMP_INDEX$(2)   T=4 U=ND
C                (RDD,DL7RIT)
C            ITEM-CRITICAL TEMP INDEX (PCRT/STBD)
C            FSSR-CRIT_TEMP_PCRT_INDEX
C                 CRIT_TEMP_STRBD_INDEX
C                1 - PORT                                              V92U3700C
C                2 - STBD                                              V92U3701C
C
                 DECLARE
 CRAV_DEC_DSP_DATA   ARRAY(3) INTEGER   INITIAL(3#0);
C                (RNC/RDD)
C            ITEM-INPUT DECIMAL FIELDS
C            FSSR-DISPLAY_DECIMAL1
C                 DISPLAY_DECIMAL2
C                 DISPLAY_DECIMAL3
C                                                                      MML# NONE
C
                 DECLARE
 CRAV_DIG_DSP_DATA   ARRAY(3) SCALAR INITIAL(3#0);
C                (RNC/RDD)
C            ITEM-INPUT DATA FIELDS
C            FSSR-DISPLAY_WORD1
C                 DISPLAY_WORD2
C                 DISPLAY_WORD3
C                                                                      MML# NONE
C
                 DECLARE
 CRAV_EE_ROT_RATE_CMD_AM VECTOR(3)  INITIAL(3#0);
```

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MEMBER NAME CRATE

```
C
C   M=V92R3182C N=CRAV_EE_ROT_RATE_CMD_AM$(1)    T=1 U=DEG/S
C   M=V92R3180C N=CRAV_EE_ROT_RATE_CMD_AM$(2)    T=1 U=DEG/S
C   M=V92R3181C N=CRAV_EE_ROT_RATE_CMD_AM$(3)    T=1 U=DEG/S
C                   (RRP,DL/RJS,RAS)
C               ITEM-COMMANDED EE ROTATIONAL RATE (AM)
C               FSSR-EE_ROT_RATE_CMD
C                   1 - ROLL'                                      V92R3182C
C                   2 - PITCH'                                     V92R3180C
C                   3 - YAW'                                       V92R3181C
C
                    DECLARE
 CRAV_EE_XLT_RATE_CMD_AM VECTOR(3)  INITIAL(3#0);
C
C   M=V92R3175C N=CRAV_EE_XLT_RATE_CMD_AM$(1)    T=1 U=FT/S
C   M=V92R3176C N=CRAV_EE_XLT_RATE_CMD_AM$(2)    T=1 U=FT/S
C   M=V92R3177C N=CRAV_EE_XLT_RATE_CMD_AM$(3)    T=1 U=FT/S
C                   (RRP,DL/RJS,RAS)
C               ITEM-COMMANDED EE TRANSLATIONAL RATE (AM)
C               FSSR-EE_TRANS_RATE_CMD
C                                                        V92R3175C - 177C
                    DECLARE
 CRAV_GOOD_POR_ATD_DES VECTOR(3)  INITIAL(3#0);
C                   (RAS/RPO)
C               ITEM-GOOD POR ATD DESIRED
C               FSSR-OPR_POR_ATT_DES                  V93J7523C-525C
C                                                      ~~MML# NONE~~
C
C
                    DECLARE
 CRAV_GOOD_POR_POS_DES VECTOR(3)  INITIAL(3#0);
C                   (RAS/RPO)
C               ITEM-GOOD POR POS DESIRED             V93J7520C-522C
C               FSSR-OPR_POR_POS_DES
C                                                      ~~MML# NONE~~
C
                    DECLARE
 CRAV_HC_COMP_SCALE ARRAY(6) SCALAR  INITIAL(6#0);
C                   (RYE/RCD)
C               ITEM-SCALED HC COMPONENTS
C               FSSR-????
C                                                          MML# NONE
C
                    DECLARE
 CRAV_JA_ATL  ARRAY(6)  SCALAR  INITIAL(6#0);
C
C   M=V92H3300C N=CRAV_JA_ATL$(1)  T=1 U=DEG
C   M=V92H3301C N=CRAV_JA_ATL$(2)  T=1 U=DEG
C   M=V92H3302C N=CRAV_JA_ATL$(3)  T=1 U=DEG
C   M=V92H3303C N=CRAV_JA_ATL$(4)  T=1 U=DEG
C   M=V92H3304C N=CRAV_JA_ATL$(5)  T=1 U=DEG
C   M=V92H3305C N=CRAV_JA_ATL$(6)  T=1 U=DEG
C                   (RWP,RKG,RSC,RFP,RRP,RHM,RDD,RVM,DL/RYE)
C               ITEM-ACTUAL JOINT ANGLES
C               FSSR-JOINT_ANGLES
C                   1 - SHY'                                       V92H3300C
C                   2 - SHP'                                       V92H3301C
C                   3 - ELP'                                       V92H3302C
```

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

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```
MEMBER NAME  CRATE
C                 4 - WRP'                                           V92H3303C
C                 5 - WRY'                                           V92H3304C
C                 6 - WRR'                                           V92H3305C
C
                  DECLARE
 CRAV_JA_CMD    ARRAY(6) SCALAR INITIAL(6#0);
C
C   M=V92H3235C N=CRAV_JA_CMD$(1)  T=1 U=DEG
C   M=V92H3236C N=CRAV_JA_CMD$(2)  T=1 U=DEG
C   M=V92H3237C N=CRAV_JA_CMD$(3)  T=1 U=DEG
C   M=V92H3238C N=CRAV_JA_CMD$(4)  T=1 U=DEG
C   M=V92H3239C N=CRAV_JA_CMD$(5)  T=1 U=DEG
C   M=V92H3240C N=CRAV_JA_CMD$(6)  T=1 U=DEG
C                (DL)(RFP/RWP)
C               ITEM-COMMANDED JOINT ANGLES
C               FSSR-JOINT_ANGLE_CMD
C                 1 - SHY                                            V92H3235C
C                 2 - SHP                                            V92H3236C
C                 3 - ELP                                            V92H3237C
C                 4 - WRP                                            V92H3238C
C                 5 - WRY                                            V92H3239C
C                 6 - WRR                                            V92H3240C
C
                  DECLARE
 CRAV_JA_COS    ARRAY(6) SCALAR INITIAL(6#0);
C                 (RRP,RTV/RKG)
C               ITEM-COSINES OF JOINT ANGLES
C               FSSR-JOINT_ANGLE_COS
C                                                                    V92H3350C-
C                                                                    V92H3355C
                  DECLARE
 CRAV_JA_SCALE  ARRAY(6) SCALAR INITIAL(6#0);
C                 (RYE/RCD)
C               ITEM-JOINT ANGLE SCALE
C               FSSR-????
C                                                                    MML # NONE
C
                  DECLARE
 CRAV_JA_SIN    ARRAY(6) SCALAR  INITIAL(6#0);
C                 (RRP,RTV/RKG)
C               ITEM-SINES OF JOINT ANGLES
C               FSSR-JOINT_ANGLE_SIN
C                                                                    V92H3340C-
C                                                                    V92H3345C
                  DECLARE
 CRAV_JAR_ATL   ARRAY(6)  SCALAR INITIAL(6#0);
C
C   M=V92R3310C N=CRAV_JAR_ATL$(1)  T=1 U=DEG/S
C   M=V92R3311C N=CRAV_JAR_ATL$(2)  T=1 U=DEG/S
C   M=V92R3312C N=CRAV_JAR_ATL$(3)  T=1 U=DEG/S
C   M=V92R3313C N=CRAV_JAR_ATL$(4)  T=1 U=DEG/S
C   M=V92R3314C N=CRAV_JAR_ATL$(5)  T=1 U=DEG/S
C   M=V92R3315C N=CRAV_JAR_ATL$(6)  T=1 U=DEG/S
C              (RAS)(RWP,ROC,RSC,,RTV,DL/RYE)
C              ITEM-ACTUAL JOINT ANGLES
C              FSSR-JOINT_RATES
C                 1 - SHY'                                           V92R3310C
C                 2 - SHP'                                           V92R3311C
```

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```
MEMBER NAME  CRATE
C                  3 - ELP'                                                          V92R3312C
C                  4 - WRP'                                                          V92R3313C
C                  5 - WRY'                                                          V92R3314C
C                  6 - WRR'                                                          V92R3315C
C
                   DECLARE
 CRAV_JAR_CMD   ARRAY(6) SCALAR INITIAL(6#0);
C
C   M=V92R3205C N=CRAV_JAR_CMD$(1)   T=1 U=DEG/S
C   M=V92R3206C N=CRAV_JAR_CMD$(2)   T=1 U=DEG/S
C   M=V92R3207C N=CRAV_JAR_CMD$(3)   T=1 U=DEG/S
C   M=V92R3208C N=CRAV_JAR_CMD$(4)   T=1 U=DEG/S
C   M=V92R3209C N=CRAV_JAR_CMD$(5)   T=1 U=DEG/S
C   M=V92R3210C N=CRAV_JAR_CMD$(6)   T=1 U=DEG/S
C                (DL-(RHM,RTV,RNC/RXY,RSC,RRP,RFP)
C              ITEM-JOINT ANGLE RATE COMMANDS
C              FSSR-JOINT_RATE_CMD
C                  1 - SHY'                                                          V92R3205C
C                  2 - SHP'                                                          V92R3206C
C                  3 - ELP'                                                          V92R3207C
C                  4 - WRP'                                                          V92R3208C
C                  5 - WRY'                                                          V92R3209C
C                  6 - WRR'                                                          V92R3210C
C
                   DECLARE
 CRAV_JAR_RAW   ARRAY(6) SCALAR INITIAL(6#0);
C                  (RVM/RYE)
C              ITEM-RAW JOINT RATES
C              FSSR-RAW_JOINT_RATES
C                                                                                    V92R3410C-
C                                                                                    V92R3415C
                   DECLARE
 CRAV_MOTOR_SPEED_LP   ARRAY(3,6)
                   SCALAR  INITIAL(18#0);
C                  (RVM/RNC)
C              ITEM-MCT SPEED LP
C              FSSR-MCT_SPEED_LP
C                                                                                    V92R3805C-
C                                                                                    V92R3822C
C
                   DECLARE
 CRAV_JNT_RATE_LIM   ARRAY(6) SCALAR INITIAL(6#0);
C                  (RSC,RFP,RRP/RYE)
C              ITEM-MAXIMUM JOINT RATE LIMITS
C              FSSR-JOINT_CURRENT_LIMITS
C                                                                                    MML# NONE
C
                   DECLARE
 CRAV_MOT_RATE_RAW ARRAY(6) SCALAR INITIAL(6#0):
C                  (RYE/RCD)
C              ITEM-UNFILTERED MOTOR RATES
C              FSSR-MCT_RATE_UNFILT
C                                                                                    MML# NONE
C
                   DECLARE
 CRAV_OPR_CMD_CK_INDEX   CHARACTER(4) INITIAL('    ');
C                  (RAS,DISP/RUD,RPD)
C              ITEM-OPR CMD CHECK INDEX
```

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```
MEMBER NAME  CRATE
C              FSSR-????
C                                                              V92X3840X
C
                    DECLARE
 CRAV_PACK_FAULT      BIT(16)   INITIAL(HEX'0000');
C  M=V92X3040X N=CRAV_PACK_FAULT T=6 B=16
C                   (DL/RNC)
C              ITEM-FAULT LOG PACK WORD
C              FSSR-PACKED_FAULTS
C                                                              V92X3040X
C
                    DECLARE
 CRAV_PL_INIT_PAM     BIT(16) INITIAL(HEX'0000');
C                   (DISP/RUD)
C              ITEM-PL INIT BLANKING WORD
C              FSSR-????
C                                                              MML# NONE
C
                    DECLARE
 CRAV_POR_ATD_OS VECTOR(3) INITIAL(3#0);
C
C   M=V92H3335C N=CRAV_POR_ATD_OS$(3)     T=1 U=DEG
C   M=V92H3333C N=CRAV_POR_ATD_OS$(1)     T=1 U=DEG
C   M=V92H3334C N=CRAV_POR_ATD_OS$(2)     T=1 U=DEG
C                   (RDD,DISP,DL/RKG)
C              ITEM-POR TIP ATTITUDE IN OS
C               FSSR-POR_ATT_STR
C                   1 - ROLL                                   V92H3333C
C                   2 - PITCH                                  V92H3334C
C                   3 - YAW                                    V92H3335C
C
                    DECLARE
 CRAV_POR_COR_DESIRED     ARRAY(6)  INITIAL(6#0);
C                   (RPC,DISP/RUD)
C              ITEM-DESIRED POR POSITION AND ATTITUDE IN
C                   ORBITER STRUCTURAL FRAME
C              FSSR-????
C                   1 - X                                      V93J7520C
C                   2 - Y                                      V93J7521C
C                   3 - Z                                      V93J7522C
C                   4 - PITCH                                  V93J7523C
C                   5 - YAW                                    V93J7524C
C                   6 - ROLL                                   V93J7525C
C
                    DECLARE
 CRAV_POR_COR_DES_BM ARRAY(6)
                    BIT(16) INITIAL(6#HEX'0000');
C                   (DISP/RKG,RUD)
C              ITEM-POR CORD DESIRED BLANKING WORD
C              FSSR-????
C                                                              MML# NONE
C
                    DECLARE
 CRAV_POR_POS_DISP         VECTOR(3)
                        INITIAL(0.0,0.0,0.0);
C
C                   (RDD,DISP/RKG)
C              ITEM-POR TOP POSITION IN OS
```

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```
MEMBER NAME  CRATE
C               FSSR-POR_POS_DISP                                        127700AB
C                                                          V92H3417-     127800AB
C                                                          V92H3419      127900AB
C  M=V92H3417C N=CRAV_POR_POS_DISP$(1) T=1 U=IN                          128000AB
C  M=V92H3418C N=CRAV_POR_POS_DISP$(2) T=1 U=IN                          128100AB
C  M=V92H3419C N=CRAV_POR_POS_DISP$(3) T=1 U=IN                          128200AB
                    DECLARE                                              128300AB
 CRAV_POR_POS_OS VECTOR(3)                                               128400AB
                    INITIAL(0.0,0.0,0.0);                                128500AB
C                   (RAS,RDD,DISP,DL/RKG)                                128600AB
C               ITEM-POSITION OF POR IN OS                               128700AB
C               FSSR-POR_POS_STR                                         128800AB
C                   1 - X                                  V92H3330C     128900AB
C                   2 - Y                                  V92H3331C     129000AB
C                   3 - Z                                  V92H3332C     129100AB
C                                                                        129200AB
                    DECLARE                                              129300AB
 CRAV_POR_ROT_ATL_RD VECTOR(3) INITIAL(3#0);                             129400AB
C                                                                        129500AB
C   M=V92R3325C N=CRAV_POR_ROT_ATL_RD$(1)   T=1 U=DEG/S                  129600AB
C   M=V92R3323C N=CRAV_POR_ROT_ATL_RD$(2)   T=1 U=DEG/S                  129700AB
C   M=V92R3324C N=CRAV_POR_ROT_ATL_RD$(3)   T=1 U=DEG/S                  129800AB
C                   (RDD,DISP,DL/RTV)                                    129900AB
C                ITEM-ACTUAL POR ROTATION RATE IN SL                     130000AB
C                FSSR-ACT_POR_ROT_RATE_SEL                               130100AB
C                   1 - ROLL'                              V92R3325C     130200AB
C                   2 - PITCH'                             V92R3323C     130300AB
C                   3 - YAW'                               V92R3324C     130400AB
C                                                                        130500AB
                    DECLARE                                              130600AB
 CRAV_POR_ROT_CMD_RD VECTOR(3) INITIAL(3#0);                             130700AB
C                                                                        130800AB
C   M=V92R3262C N=CRAV_POR_ROT_CMD_RD$(1)   T=1 U=DEG/S                  130900AB
C   M=V92R3260C N=CRAV_POR_ROT_CMD_RD$(2)   T=1 U=DEG/S                  131000AB
C   M=V92R3261C N=CRAV_POR_ROT_CMD_RD$(3)   T=1 U=DEG/S                  131100AB
C                   (DISP,DL/RTV)                                        131200AB
C                ITEM-COMMANDED POINT OF RESOLUTION ROTATION             131300AB
C                     RATE IN THE SELECTED REF FRAME                     131400AB
C                FSSR-POR_ROT_RATE_CMD_DISP                              131500AB
C                   1 - ROLL'                              V92R3262C     131600AB
C                   2 - PITCH'                             V92R3260C     131700AB
C                   3 - YAW'                               V92R3261C     131800AB
C                                                                        131900AB
                    DECLARE                                              132000AB
 CRAV_POR_XLT_ATL_TD VECTOR(3) INITIAL(3#0);                             132100AB
C                                                                        132200AB
C   M=V92R3320C N=CRAV_POR_XLT_ATL_TD$(1)   T=1 U=FT/S                   132300AB
C   M=V92R3321C N=CRAV_POR_XLT_ATL_TD$(2)   T=1 U=FT/S                   132400AB
C   M=V92R3322C N=CRAV_POR_XLT_ATL_TD$(3)   T=1 U=FT/S                   132500AB
C                   (RDD,DISP,DL/RTV)                                    132600AB
C                ITEM-ACTUAL POR TRANSLATION RATE IN SL                  132700AB
C                FSSR-ACT_POR_TRANS_RATE_SEL                             132800AB
C                   1 - X'                                 V92R3320C     132900AB
C                   2 - Y'                                 V92R3321C     133000AB
C                   3 - Z'                                 V92R3322C     133100AB
C                                                                        133200AB
                    DECLARE                                              133300AB
 CRAV_POR_XLT_CMD_TD VECTOR(3) INITIAL(3#0);                             133400AB
```


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```
MEMBER NAME  CRATE
C
C   M=V92R3250C N=CRAV_POR_XLT_CMD_TD$(1)   T=1 U=FT/S
C   M=V92R3251C N=CRAV_POR_XLT_CMD_TD$(2)   T=1 U=FT/S
C   M=V92R3252C N=CRAV_POR_XLT_CMD_TD$(3)   T=1 U=FT/S
C                    (DISP,DL/RTV)
C                ITEM-COMMANDED POR TRANSLATION RATES IN THE
C                     SELECTED REFERENCE FRAME
C                FSSR-POR_TRANS_RATE_CMD_DISP
C                    1 - X'                                          V92R3250C
C                    2 - Y'                                          V92R3251C
C                    3 - Z'                                          V92R3252C
C
                    DECLARE
 CRAV_PS_TEMP_DATA ARRAY(32) INTEGER INITIAL(32#0);
C                    (RYE/RCD)
C                ITEM-THERM DATA
C                FSSR-????
C                                                                    MML# NONE
C
                    DECLARE
 CRAV_PS_TEMP_ID ARRAY(4) INTEGER INITIAL(4#0);
C                    (RYE/RCD)
C                ITEM-PORT/STBD TEMP ID
C                FSSR-????
C                                                                    MML# NONE
C
                    DECLARE
 CRAV_RATE_DMD_ID   ARRAY(3) INTEGER
                    INITIAL(128,129,130);
C                    (RVM,RNC/RXY,RNC)
C                ITEM-RATE DEMAND ID
C                FSSR-RATE_DMD_ID
C                                                                    V92J3801C-
C                                                                    V92J3803C
                    DECLARE
 CRAV_RMS_EE_ID    ARRAY(2) INTEGER  INITIAL(1,1);
C
C   M=V93J7507C N=CRAV_RMS_EE_ID$(1)       T=4 U=ND
C   M=V93J7508C N=CRAV_RMS_EE_ID$(2)       T=4 U=ND
C                    (RCD,RPO,DL/RUD)
C                ITEM-RMS EE ID
C                FSSR-RMS_EE_SEL_PORT
C                     RMS_EE_SEL_STRBD
C                    1 - PORT                                        V93J7507C
C                    2 - STBD                                        V93J7508C
C
                    DECLARE
 CRAV_RMS_PL_ID  ARRAY(2) INTEGER  INITIAL(1,1);
C
C   M=V93J7505C N=CRAV_RMS_PL_ID$(1) T=4 U=ND
C   M=V93J7506C N=CRAV_RMS_PL_ID$(2) T=4 U=ND
C                    (RCD,DL,RXY/RUD)
C                ITEM-RMS PAYLOAD ID
C                FSSR-RMS_PL_SEL_PORT
C                     RMS_PL_SEL_STRBD
C                    1 - PORT                                        V93J7505C
C                    2 - STBD                                        V93J7506C
C
```

```
MEMBER NAME  CRATE
                DECLARE
 CRAV_SAVE_EE_ID         ARRAY(2) INTEGER INITIAL(2#1);
C
C               (RUD/REX)
C           ITEM-EE ID   SAVE EE ID
C           FSSR-????
C                                                        MML# NONE
C
                DECLARE
 CRAV_SAVE_PYLD_ID       ARRAY(2) INTEGER INITIAL(2#0);
C
C               (RUD/REX)
C           ITEM-PAYLOAD ID   SAVE PAYLOAD ID
C           FSSR-PL_INIT_ID
C
                DECLARE
 CRAV_SENSOR_ID ARRAY(4) INTEGER INITIAL(4#0);
C               (RYE,RIT/RCD)
C           ITEM-SENSOR ID
C           FSSR-????
C                                                        MML# NONE
C
                DECLARE
 CRAV_THERM_TEMP  ARRAY(24) INTEGER INITIAL(24#100);
C
C               (RIT,RDD,DL/RYE)
C           ITEM-THERM TEMP
C           FSSR-LED_TEMP_PORT
C                LED_TEMP_STRBD
C                ABE_TEMP_PORT
C                ABE_TEMP_STRBD
C               PORT - LED                    V92T3710C - 716C
C               PORT - ABE                    V92T3720C - 724C
C               STBD - LED                    V92T3730C - 736C
C               STBD - ABE                    V92T3740C - 744C
C
                DECLARE
 CRAV_TRFM_MAT    ARRAY(3) MATRIX(3,3) INITIAL(27#0);
C               (RJS,RAS,RTV/RKG)
C           ITEM-TRANSFORMATION MATRICES
C           FSSR-STR_TO_SHY
C                PCT_TO_STR
C                PCR_TO_SHY
C               1 - PCR_TO_OS                 V92U3390C - 398C
C               2 - PCR_TO_AM                 V92U3400C - 408C
C               3 - OS_TO_AM                  V92U3380C - 388C
C
                DECLARE
 CRAV_V_EE_POR    VECTOR(3) INITIAL(3#0);
C               (RKG/RTV,RAS) RJS,RTV,RAS/RKG)
C           ITEM-SELECTED VECTOR FROM EE TO POR
C           FSSR-V_EE_POR                     V92H3421C-423C
C                                                  MML TBD
C
                DECLARE
 CRAV_WRR_RANGE ARRAY(2) INTEGER INITIAL(2#4);
C               (RYE/RYE)
C           ITEM-WRR RANGE
```

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```
MEMBER NAME  CRATE
C            FSSR-WRR_RANGE_PORT
C                 WRR_RANGE_STRBD
C                                                          MML# NONE
                DECLARE
 CRAV_DUM_STAT BIT(16) INITIAL(HEX'0000');
C               (DISP/)
C            ITEM-DUMMY STATUS WORD
C            FSSR-NONE
C                                                          MML# NONE
C
                DECLARE
 CRAV_DEU_NUM       INTEGER INITIAL(0);
C                  (RUD/FMC)
C            ITEM-DEU NUMBER
C            FSSR-????
C                                                          MML# NONE
C
                DECLARE
 CRAB_RVM_ALARM     BOOLEAN    INITIAL(OFF);
C                  (RDD/RVM,RSX)
C            ITEM-RVM ALARM FLAG
C            FSSR-RMS_MASTER_ALARM_WARNING
C                                                          MML# NONE
C
                DECLARE
 CRAV_POR_INDEX     INTEGER    INITIAL(1);
C                  (RAS,RKG/RXY)
C            ITEM-POR INDEX
C            FSSR-POR_FLAG
C                                                         V92X3107X
                 DECLARE
 CRAB_MCIU_IO_ON_OFF_LP BOOLEAN INITIAL(OFF);
C                 (RXY,RQC/REX)
C             ITEM - MCIU I/O FLAG LP
C             FSSR - LAST_IO_ON_OFF_FLAG
C                                                       MML# NONE
                 DECLARE
 CRAV_MOT_RATE_FILT ARRAY(6) SCALAR INITIAL(6#0);
C                 (RVM,SRY/LYE) RVM/RYE,RXY)
C             ITEM - MOT RATE FILT
C             FSSR - MOT_RATE_FILT                    V92U3436C-441C
C                                                       MML# TBD
                 DECLARE
 CRAV_MOT_RATE_FILT_LP ARRAY(6) SCALAR INITIAL(6#0);
C                 (RVM/RXY,RYE)
C             ITEM - MOT RATE FILT LP                 none
C             FSSR - MOT_RATE_FILT_LP
C                                                       MM# TBD
                 DECLARE
 CRAB_CONSIS_FLAG    BIT(1) INITIAL(ON);
C                 (RVM,DISP/RLD)
C             ITEM - CONSIS FLAG                      V93X7545X
C             FSSR - CONSIS_FLAG
C                                                       MML# TBD
                  DECLARE
 CRAV_TEST_WD_INCNT INTEGER INITIAL(0);
C                 (RNC/RXY)
C              ITEM - TEST WD INCNT
```

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```
MEMBER NAME  CRATE                                        MML# NONE    150900AD
C                   FSSR - INCNT                                       151000AD
C CRATE_CLOSE: CLOSE CRA_TE;                                           151100AD
```

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ORIGINAL PAGE IS POOR

```
MEMBER NAME  CRDCIL
C*****************************************************************************
C*     A.2.33   CONSTANTS AND ILCS DATA CCMPCCL (CRD_CIL)                   *
C*                                                                           *
C*     NONCHANGING RMS LEVEL C DATA AND RMS HARDWARE DEPENDENT DATA          *
C*     MISSION AND PAYLOAD INDEPENDENT                                       *
C*                                                                           *
C*                                                                           *
C*****************************************************************************
 CRD_CIL_DUMMY: EXTERNAL COMPOOL;
C
D INCLUDE CSSCOTR
C
 CLOSE CRD_CIL_DUMMY;
 CRD_CIL: COMPOOL RIGID;
C
C
                 DECLARE
 CRDK_DTR SCALAR CONSTANT (3.1415927/180.);
C              (RJS,RRP,RKG,RTV,FNC,RPC,RAS/)
C            ITEM-DEGREES TO RADIANS CONVERSION FACTOR              none
C            FSSR-DTR
C                                                                   V98469040C
C
                 DECLARE
 CRDK_SIN_WR_PROX_TOL SCALAR  CONSTANT (SIN(15.0 CRDK_DTR));
C                (RRP/)
C            ITEM-SINE OF WRIST SINGULARITY PROXIMITY TOLERENCE none
C            FSSR-W_PROX_TOL
C                                                                   V98089288C
C
                 DECLARE
 CRDK_RTD SCALAR  CONSTANT  (180./3.1415927);
C                (RRP,RKG,RPC,RYE,RAS/)
C            ITEM-RADIANS TO DEGREES CONVERSION FACTOR              none
C            FSSR-RTD
C                                                                   V98409960C
C
                 DECLARE
 CRDK_L_SHP_ELP SCALAR  CONSTANT (251.05/12.);
C                (RRP,RKG,RTV/)
C            ITEM-LENGTH FROM SHP TO ELP                            none
C            FSSR-L_SHP_ELP
C                                                                   V98069943C
C
                 DECLARE
 CRDK_L_ELP_WP SCALAR  CONSTANT (277.95/12.);
C                (RKG,RTV/)
C            ITEM-LENGTH FROM ELP TO WRP                            none
C            FSSR-L_ELP_WP
C                                                                   V98079312C
C
                 DECLARE
 CRDK_L_WP_WY SCALAR CONSTANT (18.00/12.);
C                (RKG,RPC/)
C            ITEM-LENGTH FROM WRP TO WRY                            none
C            FSSR-L_WP_WY
C                                                                   V98089311C
C
```

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MEMBER NAME CRDCIL

```
                   DECLARE
 CRDK_SWCUT_SIN_PORT SCALAR
                   CONSTANT (SIN(19.48 CRDK_DTR));
C                  (RKG,RPO/)
C             ITEM-SINE OF PORT SWINGCUT ANGLE                 none
C             FSSR-SWCUT_SIN_PORT
C                                                              V9809322C
C
                   DECLARE
 CRDK_SWCUT_COS_PORT SCALAR
                   CONSTANT  (COS(19.48 CRDK_DTR));
C                  (RKG,RPO/)
C             ITEM-COSINE OF PORT SWINGCUT ANGLE               none
C             FSSR-SWCUT_COS_PORT
C                                                              V9809323C
C
                   DECLARE
 CRDK_RRP_DELTA SCALAR CONSTANT (1.369);
C                  (RPC/)
C             ITEM-ARCTANGENT OF (ELBOW_OFFSET/L_SHP_ELP)      none
C             FSSR-DELTA
C                                                              V9809328C
C
                   DECLARE
 CRDK_RRP_EPSILON SCALAR CONSTANT (1.237);
C                  (RRP/)
C             ITEM-ARCTANGENT OF(ELBOW OFFSET/LENGTH
C                  FROM ELP TO WRP)                            none
C             FSSR-EPSILON
C                                                              V9810906C
C
                   DECLARE
 CRDK_DELTA_EPSILON SCALAR
                   CONSTANT (CRDK_RRP_DELTA
                   + CRDK_RRP_EPSILON);
C                  (RRP,RPO/)
C             ITEM-SUM OF DELTA AND EPSILON                    none
C             FSSR-DELTA_EPSILON
C                                                              V9808903C
C
                   DECLARE
 CRDK_RATIO_SHEL_CDEL SCALAR
                   CONSTANT (CRDK_L_SHP_ELP
                   / COS(CRDK_RRP_DELTA CRDK_DTR));
C                  (RRP,RPO/)
C             ITEM-RATIO OF (L_SHP_ELP/COSINE DELTA)           none
C             FSSR-RATIO_SHEL_CDEL
C                                                              V9806952C
C
                   DECLARE
 CRDK_RATIO_ELW_CEPS SCALAR
                   CONSTANT (CRDK_L_ELP_WP
                   / COS(CRDK_RRP_EPSILON CRDK_DTR));
C                  (RRP,RPO/)
C             ITEM-RATIO OF (LENGTH FROM ELP TO WRP/
C                  COSINE DELTA) EPSILON                       none
C             FSSR-RATIO_ELW_CEPS
C                                                              V9806951C
```

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A.2.33-2
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MEMBER NAME CRDCIL

```
C
                  DECLARE
 CRDK_UP_SW_STOP_LIM_FIVE SCALAR CONSTANT (+116.6);
C                 ** ADDED FOR MAINTAINABILITY
C                 ** COULD  NOT BE REACHED AT COMPILE
C                 ** AS PART OF AN ARRAY
C                                                                 MML# NONE
C
                  DECLARE
 CRDK_UP_SW_STOP_LIM ARRAY(6) SCALAR
                  CONSTANT (+177.4, -C.6, +157.6,
                  +116.4,CRDK_UP_SW_STOP_LIM_FIVE,+442.);
C                 (RHM,RPC/)
C             ITEM-UPPER SOFTWARE LIM
C             FSSR-UP_SFTWR_LMT
C
C                                                                 V98U53358C
C                                                                 V98U53359C
C                                                                 V98U53360C
C                                                                 V98U53361C
C                                                                 V98U53362C
C                                                                 MML# TBD none
C
                  DECLARE
 CRDK_PHI_WASHOUT   SCALAR CONSTANT(0.1 CRDK_RTD);
C                 (RAS/)
C             ITEM-PHI WASHOUT                                    none
C             FSSR-PHI_WASHOUT
C                                                                 V98U49292C
C
                  DECLARE
 CRDK_PHI_HOLD    SCALAR CONSTANT(0.01 CRDK_RTD);
C                 (RAS/)
C             ITEM-PHI HOLD                                       none
C             FSSR-PHI_HOLD
C                                                                 V98U49296C
C
                  DECLARE
 CRDK_L_ELP_WY SCALAR
                  CONSTANT (CRDK_RATIO_ELW_CEPS
                  + CRDK_L_WP_WY);
C                 (RPC/)
C             ITEM-SUM OF RATIO_ELW_CEPS AND L_WP_WY
C             DESC-EXTENDED UPPER ARM LENGTH
C             FSSR-NONE
C                                                                 MML# NONE
C
                  DECLARE
 CRDK_SWRY_MIN  SCALAR
                  CONSTANT(SIN(CRDK_UP_SW_STOP_LIM_FIVE
                  CRDK_DTR));
C                 (RPC/)
C             ITEM-SWRY MIN
C             FSSR-NONE
C                                                                 MML# NONE
C
                  DECLARE
 CRDK_TACH_GAIN SCALAR INITIAL (1.);
C                 (RYE/)
```

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```
MEMBER NAME  CRDCIL
C              ITEM-TACH GAIN
C              DESC-TACHOMETER FILTER GAIN CONSTANT
C              FSSR-TACH_GAIN                                    none
C                                                           MML # TBD
C
                    DECLARE
 CRDK_TACH_TIME_CONSTANT   INITIAL (24.);
C                   (RYE/)
C              ITEM-TACH TIME
C              DESC-TACHOMETER FILTER TIME CONSTANT
C              FSSR-TACH_TIME_CONSTANT                           none
C                                                           MML # TBD
C
                    DECLARE
 CRDK_TEMP_CNV_COEF_A      SCALAR INITIAL (9.31E-4);
C                   (RYE/)
C              ITEM-0 ORDER COEFFICIENT FOR TEMP CONVERSION     none
C              FSSR-A
C                                                           V98U9371C
C
                    DECLARE
 CRDK_TEMP_CNV_COEF_B      SCALAR INITIAL (2.22E-4);
C                   (RYE/)
C               ITEM-1ST ORDER COEFFICIENT FOR TEMP CONVERSION  none
C              FSSR-B
C                                                           V98U9372C
C
                    DECLARE
 CRDK_TEMP_CNV_COEF_C      SCALAR INITIAL (1.247E-7);
C                   (RYE/)
C              ITEM-3RD ORDER COEFFICIENT FOR TEMP CONVERSION   none
C              FSSR-C
C                                                           V98U9373C
C
                    DECLARE
 CRDK_TD_MAX     SCALAR INITIAL (122.);
C                   (RYE/)
C              ITEM-MAXIMUM VALUE OF THERMISTER DATA             none
C              FSSR-TD_MAX
C                                                           V98U9375C
C
                    DECLARE
 CRDK_SER_RES    SCALAR INITIAL (7150.);
C                   (RYE/)
C              ITEM-RESISTANCE CONSTANT IN TEMP CALCULATION      none
C              FSSR-SER_RES
C                                                           V98U9376C
C
                    DECLARE
 CRDK_TEMP_RES SCALAR INITIAL (122.67);
C                   (RYE/)
C              ITEM-RESISTANCE CONSTANT IN TEMP CALCULATION      none
C              FSSR-TEMP_RES
C                                                           V98U9377C
C
                    DECLARE
 CRDK_K_TO_F1    SCALAR INITIAL (9./5.);
C                   (RYE/)
```

```
MEMBER NAME  CRDCIL
C              ITEM-KELVIN TO FAHRENHEIT CONVERSION
C                   CONSTANT #1                                  none
C              FSSR-K_TO_F1
C                                                                V98[illegible]378C
C
                    DECLARE
 CRDK_K_TO_F2   SCALAR INITIAL (459.6);
C                   (RYE/)
C              ITEM-KELVIN TO FAHRENHEIT CONVERSION
C                   CONSTANT #2                                  none
C              FSSR-K_TO_F2
C                                                                V98[illegible]379C
C
                    DECLARE
 CRDK_DIST_EXP SCALAR  INITIAL (0.95);
C                   (RAS/)
C              ITEM-DIST EXP
C              DESC-DISTANCE EXPONENTIAL SCALE FACTOR            none
C              FSSR-DIST_EXP
C                                                                V98[illegible]297C
C
                    DECLARE
 CRDK_PHI_EXP SCALAR   INITIAL (0.95);
C                   (RAS/)
C              ITEM-PHI EXP
C              DESC-ANGLE EXPONENTIAL SCALE FACTOR               none
C              FSSR-PHI_EXP
C                                                                V98[illegible]298C
C
                    DECLARE
 CRDK_DIST_WASHOUT  SCALAR INITIAL (2.0);
C                   (RAS/)
C              ITEM-DIST WASHOUT
C              DESC-WASHOUT DISTANCE TOLERANCE.  FEET            none
C              FSSR-DIST_WASHOUT
C                                                                V98[illegible]291C
C
                    DECLARE
 CRDK_PHI_FLYBY SCALAR CONSTANT(0.05);
C                   (RAS/)
C              ITEM-PHI FLYBY
C              DESC-FLY-BY ANGLE TOLERANCE, DEGREES              none
C              FSSR-PHI_FLYBY
C                                                                V98[illegible]294C
                    DECLARE
 CRDK_DIST_FLYBY    SCALAR INITIAL (1);
C                   (RAS/)
C              ITEM-DIST FLYBY
C              DESC-FLY-BY DISTANCE TOLERANCE, FEET              none
C              FSSR-DIST_FLYBY
C                                                                V98[illegible]293C
C
                    DECLARE
 CRDK_DIST_HOLD     SCALAR INITIAL (0.2);
C                   (RAS/)
C              ITEM-DIST HOLD
C              DESC-POSITION HOLD DISTANCE TOLERANCE, FEET
C              FSSR-DIST_HOLD
```

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```
MEMBER NAME  CRCCIL                                                  none
C                                                                    V9800295C
C
                     DECLARE
 CRDK_MAX_DIST         SCALAR INITIAL (100.);
C                    (RAS/)
C              ITEM-MAX DIST
C              DESC-MAXIMUM TRANSLATION DISTANCE, FEET
C              FSSR-MAX_DIST                                         none
C                                                                    V9800300C
C
                     DECLARE
 CRDK_MAX_PHI          SCALAR INITIAL (180.);
C                    (RAS/)
C              ITEM-MAX PHI
C              DESC-MAXIMUM ANGULAR DISTANCE, DEGREES                none
C              FSSR-MAX_PHI
C                                                                    V9800301C
C
                     DECLARE
 CRDK_STOP_LIMIT INTEGER INITIAL(25);
C                    (RAS/)
C              ITEM-STOP LIMIT
C              DESC-LIMIT FOR STOP COUNTER                           none
C              FSSR-????
C                                                                    V9800299C
C
                     DECLARE
 CRDK_APZERO SCALAR INITIAL(1.0E-8);
C              (RRP,(RAS,R??/)
C              ITEM-AP ZERO
C              DESC-AP-101 ZERO, ANY ABSOLUTE VALUE LESS
C                   THAN THIS IS TREATED AS ZERO
C              FSSR-NONE
C                                                                    MML# NONE
C
                     DECLARE
 CRDK_L_MPM_SWOUT     SCALAR INITIAL (2.25/12.);
C                    (RPO/)
C              ITEM-LENGTH BETWEEN MANIPULATOR POSITIONING
C                   MECHANISM AND THE SWING-OUT JOINT
C              FSSR-L_MPM_SWOUT
C                                                                    MML# NONE
C
                     DECLARE
 CRDK_L_SWOUT_SHY     SCALAR INITIAL (11.49/12.);
C                    (RPO/)
C              ITEM-LENGTH BETWEEN SWING-OUT AND
C                   SHOULDER YAW JOINT
C              FSSR-L_SWOUT_SHY
C                                                                    MML# NONE
C
                     DECLARE
 CRDK_L_WR_EEAP SCALAR INITIAL (12.88 / 12.);
C                    (RKG,RPO/)
C               ITEM-LENGTH FROM WRIST ROLL TO END
C                    EFFECTOR ATTACH POINT                           none
C              FSSR-L_WR_EEAP
C                                                                    V9800309C
```

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```
MEMBER NAME  CRDCIL
C
                 DECLARE
 CRDK_L_WY_WR SCALAR INITIAL (21.62/12.);
C                (RKG,RPO/)
C            ITEM-LENGTH FROM WRIST YAW TO WRIST ROLL JOINT   none
C           FSSR-L_WY_WR
C                                                             V98H93105C
C
                 DECLARE
 CRDK_L_SHY_SHP SCALAR INITIAL (23./12.);
C                (RKG,RPO/)
C            ITEM-LENGTH FROM SHOULDER YAW TO SHOULDER
C                PITCH JOINTS                                 none
C           FSSR-L_SHY_SHP
C                                                             V98H93115C
C
                 DECLARE
 CRDK_FT_TO_IN SCALAR INITIAL (12.);
C           (RAS,(RKG,RPO/)
C            ITEM-FACTOR TO CONVERT FEET TO INCHES            none
C           FSSR-FT_TO_IN
C                                                             V98H93240C
C
                 DECLARE
 CRDK_EL_OFFSET SCALAR INITIAL (6.00/12.);
C                (RKG,RTV/)
C            ITEM-ELBOW OFFSET                                none
C           FSSR-EL_OFFSET
C                                                             V98H93113C
C
                 DECLARE
 CRDK_SF_X1 SCALAR INITIAL  (1.0/0.25);
C                (RDD/)
C            ITEM-X1 SCALE FACTOR
C            DESC-SCALE FACTOR FOR X1 METER SCALING           none
C           FSSR-SCALE_FACTOR_X1
C                                                             V98H98339C
C
                 DECLARE
 CRDK_SF_X10 SCALAR  INITIAL  (1.0/2.5);
C                (RDD/)
C            ITEM-X10 SCALE FACTOR
C            DESC-SCALE FACTOR FOR X10 METER SCALING          none
C           FSSR-SCALE_FACTOR_X10
C                                                             V98H93400C
C
                 DECLARE
 CRDK_MAX_METER_SCALE SCALAR INITIAL (1.0);
C                (RDD/)
C            ITEM-MAX METER VALUE
C            DESC-MAXIMUM VALUE OF ANALOG METER SCALE         none
C           FSSR-MAX_METER_SCALE
C                                                             V98H93356C
C
                 DECLARE
 CRDK_X1_MAX SCALAR  INITIAL(0.18);
C                (RDD/)
C            ITEM-LOW SCALE MAX
```

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```
MEMBER NAME  CRDCIL
C             DESC-VALUE FOR CHANGING ANALOG METER
C                  SCALING TO X10 RANGE                   none
C            FSSR-MAX_RANGE
C                                                       V98U9358C
C
                  DECLARE
 CRDK_X10_MIN SCALAR  INITIAL(0.17);
C                 (RCD/)
C             ITEM-HIGH SCALE MIN
C             DESC-VALUE FOR CHANGING ANALOG METER
C                  SCALING TO X1 RANGE                    none
C            FSSR-MIN_RANGE
C                                                       V98U9357C
C
                  DECLARE
 CRDK_SH_PROX_TOL SCALAR  INITIAL (3.0);
C                 (RRP/)
C             ITEM-SHOULDER SINGULARITY PROXIMITY TOLERANCE   none
C            FSSR-SH_PROX_TOL
C                                                       V98U8963C
C
                  DECLARE
 CRDK_EL_PROX_TOL SCALAR INITIAL   (5.0);
C                 (RRP/)
C             ITEM-ELBOW SINGULARITY PROXIMITY TOLERANCE      none
C            FSSR-EL_PROX_TOL
C                                                       V98U8905C
C
                  DECLARE
 CRDK_BLW_THRESH SCALAR INITIAL (11.3777778);
C                 (RNC/)
C             ITEM-BELOW THRESHOLD FACTOR
C             DESC-BELOW MOTOR SPEED THRESHOLD SCALING FACTOR none
C            FSSR-BELOW_THRESHOLD
C                                                       V98U9308C
C
                  DECLARE
 CRDK_MAX_CRNT_ATTN INTEGER INITIAL (15);
C                 (RNC/)
C             ITEM-MAXIMUM CURRENT ATTENUATION
C             DESC-MINIMUM CURRENT                        none
C            FSSR-MAX_CURRENT_ATTEN
C                                                       V98U9338C
C
                  DECLARE
 CRDK_COARSE_LIM INTEGER  INITIAL(15);
C                 (RSC/)
C             ITEM-COARSE LIM
C             DESC-RSC CYCLE COUNTER-COARSE                none
C            FSSR-COARSE_LIMIT
C                                                       V98U9365C
C
                  DECLARE
 CRDK_VERN_LIM  INTEGER   INITIAL(10);
C                 (RSC/)
C             ITEM-VERNIER LIM
C             DESC-RSC CYCLE COUNTER-VERNIER
C            FSSR-VERNIER_LIMIT
```

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```
MEMBER NAME  CRDCIL                                              none
C                                                                V98U9366C
C
                  DECLARE
 CRDK_MODE_CHG_THRESH SCALAR INITIAL (0.05);
C              (RAJ,RSC,RWP,RQC/)
C               ITEM-MODE CHANGE THRESHOLD
C               DESC-JOINT RATE THRESHOLD VALUE REQUIRED
C                   FOR CHANGING MODES                           none
C              FSSR-MODE_CHG_THRESH
C                                                                V98U8950C
C
C
C
                  DECLARE
 CRDK_COUNT_MAX  INTEGER INITIAL(3);
C                 (RCD/)
C               ITEM-COUNT MAX
C               DESC-CYCLE COUNTER FOR TEST WORD
C              FSSR-CNTMAX                                        none
C                                                                MML# TBD
C
                  DECLARE
 CRDK_MAX_ERR_CNT  INTEGER INITIAL(2);
C                 (RQC,RDD/)
C               ITEM-ERR MAX
C               DESC-MAXIMUM NUMBER OF RCD READ ERRORS ALLOWED
C                   BEFORE REX GOES INTO SUSPEND CONFIGURATION   none
C              FSSR-EMAX
C                                                                V98U9374C
C
                  DECLARE
 CRDK_FILTCON  SCALAR  INITIAL(1);
C                 (RHM/)
C               ITEM-FILTCON
C               DESC-FILTER CONSTANT FOR CONSISTENCY CHECK
C              FSSR-FILTCON                                       none
C                                                                MML# TBD
C
                  DECLARE
 CRDK_MCIU_INTERVAL SCALAR INITIAL (0.042);
C                 (RMM)
C               ITEM-MCIU INTERVAL
C              DESC-MCIU INTERVAL PROCESSING CYCLE TIME           none
C              FSSR-MCIU_INTERVAL
C                                                                MML# TBD
C
                  DECLARE
 CRDK_ARM_ATTH_PT ARRAY(2) VECTOR(3)
                  INITIAL (679.5,-100.33,423.08,
                           679.5,100.33,423.08);
C                 (RKG/)
C               ITEM-ARM ATTACH POINT
C               DESC-LOCATION OF SHOULDER YAW JOINT ATTACH POINT
C                   IN ORBITAL STRUCTURAL FRAME
C              FSSR-PORT_ATTH_PT
C                  STRBD_ATTH_PT
C                  STRUCTURAL FRAME
C                  ARRAY SUBSCRIPT
```

```
MEMBER NAME  CRDCIL
C                  1 - PORT                                   none
C                    VECTOR SUBSCRIPT
C                    1 - X                              V98U9316C
C                    2 - Y                              V98U9317C
C                    3 - Z                              V98U9318C
C                  ARRAY SUBSCRIPT
C                  2 - STBD                                   none
C                    VECTOR SUBSCRIPT
C                    1 - X                              V98U9319C
C                    2 - Y                              V98U9320C
C                    3 - Z.                             V98U9321C
C
                   DECLARE
 CRDK_ALTPAT1  BIT(16) INITIAL(HEX'AAAA');
C                  (RCD,RNC/)
C              ITEM-PATTERN1
C              DESC-ALTERNATING BIT PATTERN #1                none
C             FSSR-ALTPAT1
C                                                      MML# TBD
C
                   DECLARE
 CRDK_ALTPAT2  BIT(16) INITIAL(HEX'5555');
C                  (RCD,RNC/)
C              ITEM-PATTERN2
C              DESC-ALTERNATING BIT PATTERN #2                none
C             FSSR-ALTPAT2
C                                                      MML# TBD
C
                   DECLARE
 CRDK_CHG_THRESH ARRAY(6)  SCALAR
                   INITIAL(2#3E-4,4.5E-4,3#7.8E-4);
C                  (RHM/)
C              ITEM-CHANGE THRESH
C              DESC-THRESHOLD FOR RATE CHANGE                 none
C             FSSR-CHG_THRESH
C                                                      MML# TBD
C
                   DECLARE
 CRDK_ENCOD_TACHO_ERR_LIM ARRAY(6) SCALAR
                   INITIAL(3#0.1,3#0.2);
C                  (RVM/)
C              ITEM-ENCOD TACHO ERR LIM
C              DESC-ENCODER TACHOMETER ERROR THRESHOLD
C              FSSR-ENCODER_TACHO_ERROR_LIMIT
C                                                      MML# NONE
C
                   DECLARE
 CRDK_ERR_THRESH ARRAY(6)  SCALAR
                   INITIAL(2#0.03,0.045,3#0.078);
C                  (RHM/)
C              ITEM-ERRTHRESH
C              DESC-THRESHOLD FOR SMOOTHED TACH ERROR         none
C             FSSR-ERR_THRESH
C                                                      MML# TBD
C
                   DECLARE
 CRDK_HC_MAX_DEF ARRAY(6) SCALAR INITIAL(6#127);
C                  (RYE,RJS)
```

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```
MEMBER NAME  CRDCIL
C              ITEM-HAND-CONTROLLER MAXIMUM DEFLECTION          none     057700AC
C             FSSR-THC_MAX_DEFLECT                                         057800AC
C                  RHC_MAX_DEFLECT                                         057900AC
C                  1 - TRANSLATION                          V98U9282C      058000AC
C                  2 - TRANSLATION                          V98U9283C      058100AC
C                  3 - TRANSLATION                          V98U9284C      058200AC
C                  4 - ROTATION                             V98U6953C      058300AC
C                  5 - ROTATION                             V98U6954C      058400AC
C                  6 - ROTATION                             V98U6955C      058500AC
C                                                                          058600AC
                   DECLARE                                                 058700AC
 CRDK_HC_NULL_DB ARRAY(2) SCALAR INITIAL(2#8);                             058800AC
C                  (RYE,RJS/)                                              058900AC
C              ITEM-HAND-CONTROLLER NULL DEADBAND                          059000AC
C              FSSR-THC_NULL_DEADBAND                          none        059100AC
C                   RHC_NULL_DEADBAND                                      059200AC
C                  1 - TRANSLATION                          V98U9285C      059300AC
C                  2 - ROTATION                             V98U6959C      059400AC
C                                                                          059500AC
                   DECLARE                                                 059600AC
 CRDK_INTEGRAL_RUN_LIM  ARRAY(6) SCALAR INITIAL(6#125);                    059700AC
C                  (RVM/)                                                  059800AD
C              ITEM-INTEGRAL RUN LIM                                       059900AC
C              DESC-ENCODER INTEGRAL RUN LIMIT                             060000AC
C              FSSR-INTEGRAL_RUN_LIMIT                                     060100AC
C                                                           MML# NONE      060200AD
C                                                                          060300AC
                   DECLARE                                                 060400AC
 CRDK_JNT_GEAR_RATIO ARRAY(6) SCALAR                                       060500AC
                   INITIAL (1841.95,1842.95,1260.28,                       060600AC
                        737.74, 738.74, 737.74);                           060700AD
C                  (RYE,RNC/)                                              060800AC
C              ITEM-JOINT GEAR RATIO                           none        060900AC
C              FSSR-JNT_GEAR_RATIO                                         061000AC
C                                                           V98U9302C      061100AC
C                                                        TO V98U9307C      061200AC
C                                                                          061300AC
                   DECLARE                                                 061400AC
 CRDK_LO_JNT_LIM   ARRAY(6) SCALAR                                         061500AC
                   INITIAL (-175.4, -140.4, +2.4,                          061600AC
                        -114.4, -114.6, -440.);                            061700AC
C                  (RHM/)                                                  061800AC
C              ITEM-LOW JNT LIM                                none        061900AC
C              DESC-JOINT ANGLE LOWER REACH LIMITS                         062000AC
C              FSSR-LOW_JNT_LMT                                            062100AC
C                                                           V98U5256C      062200AC
C                                                        TO V98U5260C      062300AC
C                                                        TO MML# TBD       062400AC
C                                                                          062500AC
                   DECLARE                                                 062600AC
 CRDK_LOW_SW_STOP_LIM  ARRAY(6) SCALAR                                     062700AC
                   INITIAL (-177.4, -142.4, +0.4,                          062800AC
                        -116.4, -116.6, -442.);                            062900AC
C                  (RHM,RPO/)                                              063000AC
C              ITEM-LOW SOFTWARE LIM                                       063100AC
C              DESC-JOINT ANGLE SOFTWARE STOP LOWER LIMITS                 063200AC
C              FSSR-LOW_SFTWR_LMT                                          063300AC
C                                                           V98U5261C      063400AC
```

```
MEMBER NAME  CRDCIL                                          none
C                                                 TO    V98U5265C    063500AC
C                                                  TO  MML# TBD      063600AC
C                                                                    063700AC
                DECLARE                                              063800AC
 CRDK_MPM_ATTH_PT    ARRAY(2) VECTOR(3)                              063900AC
                INITIAL(679.5/12.,-96.5/12.,410./12.,                064000AC
                        679.5/12., 96.5/12.,410./12.);               064100AC
C               (RPC/)                                               064200AC
C           ITEM-LOCATION OF THE MPM OS SELECTED ARM                 064300AC
C                MANIPULATOR POSITIONING MECHANISM IN     none       064400AC
C                THE ORBITER STRUCTURAL FRAME.                       064500AC
C           FSSR-MPM_PORT_STR                       V96U6982C-84C    064600AC
C                MPM_STRBD_STR                      V96U6985C-87C    064700AC
C                                                      MML# YES      064800AC
C                                                                    064900AC
                DECLARE                                              065000AC
 CRDK_N_NOPL      ARRAY(6) INTEGER INITIAL(5);                       065100AC
C               (RHM/)                                               065200AC
C           ITEM-N UNLOADED                                          065300AC
C           DESC-CONSISTENCY CHECK LIMIT FOR UNLOADED ARM      none  065400AC
C           FSSR-N_UNLOADED                                          065500AC
C                                                      MML# TBD      065600AC
C                                                                    065700AC
                DECLARE                                              065800AC
 CRDK_REP_JNT_CF  ARRAY(6) SCALAR                                    065900AC
                INITIAL (.0831,.0831,.121,.207,.207,.207);           066000AC
C               (REP,RSC/)                                           066100AC
C           ITEM-JOINT ANGLE CONVERSION FACTOR                       066200AC
C           FSSR-JOINT_CF_PHF                                        066300AC
C                                                      MML# NONE     066400AC
C                                                                    066500AC
                DECLARE                                              066600AC
 CRDK_UP_JNT_LIM  ARRAY(6) SCALAR                                    066700AC
                INITIAL (175.4, -2.6, 155.6,                         066800AC
                         114.4, 114.6, +440.);                       066900AC
C               (RHM/)                                               067000AC
C           ITEM-UP JNT LIM                                none      067100AC
C           FSSR-UP_JNT_LMT                                          067200AC
C           DESC-JOINT ANGLE UPPER REACH LIMITS                      067300AC
C                                                      V98U5353C     067400AC
C                                                  TO  V98U5357C     067500AC
C                                                  TO  MML# TBD      067600AC
C                                                                    067700AC
                DECLARE                                              067800AC
 CRDS_ARM_ATTN_LIM   ARRAY(2,6) INTEGER                              067900AC
          INITIAL(CSSS_COT_985101,CSSS_COT_985102,CSSS_COT_985103,   068000AD
                  CSSS_COT_985104,CSSS_COT_985105,CSSS_COT_985106,   068002AD
                  CSSS_COT_985122,CSSS_COT_985123,CSSS_COT_985124,   068004AD
                  CSSS_COT_985125,CSSS_COT_985126,CSSS_COT_985127);  068006AD
C               (RNC/)                                               068100AC
C           ITEM-ATTENUATION LIMITS                                  068200AC
C           FSSR-PORT_JOINT_ATTEN_LIMIT                              068300AC
C                STRBD_JOINT_ATTEN_LIMIT                             068400AC
C               PORT,SHY                               V98U5101C     068500AC
C               PORT,SHP                               V98U5102C     068600AC
C               PORT,ELP                               V98U5103C     068700AC
C               PORT,WRP                               V98U5104C     068800AC
C               PORT,WRY                               V98U5105C     068900AC
```

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```
MEMBER NAME  CRDCIL
C                 PORT,WRR                                      V98U5106C  069000AC
C                 STBD,SHY                                      V98U5122C  069100AC
C                 STBD,SHP                                      V98U5123C  069200AC
C                 STBD,ELP                                      V98U5124C  069300AC
C                 STBD,WRP                                      V98U5125C  069400AC
C                 STBD,WRY                                      V98U5126C  069500AC
C                 STBD,WRR                                      V98U5127C  069600AC
C                                                                          069700AC
                  DECLARE                                                  069800AC
 CRDS_BF_ARM  ARRAY(2,6) SCALAR                                            069900AC
       INITIAL(CSSS_CCT_985242,CSSS_CCT_985243,CSSS_COT_985244,            070000AD
              CSSS_CCT_985245,CSSS_CCT_985246,CSSS_COT_985247,             070002AD
              CSSS_CCT_985248,CSSS_CCT_985249,CSSS_COT_985250,             070004AD
              CSSS_CCT_985251,CSSS_COT_985252,CSSS_COT_985253);            070006AD
C                 (RNC/)                                                   070100AC
C             ITEM-BIAS FACTOR(MOTOR SPEED)                                070200AC
C             FSSR-K2_SF_PORT                                              070300AC
C                  K2_SF_STRBD                                             070400AC
C                 PORT -                                        V98U5242C  070500AC
C                                                            TO V98U5247C  070600AC
C                 STBD -                                        V98U5248C  070700AC
C                                                            TO V98U5253C  070800AC
C                                                                          070900AC
                  DECLARE                                                  071000AC
 CRDS_HC_BIAS ARRAY(6) SCALAR                                              071100AD
       INITIAL(CSSS_CCT_985163,CSSS_COT_985164,CSSS_CCT_985165,            071102AD
              CSSS_CCT_985121,CSSS_COT_985119,CSSS_COT_985120);            071104AD
C                 (RYE/)                                                   071200AC
C             ITEM-HAND-CONTROLLER BIASES                                  071300AC
C             FSSR-THC_BIAS                                                071400AC
C                  RHC_BIAS                                                071500AC
C                 TRANSLATION                                              071600AC
C                 1 - X                                         V98U5163C  071700AC
C                 2 - Y                                         V98U5164C  071800AC
C                 3 - Z                                         V98U5165C  071900AC
C                 ROTATION                                                 072000AC
C                 4 - PITCH                                     V98U5121C  072100AC
C                 5 - YAW                                       V98U5119C  072200AC
C                 6 - ROLL                                      V98U5120C  072300AC
C                                                                          072400AC
                  DECLARE                                                  072500AC
 CRDS_JNT_BIAS  ARRAY(2,6) SCALAR                                          072600AD
       INITIAL(CSSS_CCT_985107,CSSS_COT_985108,CSSS_COT_985109,            072602AD
              CSSS_CCT_985110,CSSS_CCT_985111,CSSS_COT_985112,             072604AD
              CSSS_CCT_985128,CSSS_CCT_985129,CSSS_COT_985130,             072606AD
              CSSS_CCT_985131,CSSS_COT_985132,CSSS_COT_985133);            072608AD
C                 (RYE/)                                                   072700AC
C             ITEM-JOINT BIAS                                              072800AC
C             DESC-BIAS FOR JOINT POSITION ENCODERS                        072900AC
C             FSSR-PORT_JOINT_BIAS                                         073000AC
C                  STRBD_JOINT_BIAS                                        073100AC
C                 PORT,SHY                                      V98U5107C  073200AC
C                 PORT,SHP                                      V98U5108C  073300AC
C                 PORT,ELP                                      V98U5109C  073400AC
C                 PORT,WRP                                      V98U5110C  073500AC
C                 PORT,WRY                                      V98U5111C  073600AC
C                 PORT,WRR                                      V98U5112C  073700AC
C                 STBD,SHY                                      V98U5128C  073800AC
```

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MEMBER NAME  CRDCIL
C              STBD,SHP                                      V98U5129C  073900AC
C              STBD,ELP                                      V98U5130C  074000AC
C              STBD,WRP                                      V98U5131C  074100AC
C              STBD,WRY                                      V98U5132C  074200AC
C              STBD,WRR                                      V98U5133C  074300AC
C                                                                       074400AC
               DECLARE                                                  074500AC
 CRDS_MTR_SPD_THRESH ARRAY(2,6) SCALAR                                  074600AC
        INITIAL(CSSS_COT_985296,CSSS_COT_985297,CSSS_COT_985298,        074700AD
               CSSS_COT_985299,CSSS_COT_985300,CSSS_COT_985301,         074702AD
               CSSS_COT_985302,CSSS_COT_985303,CSSS_COT_985304,         074704AD
               CSSS_COT_985305,CSSS_COT_985306,CSSS_COT_985307);        074706AD
C              (RNC/)                                                   074800AC
C            ITEM-MOTOR SPEED THRESHOLD                                 074900AC
C            DESC-PORT AND STBD MOTOR SPEED THRESHOLD                   075000AC
C            FSSR-MOTOR_SPEED_THRESHOLD_PORT                            075100AC
C                 MOTOR_SPEED_THRESHOLD_STRBD                           075200AC
C              (ARM,JOINT)                                              075300AC
C              PORT -                                   V98U5296C-5301C 075400AC
C              STBD -                                   V98U5302C-5307C 075500AC
C                                                                       075600AC
               DECLARE                                                  075700AC
 CRDS_SF_ARM  ARRAY(2,6)  SCALAR                                        075800AC
        INITIAL(CSSS_COT_985230,CSSS_COT_985231,CSSS_COT_985232,        075900AD
               CSSS_COT_985233,CSSS_COT_985234,CSSS_COT_985235,         075902AD
               CSSS_COT_985236,CSSS_COT_985237,CSSS_COT_985238,         075904AD
               CSSS_COT_985239,CSSS_COT_985240,CSSS_COT_985241);        075906AD
C              (RNC/)                                                   076000AC
C            ITEM-SCALE FACTOR(MOTOR SPEED)                             076100AC
C            DESC-PORT AND STRBD ARM SCALING FACTORS                    076200AC
C            FSSR-K1_SF_PORT                                            076300AC
C                 K1_SF_STRBD                                           076400AC
C              PORT -                                   V98U5230C-5235C 076500AC
C              STBD -                                   V98U5236C-5241C 076600AC
C                                                                       076700AC
               DECLARE                                                  076800AC
 CRDS_TACH_BIAS  ARRAY(2,6) SCALAR INITIAL(12#0);                       076900AC
C              (RYE/)                                                   077000AC
C            ITEM-TACHOMETER BIAS                                       077100AC
C            FSSR-PORT_TACH_BIAS                                 none   077200AC
C                 STRBD_TACH_BIAS                                       077300AC
C              PORT,SHY                                      V98U5114C  077400AC
C              PORT,SHP                                      V98U5113C  077500AC
C              PORT,ELP                                      V98U5115C  077600AC
C              PORT,WRP                                      V98U5116C  077700AC
C              PORT,WRY                                      V98U5117C  077800AC
C              PORT,WRR                                      V98U5118C  077900AC
C              STBD,SHY                                      V98U5135C  078000AC
C              STBD,SHP                                      V98U5134C  078100AC
C              STBD,ELP                                      V98U5136C  078200AC
C              STBD,WRP                                      V98U5137C  078300AC
C              STBD,WRY                                      V98U5138C  078400AC
C              STBD,WRR                                      V98U5139C  078500AC
C                                                                       078600AC
               DECLARE                                                  078700AC
 CRDS_WR_TO_EE_ANGLE_ARM ARRAY(2) SCALAR                                078800AC
               INITIAL(-19.48,19.48);                                   078900AC
C              (RYE/)                                                   079000AC
```

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```
MEMBER NAME  CRDCIL
C               ITEM-ROTATION OF EE FROM WRR FRAME
C              FSSR-WR_TO_EE_ANGLE_PORT
C                   WR_TO_EE_ANGLE_STRBD
C
C
 CLOSE CRD_CIL;
```

none
MML# ~~TBD~~

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REPRODUCIBILITY OF THE
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```
MEMBER NAME  CREMCO
C*************************************************************************
C*************************************************************************
C**                                                                     **
C**                                                                     **
C**     A.2.34              OUTPUT WRITE COMPOOL (CRE_MCO)              **
C**                                                                     **
C**     CONTAINS DISCRETES FOR PANEL AND DEMANDS TO THE ARM             **
C**                                                                     **
C**                                                                     **
C*************************************************************************
C*************************************************************************
 CRE_MCO:
          COMPOOL RIGID;
 STRUCTURE CRE_MCO_DATA DENSE RIGID:
  1 CREV_WORD1,
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY
C                                     MML#-                    V54U3301J
    2 CREV_WD1_SPARE1 BIT(16),
C
  1 CREV_WORD2,
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY
C                                     MML#-                    V54U3302J
    2 CREV_WD2_SPARE1 BIT(16),
C
  1 CREV_WORD3,
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY
C                                     MML#-                    V54U3303J
    2 CREV_WD3_SPARE1 BIT(16),
C
  1 CREV_WORD4,
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY
C                                     MML#-                    V54U3304J
    2 CREV_WD4_SPARE1 BIT(16);
C
 DECLARE CRE_MCO_DATA CRE_MCO_DATA-STRUCTURE INITIAL(BIN'0',BIN'0',
          BIN'0',BIN'0');
 EQUATE EXTERNAL TFCVMCI1 TO CREV_WORD1;
C    EQUATE FOR FCCS TO USE AS I/O BUFFER
 STRUCTURE CRE_MCO_SUBTREE1 DENSE RIGID:
  1 CREV_WORD5,
C                                     DESC-2'S COMPLEMENT JOINT RATE
C                                          DEMANDS
C                                     MML#-WORD5-              TBD
C                                          WORD7-              TBD
C                                          WORD9-              TBD
C                                          WORD11-             TBD
C                                          WORD13-             TBD
C                                          WORD15-             TBD
    2 CREV_JNT_RATE_DEMAND BIT(12),
C                                     (RNC/MCIU)
C                                     ITEM-FIXED-POINT JOINT RATE COMMANDS-
C                                          WRIST ROLL
C                                          WRIST YAW
C                                          WRIST PITCH
C                                          ELBOW PITCH
C                                          SHOULDER PITCH
C                                          SHOULDER YAW
C                                     FSSR-JOINT_RATE_CMD_FXPT
```

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MEMBER NAME CREMCO

```
C                                       DESC-FIXED-POINT JOINT RATE COMMANDS
C                                       MML#-                    V54K2700J
C                                                                V54K2600J
C                                                                V54K2500J
C                                                                V54K2400J
C                                                                V54K2300J
C                                                                V54K2200J
    2 CREV_WD5_SPARE1 BIT(4),
C
  1 CREV_WORD6,
C                                       DESC-ATTENUATIONS & RATE DEMAND ID
C                                       MML#-WORD6-              TBD
C                                            WORD8-              TBD
C                                            WORD10-             TBD
C                                            WORD12-             TBD
C                                            WORD14-             TBD
C                                            WORD16-             TBD
    2 CREV_JNT_CRNT_LIM BIT(4),
C                                       (RNC/MCIU)
C                                       ITEM-JOINT CURRENT LIMITS-
C                                            WRIST ROLL
C                                            WRIST YAW
C                                            WRIST PITCH
C                                            ELBOW PITCH
C                                            SHOULDER PITCH
C                                            SHOULDER YAW
C                                       FSSR-JOINT CURRENT LIMIT
C                                       DESC-JOINT CURRENT LIMITS
C                                       MML#-                    V54K2710J
C                                                                V54K2610J
C                                                                V54K2510J
C                                                                V54K2410J
C                                                                V54K2310J
C                                                                V54K2210J
    2 CREV_WD6_SPARE1 BIT(4),
C
    2 CREV_RATE_DMD_ID_CMD BIT(7),
C                                       (RNC/MCIU)
C                                       ITEM-FIXED-POINT RATE DEMAND ID
C                                            (COMMANDED)
C                                       FSSR-RATE_DEMAND_ID_CMD
C                                       DESC-FIXED-POINT RATE DEMAND
C                                            IDENTIFIER
C                                       MML#-                    V54K2800J
C                                                                NONE
C                                                                NONE
C                                                                NONE
C                                                                NONE
C                                                                NONE
    2 CREB_WD6_SPARE2 BIT(1);
C
 DECLARE CRE_MCO_SUBTREE1 CRE_MCO_SUBTREE1-STRUCTURE(6) INITIAL(36#
         BIN'0');
 STRUCTURE CRE_MCO_SUBTREE2 DENSE RIGID:
  1 CREV_WORD17,
C                                       DESC-UNASSIGNED; CONTENT ARBITRARY
C                                       MML#-                    V54U3317J
    2 CREV_WD17_SPARE1 BIT(16),
```

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```
MEMBER NAME  CREMCO
C                                                                                        011700AB
  1 CREV_WORD18,                                                                         011800AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 011900AB
C                                     MML#-                           V54U3318J          012000AB
    2 CREV_WD18_SPARE1 BIT(16),                                                          012100AB
C                                                                                        012200AB
  1 CREV_WORD19,                                                                         012300AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 012400AB
C                                     MML#-                           V54U3319J          012500AB
    2 CREV_WD19_SPARE1 BIT(16),                                                          012600AB
C                                                                                        012700AB
  1 CREV_WORD20,                                                                         012800AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 012900AB
C                                     MML#-                           V54U3320J          013000AB
    2 CREV_WD20_SPARE1 BIT(16),                                                          013100AB
C                                                                                        013200AB
  1 CREV_WORD21,                                                                         013300AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 013400AB
C                                     MML#-                           V54U3321J          013500AB
    2 CREV_WD21_SPARE1 BIT(16),                                                          013600AB
C                                                                                        013700AB
  1 CREV_WORD22,                                                                         013800AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 013900AB
C                                     MML#-                           V54U3322J          014000AB
    2 CREV_WD22_SPARE1 BIT(16),                                                          014100AB
C                                                                                        014200AB
  1 CREV_WORD23,                                                                         014300AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 014400AB
C                                     MML#-                           V54U3323J          014500AB
    2 CREV_WD23_SPARE1 BIT(16),                                                          014600AB
C                                                                                        014700AB
  1 CREV_WORD24,                                                                         014800AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 014900AB
C                                     MML#-                           V54U3324J          015000AB
    2 CREV_WD24_SPARE1 BIT(16),                                                          015100AB
C                                                                                        015200AB
  1 CREV_WORD25,                                                                         015300AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 015400AB
C                                     MML#-                           V54U3325J          015500AB
    2 CREV_WD25_SPARE1 BIT(16),                                                          015600AB
C                                                                                        015700AB
  1 CREV_WORD26,                                                                         015800AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 015900AB
C                                     MML#-                           V54U3326J          016000AB
    2 CREV_WD26_SPARE1 BIT(16),                                                          016100AB
C                                                                                        016200AB
  1 CREV_WORD27,                                                                         016300AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 016400AB
C                                     MML#-                           V54U3327J          016500AB
    2 CREV_WD27_SPARE1 BIT(16),                                                          016600AB
C                                                                                        016700AB
  1 CREV_WORD28,                                                                         016800AB
C                                     DESC-UNASSIGNED; CONTENT ARBITRARY                 016900AB
C                                     MML#-                           V54U3328J          017000AB
    2 CREV_WD28_SPARE1 BIT(16),                                                          017100AB
C                                                                                        017200AB
  1 CREV_WORD29,                                                                         017300AB
C                                     DESC-PACKED DISCRETE WORD INDICATING               017400AB
```

```
MEMBER NAME  CREMCO
C                                        THE CONTROL MODE SELECTED IN THE017500AB
C                                        GPC                             017600AB
C                                   MML#-                    V54M3329P   017700AB
       2 CREV_WD29_SPARE1 BIT(5),                                        017800AB
C                                                                        017900AB
       2 CREB_MAN_PYLD_ACT BIT(1),                                       018000AB
C                                   (RXY/MCIU)                           018100AB
C                                   ITEM-MANUAL_AUGMENTED PL MODE        018200AB
C                                        SELECTED DISCRETE               018300AB
C                                   FSSR-MAN_AUG_PL_MODE_SEL             018400AB
C                                   DESC-MANUAL AUGMENTED PAYLOAD MODE   018500AB
C                                        SELECTED - TRANSMITTED TO D&C   018600AB
C                                        1=SELECTED                      018700AB
C                                   MML#-                    V72X2909J   018800AB
       2 CREB_OPR_CMD_ACT BIT(1),                                        018900AB
C                                   (RXY/MCIU)                           019000AB
C                                   ITEM-OPERATOR COMMANDED MODE SELECTED019100AB
C                                        DISCRETE                        019200AB
C                                   FSSR-OPR_CMD_MODE_SEL                019300AB
C                                   DESC-OPERATOR COMMANDED MODE SELECTED019400AB
C                                        1=SELECTED                      019500AB
C                                   MML#-                    V72X2904J   019600AB
       2 CREB_AUTO_1_ACT BIT(1),                                         019700AB
C                                   (RXY/MCIU)                           019800AB
C                                   ITEM-AUTO SEQ 1 MODE SELECTED        019900AB
C                                        DISCRETE                        020000AB
C                                   FSSR-AUTO_SEQ_MODE_SEL               020100AB
C                                   DESC-AUTOMATIC SEQUENCE 1 MODE       020200AB
C                                        SELECTED                        020300AB
C                                        1=SELECTED                      020400AB
C                                   MML#-                    V72X2900J   020500AB
       2 CREB_AUTO_2_ACT BIT(1),                                         020600AB
C                                   (RXY/MCIU)                           020700AB
C                                   ITEM-AUTO SEQ 2 MODE SELECTED        020800AB
C                                        DISCRETE                        020900AB
C                                   FSSR-AUTO_SEQ_MODE_SEL               021000AB
C                                   DESC-AUTOMATIC SEQUENCE 2 MODE       021100AB
C                                        SELECTED                        021200AB
C                                        1=SELECTED                      021300AB
C                                   MML#-                    V72X2901J   021400AB
       2 CREB_AUTO_3_ACT BIT(1),                                         021500AB
C                                   (RXY/MCIU)                           021600AB
C                                   ITEM-AUTO SEQ 3 MODE SELECTED        021700AB
C                                        DISCRETE                        021800AB
C                                   FSSR-AUTO_SEQ_MODE_SEL               021900AB
C                                   DESC-AUTOMATIC SEQUENCE 3 MODE       022000AB
C                                        SELECTED                        022100AB
C                                        1=SELECTED                      022200AB
C                                   MML#-                    V72X2902J   022300AB
       2 CREB_AUTO_4_ACT BIT(1),                                         022400AB
C                                   (RXY/MCIU)                           022500AB
C                                   ITEM-AUTO SEQ 4 MODE SELECTED        022600AB
C                                        DISCRETE                        022700AB
C                                   FSSR-AUTO_SEQ_MODE_SEL               022800AB
C                                   DESC-AUTOMATIC SEQUENCE 4 MODE       022900AB
C                                        SELECTED                        023000AB
C                                        1=SELECTED                      023100AB
C                                   MML#-                    V72X2903J   023200AB
```

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```
MEMBER NAME  CREMCO
    2 CREB_TEST_ACT BIT(1),
C                                          (RXY/MCIU)
C                                          ITEM-TEST MODE SELECTED DISCRETE
C                                          FSSR-TEST_MODE_SEL
C                                          DESC-IDLE MODE SELECTED
C                                               1=SELECTED
C                                          MML#-                    V72X2905J
    2 CREB_WD29_SPARE2 BIT(1),
C
    2 CREB_SINGL_JNT_ACT BIT(1),
C                                          (RXY/MCIU)
C                                          ITEM-SINGLE MODE SELECTED DISCRETE
C                                          FSSR-SINGLE_JOINT_MODE_SEL
C                                          DESC-SINGLE JOINT MODE SELECTED
C                                               1=SELECTED
C                                          MML#-                    V72X2910J
    2 CREB_MASTER_ALARM BIT(1),
C                                          (RDD/MCIU)
C                                          ITEM-MASTER ALARM DISCRETE
C                                          FSSR-RMS_MASTER_ALARM_WARNING
C                                          DESC-RMS MASTER ALARM WARNING
C                                               ANNUNCIATOR
C                                               1=WARNING
C                                          MML#-                    V72X2915J
    2 CREB_WD29_SPARE3 BIT(1),
C
  1 CREV_WORD30,
C                                          DESC-PACKED DISCRETE WORD USED TO
C                                               DRIVE CAUTION & WARNING
C                                               INDICATORS ON THE RMS D&C PANEL
C                                          MML#-                    V54M3330P
    2 CREV_WD30_SPARE1 BIT(6),
C
    2 CREB_PS_TEMP_CAUT_ACT BIT(2),
C                                          (RIT/MCIU)
C                                          ITEM-TEMP CAUTION (PORT/STBD)
C                                          FSSR-STRBD_TEMP_CAUTION
C                                               PORT_TEMP_CAUTION
C                                          DESC-STARBOARD ARM TEMPERATURE CAUT.
C                                               PORT ARM TEMPERATURE CAUTION
C                                               10=STBD,01=PORT,11=BOTH
C                                          MML#-                    V72X2925J
C                                                                   V72X2931J
    2 CREB_SOFTWARE_STOP BIT(1),
C                                          (RHM,RNC,RQC,RXY/MCIU RQC,RNC)
C                                          ITEM-SOFTWARE STOP FLAG
C                                          FSSR-SOFTWARE_STOP_FLAG
C                                          DESC-SOFTWARE STOP FLAG
C                                               1=STOP
C                                          MML#-                    V72X2937J
    2 CREB_SING_CAUT BIT(1),
C                                     (RXY (RHM/MCIU)
C                                          ITEM-SING CAUTION FLAG
C                                          FSSR-SING_CAUTION_FLAG
C                                          DESC-SINGULARITY CAUTION FLAG
C                                               1=CAUTION
C                                          MML#-                    V72X2923J
    2 CREB_REACH_LIM_CAUT BIT(1),
```

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```
MEMBER NAME  CREMCO
C                                        (RXY (RHM/MCIU)
C                                             ITEM-REACH LIMIT CAUTION FLAG
C                                             FSSR-REACH_LIMIT_CAUTION_FLAG
C                                             DESC-REACH LIMIT CAUTION FLAG
C                                                  1=CAUTION
C                                             MML#-                    V72X2930J
    2 CREB_EE_DERIG_WARN BIT(1),
C                                    (Rxy,mciu (RHM/RNC/MCIU)
C                                             ITEM-EE DERIGID WARN
C                                             FSSR-EE_DERIGID_WARN_FLAG
C                                             DESC-END-EFFECTOR DERIGIDIZED WARNING
C                                                  FLAG
C                                                  1=WARNING
C                                             MML#-                    V72X2926J
    2 CREB_EE_REL_WARN BIT(1),
C                                    (RXY,mciu (RHM/RNC/MCIU)
C                                             ITEM-EE REL'D WARN
C                                             FSSR-EE_RELD_WARN_FLAG
C                                             DESC-END-EFFECTOR RELEASED WARNING
C                                                  FLAG
C                                                  1=WARNING
C                                             MML#-                    V72X2927J
    2 CREB_CK_CRT_CAUT BIT(1),
C                                    (Rxy,RVM (RDD/MCIU)
C                                             ITEM-CHECK CRT CAUTION DISCRETE
C                                             FSSR-CK_CRT_CAUTION_FLAG
C                                             DESC-CHECK CRT CAUTION FLAG
C                                                  1=CAUTION
C                                             MML#-                    V72X2929J
    2 CREB_CTL_ERROR_CAUT BIT(1),
C                                    (RXY,RVM RHM/MCIU)
C                                             ITEM-CONTROL ERROR CAUTION
C                                             FSSR-CONTROL_ERR_CAUTION_FLAG
C                                             DESC-CONTROL ERROR CAUTION FLAG
C                                                  1=CAUTION
C                                             MML#-                    V72X2924J
    2 CREB_WD30_SPARE2 BIT(1),
C
  1 CREV_WORD31,
C                                             DESC-PACKED DISCRETE WORD USED
C                                                  TO DRIVE SELECTED TALKBACKS
C                                                  ON THE RMS D&C PANEL.  BITS
C                                                  14 THROUGH 22 ARE TRANSMITTED
C                                                  TO THE D&C PANEL.
C                                             MML#-                    V54M3331P
    2 CREV_WD31_SPARE1 BIT(5),
C
    2 CREB_RATE_HOLD_ACT BIT(1),
C                                        (RJS (RXY/MCIU)
C                                             ITEM-RATE HOLD SELECTED FLAG
C                                             FSSR-RATE_HOLD_SEL_FLAG
C                                             DESC-RATE HOLD SELECTED FLAG
C                                                  1=SELECTED
C                                             MML#-                    V72X2940J
    2 CREB_X10_SCALE_ACT BIT(1),
C                                             (RDD/MCIU)
C                                             ITEM-X10 DISCRETE
C                                             FSSR-METER_SCAL_X10
```

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```
MEMBER NAME  CREMCO
C                                         DESC-METER SCALING IS "TIMES 10"       034900AB
C                                             1=SCALING IS X10                   035000AB
C                                         MML#-                     V72X2939J    035100AB
    2 CREB_MIN_RATE_ACT BIT(1),                                                  035200AB
C                                         (RXY,RJS,RSC/MCIU)                     035300AB
C                                         ITEM-MINIMUM RATE SELECTED             035400AB
C                                         FSSR-MIN_RATE_FLAG                     035500AB
C                                         DESC-MINIMUM RATE FLAG                 035600AB
C                                             1=MINIMUM                          035700AB
C                                         MML#-                     V72X2938J    035800AB
    2 CREP_WD31_SPARE2 BIT(1),                                                   035900AB
C                                                                                036000AB
    2 CREB_AUTO_SEQ_READY BIT(1),                                                036100AB
C                                         (RXY,RAS/MCIU)                         036200AB
C                                         ITEM-AUTO SEQUENCE READY               036300AB
C                                         FSSR-AUTO_SEQ_READY                    036400AB
C                                         DESC-AUTOMATIC SEQUENCE READY          036500AB
C                                             FLAG  (1=READY)                    036600AB
C                                         MML#-                     V72X2941J    036700AB
    2 CREB_AUTO_SEQ_IN_PROG BIT(1),                                              036800AB
C                                         (RXY,RAS/MCIU)                         036900AB
C                                         ITEM-AUTO SEQUENCE IN PROGRESS         037000AB
C                                         FSSR-AUTO_SEQ_INPROG                   037100AB
C                                         DESC-AUTOMATIC SEQUENCE IN             037200AB
C                                             PROGRESS FLAG                      037300AB
C                                             1=IN PROGRESS                      037400AB
C                                         MML#-                     V72X2942J    037500AB
    2 CREB_MAN_UNL_ACT BIT(1),                                                   037600AB
C                                         (RXY/MCIU)                             037700AB
C                                         ITEM-MANUAL AUG ORBITER UNLOADED       037800AB
C                                             MODE SELECTED DISCRETE             037900AB
C                                         FSSR-MAN_AUG_ORB_UNLOADED_MODE_SEL     038000AB
C                                         DESC-MANUAL AUGMENTED ORBITER          038100AB
C                                             UNLOADED MODE SELECTED             038200AB
C                                             1=SELECTED                         038300AB
C                                         MML#-                     V72X2906J    038400AB
    2 CREB_MAN_EE_ACT BIT(1),                                                    038500AB
C                                         (RXY/MCIU)                             038600AB
C                                         ITEM-MANUAL AUG. EE MODE SELECTED      038700AB
C                                             DISCRETE                           038800AB
C                                         FSSR-MAN_AUG_EE_MODE_SEL               038900AB
C                                         DESC-MANUAL AUGMENTED END-EFFECTOR     039000AB
C                                             MODE SELECTED                      039100AB
C                                             1=SELECTED                         039200AB
C                                         MML#-                     V72X2907J    039300AB
    2 CREB_MAN_LOD_ACT BIT(1),                                                   039400AB
C                                         (RXY/MCIU)                             039500AB
C                                         ITEM-MAN. AUG. ORB LOADED DISC.        039600AB
C                                         FSSR-MAN_AUG_ORB_LOADED_MODE_SEL       039700AB
C                                         DESC-MANUAL AUGMENTED ORBITER          039800AB
C                                             LOADED MODE SELECTED               039900AB
C                                             1=SELECTED                         040000AB
C                                         MML#-                     V72X2908J    040100AB
    2 CREV_WD31_SPARE3 BIT(2),                                                   040200AB
C                                                                                040300AB
  1 CREV_WORD32 BIT(16),                                                         040400AB
C                                         DESC-UNASSIGNED; CONTENT ARBITRARY     040500AB
C                                         MML#-                     V54U3332J    040600AB
```


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MEMBER NAME  CREMCO
  1 CREV_WORD33 BIT(16),
C                                            DESC-UNASSIGNED; CONTENT ARBITRARY
C                                            MML#-                    V54U3333J
  1 CREV_WORD34,
C                                            DESC-BITS 16-23, IN BINARY CODE,
C                                                 CONTAIN THE LINEARLY SCALED,
C                                                 COMMANDED EE TOTAL RATE
C                                                 WHERE THE MSB IS BIT 16, ALL
C                                                 ZEROS INDICATE A METER READ-
C                                                 ING OF ZERO AND ALL ONES
C                                                 INDICATE A POSITIVE FULL-
C                                                 SCALE METER READING.
    2 CREV_WD34_SPARE1 BIT(7),
C
    2 CREV_POR_VEL_CMD BIT(8),
C                                            (RNC/MCIU)
C                                            ITEM-COMMANDED POR RESULTANT
C                                                 VELOCITY
C                                            FSSR-CMD_POR_RESULTANT_VEL
C                                            DESC-COMMANDED POINT OF RESOLUTION
C                                                 RESULTANT VELOCITY
C                                            MML#-                    V72L2934J
    2 CREB_WD34_SPARE2 BIT(1),
C
  1 CREV_WORD35,
C                                            DESC-BITS 16-23 CONTAIN THE
C                                                 ACTUAL EE TOTAL RATE IN
C                                                 THE FORMAT SPECIFIED FOR
C                                                 WORD 34, BITS 16-23.
    2 CREV_WD35_SPARE1 BIT(7),
C
    2 CREV_POR_VEL_ATL BIT(8),
C                                            (RNC/MCIU)
C                                            ITEM-ACTUAL POR RESULTANT
C                                                 VELOCITY
C                                            FSSR-ACT_POR_RESULTANT_VEL
C                                            DESC-ACTUAL POINT OF RESOLUTION
C                                                 RESULTANT VELOCITY
C                                            MML#-                    V72L2933J
    2 CREB_WD35_SPARE2 BIT(1);
C
 DECLARE CRE_MCO_SUBTREE2 CRE_MCC_SUBTREE2-STRUCTURE
         INITIAL(53#BIN'0');
 STRUCTURE CRE_MCC_SUBTREE3 DENSE RIGID:
  1 CREV_WORD36,
C                                            DESC-THIS 10 BIT WORD CONTAINS
C                                                 DIGITAL DISPLAY WORD 1
C                                                 PARAMETERS.
C                                            MML#-                    V54M3436J
C                                                                     V54M3438P
C                                                                     V54U3440P
    2 CREV_WD36_SPARE1 BIT(5),
C
    2 CREV_DIG_DSP_SIGN BIT(2),
C                                            (RDD/MCIU)
C                                            ITEM-SIGN FIELDS
C                                            FSSR-DISPLAY_SIGN1
C                                                 DISPLAY_SIGN2
```

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MEMBER NAME CREMCO

```
C                                       DISPLAY_SIGN3
C                                   DESC-SIGN INDICATOR
C                                       DIGITAL DISPLAY #1
C                                       DIGITAL DISPLAY #2
C                                       DIGITAL DISPLAY #3
C                                   MML#-                   V72J2950J
C                                                           V72J2955J
C                                                           V72J2960J
    2 CREV_DIG_DSP_DEC BIT(2),
C                                   (RNC/MCIU)
C                                   ITEM-OUTPUT DECIMAL FIELDS
C                                   FSSR-DISPLAY_DECIMAL1
C                                       DISPLAY_DECIMAL2
C                                       DISPLAY_DECIMAL3
C                                   DESC-DECIMAL LOCATION INDICATOR
C                                       DIGITAL DISPLAY#1
C                                       DIGITAL DISPLAY#2
C                                       DIGITAL DISPLAY#3
C                                   MML#-                   V72J2951J
C                                                           V72J2956J
C                                                           V72J2961J
    2 CREV_DIG_DSP_D1 BIT(4),
C                                   (RNC/MCIU)
C                                   ITEM-DIGIT 1
C                                   FSSR-DIGIT_1
C                                   DESC-DIGITAL DISPLAY WORD #1
C                                       DIGITAL DISPLAY WORD #2
C                                       DIGITAL DISPLAY WORD #3
C                                       DIGIT 1
C                                   MML#-                   V72U2952J
C                                                           V72U2957J
C                                                           V72U2962J
    2 CREV_DIG_DSP_D2A BIT(2),
C                                   (RNC/MCIU)
C                                   ITEM-HALF DIGIT 2A
C                                   FSSR-DIGIT_2  (BITS 1 AND 2)
C                                   DESC-DIGITAL DISPLAY WORD #1
C                                       DIGITAL DISPLAY WORD #2
C                                       DIGITAL DISPLAY WORD #3
C                                       DIGIT 2 (BITS 1 AND 2)
C                                   MML#-                   V72U2952J
C                                                           V72U2957J
C                                                           V72U2962J
    2 CREB_WD36_SPARE2 BIT(1),
C
  1 CREV_WORD37,
C                                   DESC-THIS 10 BIT WORD CONTAINS
C                                       DIGITAL DISPLAY WORD 1A,
C                                       2A, AND THEN 3A PARAMETERS
C                                       WHICH ARE A CONTINUATION
C                                       OF THE DATA FIELDS OF
C                                       DIGITAL DISPLAY WORD 1, 2,
C                                       AND THEN 3.
    2 CREV_WD37_SPARE1 BIT(5),
C
    2 CREV_DIG_DSP_D2B BIT(2),
C                                   (RNC/MCIU)
C                                   ITEM-HALF DIGIT 2B
```

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```
MEMBER NAME  CREMCO
C                                          FSSR-DIGIT_2  (BITS 3 AND 4)
C                                          DESC-DIGITAL DISPLAY WORD #1
C                                               DIGITAL DISPLAY WORD #2
C                                               DIGITAL DISPLAY WORD #3
C                                               DIGIT 2 (BITS 3 AND 4)
C                                          MML#-                     V72U2953J
C                                                                    V72U2958J
C                                                                    V72U2963J
    2 CREV_DIG_DSP_D3 BIT(4),
C                                          (RNC/MCIU)
C                                          ITEM-DIGIT 3
C                                          FSSR-DIGIT_3
C                                          DESC-DIGITAL DISPLAY #1
C                                               DIGITAL DISPLAY #2
C                                               DIGITAL DISPLAY #3
C                                               DIGIT 3
C                                          MML#-                     V72U2953J
C                                                                    V72U2958J
C                                                                    V72U2963J
    2 CREV_DIG_DSP_D4 BIT(4),
C                                          (RNC/MCIU)
C                                          ITEM-DIGIT 4
C                                          FSSR-DIGIT_4
C                                          DESC-DIGITAL DISPLAY WORD #1
C                                               DIGITAL DISPLAY WORD #2
C                                               DIGITAL DISPLAY WORD #3
C                                               DIGIT 4
C                                          MML#-                     V72U2953J
C                                                                    V72U2958J
C                                                                    V72U2963J
    2 CREB_WD37_SPARE2 BIT(1);
C
 DECLARE CRE_MCO_SUBTREE3  CRE_MCO_SUBTREE3-STRUCTURE(3);
 STRUCTURE CRE_MCO_SUBTREE4 RIGID:
  1 CREV_WORD42 BIT(16),
C                                          UNASSIGNED; CONTENT ARBITRARY
C                                          MML#-                     V54U3342J
  1 CREV_WORD43 BIT(16),
C                                          UNASSIGNED; CONTENT ARBITRARY
C                                          MML#-                     V54U3343J
  1 CREV_WORD44 BIT(16),
C                                          UNASSIGNED; CONTENT ARBITRARY
C                                          MML#-                     V54U3344J
  1 CREV_TEST_WORD BIT(16);
C                                   (mcTu) RQC,RNC/MCIU)
C                                          ITEM-TEST WORD
C                                          FSSR-TEST_WORD
C                                          DESC-TEST WORD FOR INTERFACE TEST
C                                          MML#-                     V72U3050J
C
C
 DECLARE CRE_MCO_SUBTREE4  CRE_MCO_SUBTREE4-STRUCTURE
         INITIAL(4#BIN'0');
C*****************************************************************************
C****                    DOWNLIST COMMENT CARDS                          ****
C*****************************************************************************
C
C****  WORD1  ****
```

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```
MEMBER NAME  CREMCO
C
C  M=V54U3301J N=CREV_WORD1.CREV_WD1_SPARE1           T=9
C
C****  WORD2   ****
C
C  M=V54U3302J N=CREV_WORD2.CREV_WD2_SPARE1           T=9
C
C****  WORD3   ****
C
C  M=V54U3303J N=CREV_WORD3.CREV_WD3_SPARE1           T=9
C
C****  WORD4   ****
C
C  M=V54U3304J N=CREV_WORD4.CREV_WD4_SPARE1           T=9
C
C****  WORD5   ****
C
C  M=V54K2700J N=CREV_JNT_RATE_DEMAND$(1;)            T=9
C
C****  WORD6   ****
C
C  M=V54K2710J N=CREV_JNT_CRNT_LIM$(1;)               T=9
C  M=V54K2800J N=CREV_RATE_DMD_ID_CMD$(1;)            T=9
C
C****  WORD7   ****
C
C  M=V54K2600J N=CREV_JNT_RATE_DEMAND$(2;)            T=9
C
C****  WORD8   ****
C
C  M=V54K2610J N=CREV_JNT_CRNT_LIM$(2;)               T=9
C
C  M=V54M3308P N=CREV_WORD6.CREV_JNT_CRNT_LIM$(2;) T=9
C
C****  WORD9   ****
C
C  M=V54K2500J N=CREV_JNT_RATE_DEMAND$(3;)            T=9
C
C****  WORD10   ****
C
C  M=V54K2510J N=CREV_JNT_CRNT_LIM$(3;)               T=9
C
C****  WORD11   ****
C
C  M=V54K2400J N=CREV_JNT_RATE_DEMAND$(4;)            T=9
C
C****  WORD12   ****
C
C  M=V54K2410J N=CREV_JNT_CRNT_LIM$(4;)               T=9
C
C****  WORD13   ****
C
C  M=V54K2300J N=CREV_JNT_RATE_DEMAND$(5;)            T=9
C
C****  WORD14   ****
C
C  M=V54K2310J N=CREV_JNT_CRNT_LIM$(5;)               T=9
C
```


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```
MEMBER NAME  CREMCO
C****  WORD15  ****
C
C M=V54K2200J N=CREV_JNT_RATE_DEMAND$(6;)          T=9
C
C****  WORD16  ****
C
C M=V54K2210J N=CREV_JNT_CRNT_LIM$(6;)             T=9
C
C****  WORD17  ****
C
C M=V54U3317J N=CREV_WORD17.CREV_WD17_SPARE1       T=9
C
C****  WORD18  ****
C
C M=V54U3318J N=CREV_WORD18.CREV_WD18_SPARE1       T=9
C
C****  WORD19  ****
C
C M=V54U3319J N=CREV_WORD19.CREV_WD19_SPARE1       T=9
C
C****  WORD20  ****
C
C M=V54U3320J N=CREV_WORD20.CREV_WD20_SPARE1       T=9
C
C****  WORD21  ****
C
C M=V54U3321J N=CREV_WORD21.CREV_WD21_SPARE1       T=9
C
C****  WORD22  ****
C
C M=V54U3322J N=CREV_WORD22.CREV_WD22_SPARE1       T=9
C
C****  WORD23  ****
C
C M=V54U3323J N=CREV_WORD23.CREV_WD23_SPARE1       T=9
C
C****  WORD24  ****
C
C M=V54U3324J N=CREV_WORD24.CREV_WD24_SPARE1       T=9
C
C****  WORD25  ****
C
C M=V54U3325J N=CREV_WORD25.CREV_WD25_SPARE1       T=9
C
C****  WORD26  ****
C
C M=V54U3326J N=CREV_WORD26.CREV_WD26_SPARE1       T=9
C
C****  WORD27  ****
C
C M=V54U3327J N=CREV_WORD27.CREV_WD27_SPARE1       T=9
C
C****  WORD28  ****
C
C M=V54U3328J N=CREV_WORD28.CREV_WD28_SPARE1       T=9
C
C****  WORD29  ****
C
```

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```
MEMBER NAME  CREMCO
C  M=V54M3329P N=CREV_WORD29.CREV_WD29_SPARE1          T=9
C
C  M=V72X2909J N=CREB_MAN_PYLD_ACT                     T=9
C  M=V72X2904J N=CREB_CPR_CMD_ACT                      T=9
C  M=V72X2900J N=CREB_AUTO_1_ACT                       T=9
C  M=V72X2901J N=CREB_AUTO_2_ACT                       T=9
C  M=V72X2902J N=CREB_AUTO_3_ACT                       T=9
C  M=V72X2903J N=CREB_AUTO_4_ACT                       T=9
C  M=V72X2905J N=CREB_TEST_ACT                         T=9
C  M=V72X2910J N=CREB_SINGL_JNT_ACT                    T=9
C  M=V72X2915J N=CREB_MASTER_ALARM                     T=9
C
C****  WORD30   **
C
C  M=V54M3330P N=CREV_WORD30.CREV_WD30_SPARE1          T=9
C  M=V72X2925J N=CREB_PS_TEMP_CAUT_ACT$(1)             T=9
C  M=V72X2931J N=CREB_PS_TEMP_CAUT_ACT$(2)             T=9
C  M=V72X2937J N=CREB_SOFTWARE_STOP                    T=9
C  M=V72X2923J N=CREB_SING_CAUT                        T=9
C  M=V72X2930J N=CREB_REACH_LIM_CAUT                   T=9
C  M=V72X2926J N=CREB_EE_DERIG_WARN                    T=9
C  M=V72X2927J N=CREB_EE_REL_WARN                      T=9
C  M=V72X2929J N=CREB_CK_CRT_CAUT                      T=9
C  M=V72X2924J N=CREB_CTL_ERROR_CAUT                   T=9
C
C****  WORD31   ****
C
C  M=V54M3331P N=CREV_WORD31.CREV_WD31_SPARE1          T=9
C
C  M=V72X2940J N=CREB_RATE_HOLD_ACT                    T=9
C  M=V72X2939J N=CREB_X10_SCALE_ACT                    T=9
C  M=V72X2938J N=CREB_MIN_RATE_ACT                     T=9
C  M=V72X2941J N=CREB_AUTO_SEQ_READY                   T=9
C  M=V72X2942J N=CREB_AUTO_SEQ_IN_PROG                 T=9
C  M=V72X2906J N=CREB_MAN_UNL_ACT                      T=9
C  M=V72X2907J N=CREB_MAN_EE_ACT                       T=9
C  M=V72X2908J N=CREB_MAN_LOD_ACT                      T=9
C
C****  WORD32   ****
C
C  M=V54U3332J N=CREV_WORD32                           T=9
C
C****  WORD33   ****
C
C  M=V54U3333J N=CREV_WORD33                           T=9
C
C****  WORD34   ****
C
C  M=V72L2934J N=CREV_POR_VEL_CMD                      T=9
C
C****  WORD35   ****
C
C  M=V72L2933J N=CREV_POR_VEL_ATL                      T=9
C
C****  WORD36   ****
C
C  M=V54M3436J N=CREV_WORD36.CREV_WD36_SPARE1$(1;) T=9
C
```


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```
MEMBER NAME  CREMCO
C  M=V72J2950J N=CREV_DIG_DSP_SIGN$(1;)               T=9
C  M=V72J2951J N=CREV_DIG_DSP_DEC$(1;)                T=9
C  M=V72U2952J N=CREV_DIG_DSP_D1$(1;)                 T=9
C
C****  WORD37   ****
C
C  M=V72U2953J N=CREV_DIG_DSP_D2B$(1;)                T=9
C
C****  WORD38   ****
C
C  M=V54M3438P N=CREV_WORD36.CREV_WD36_SPARE1$(2;)  T=9
C
C  M=V72J2955J N=CREV_DIG_DSP_SIGN$(2;)               T=9
C  M=V72J2956J N=CREV_DIG_DSP_DEC$(2;)                T=9
C  M=V72U2957J N=CREV_DIG_DSP_D1$(2;)                 T=9
C
C****  WORD39   ****
C
C  M=V72U2958J N=CREV_DIG_DSP_D2B$(2;)                T=9
C
C****  WORD40   ****
C
C  M=V54U3440P N=CREV_WORD36.CREV_WD36_SPARE1$(3;)  T=9
C
C  M=V72J2960J N=CREV_DIG_DSP_SIGN$(3;)               T=9
C  M=V72J2961J N=CREV_DIG_DSP_DEC$(3;)                T=9
C  M=V72J2962J N=CREV_DIG_DSP_D1$(3;)                 T=9
C
C****  WORD41   ****
C
C  M=V72U2963J N=CREV_DIG_DSP_D2B$(3;)                T=9
C
C****  WORD42   ****
C
C  M=V54U3342J N=CREV_WORD42                          T=9
C
C****  WORD43   ****
C
C  M=V54U3343J N=CREV_WORD43                          T=9
C
C****  WORD44   ****
C
C  M=V54U3344J N=CREV_WORD44                          T=9
C
C****  WORD45   ****
C
C  M=V72U3050J N=CREV_TEST_WORD                       T=9
C
C*************************************************************************
C*************************************************************************
 CLOSE CRE_MCC;
```

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```
MEMBER NAME  CRFASC
 CRF_ASC: COMPOOL RIGID;
C*****************************************************************
C**          (CRF_ASC)                                          **
C** A.2.35   AUTOMATIC SEQUENCE COMPOOL STRUCTURES              **
C**          PAYLOAD DEPENDENT DATA                             **
C**          MISSION DEPENDENT DATA                             **
C**                                                             **
C*****************************************************************
C
C            AUTO SEQUENCE HEADER TABLE
C
    STRUCTURE CRF_MISSION_ID DENSE RIGID:
C
    1  CRFS_WORD1,
       2  CRFS_WD1_SPARE1        BIT(8),
       2  CRFS_MISSION_ID        BIT(8);
C                                      MISSION IDENTIFIER
C
    STRUCTURE CRF_AUTO_SEQUENCE_HEADER DENSE RIGID:
C
    1  CRFS_WORD2,
       2  CRFS_SEQ_LENGTH       BIT(8),
C                                    SEQUENCE LENGTH
C
       2  CRFS_POINT_INDEX      BIT(8),
C                                    POINTER INTO POINT AND
C                                    PAUSE TABLES
    1  CRFS_WORD3,
       2  CRFS_TRANS_IC_TOL     BIT(8),
C                                    TRANSLATION TOLERANCE IN
C                                    INCHES  MAXIMUM-12 INCHES
       2  CRFS_ROT_IC_TOL       BIT(8),
C                                    ROTATION TOLERANCE IN
C                                    DEGREES  MAXIMUM-5
    1  CRFS_WORD4,
       2  CRFS_SEQ_PYLD_ID      BIT(8),
C                                    PAYLOAD IDENTIFIER
       2  CRFS_SEQ_EE_ID        BIT(4),
C                                    END EFFECTOR IDENTIFIER
       2  CRFS_SEQ_ARM_ID       BIT(4);
C                                    ARM IDENTIFIER
C
C
C                   POINT TABLE
C
    STRUCTURE CRF_POINT DENSE RIGID:
C
    1  CRF_WORD62,
       2  CRFS_POSITION,
          3  CRFS_POS_X      INTEGER,
          3  CRFS_POS_Y      INTEGER,
          3  CRFS_POS_Z      INTEGER,
C                                    POSITION COORDINATES OF
C                                    END EFFECTOR TIP-X,Y,Z
       2  CRFS_ATTITUDE,
         3  CRFS_ATD_P       INTEGER,
         3  CRFS_ATD_Y       INTEGER,
         3  CRFS_ATD_R       INTEGER;
```

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```
MEMBER NAME  CRFASC
C                                           ATTITUDE COORDINATES OF
C                                          END EFF. TIP-PITCH,YAW,ROLL
C
C
C                       PAUSE TABLE
C
 DECLARE CRF_MISSION_ID CRF_MISSION_ID-STRUCTURE INITIAL(
  DEC'0', DEC'2');
 DECLARE CRF_AUTO_SEQUENCE_HEADER
        CRF_AUTO_SEQUENCE_HEADER-STRUCTURE(20) INITIAL(
 /* 1  */  DEC'3', DEC'1', DEC'3', DEC'1', DEC'1', DEC'1', DEC'1',
 /* 2  */  DEC'2', DEC'4', DEC'3', DEC'1', DEC'2', DEC'1', DEC'1',
 /* 3  */  DEC'3', DEC'6', DEC'3', DEC'1', DEC'3', DEC'1', DEC'1',
 /* 4  */  DEC'3', DEC'9', DEC'3', DEC'1', DEC'4', DEC'1', DEC'1',
 /* 5  */  DEC'3', DEC'12', DEC'3', DEC'1', DEC'1', DEC'1', DEC'1',
 /* 6  */  DEC'3', DEC'15', DEC'3', DEC'1', DEC'0', DEC'1', DEC'1',
 /* 7  */  DEC'0', DEC'7', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 8  */  DEC'0', DEC'8', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 9  */  DEC'0', DEC'9', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 10  */  DEC'0', DEC'10', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 11  */  DEC'0', DEC'11', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 12  */  DEC'0', DEC'12', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 13  */  DEC'0', DEC'13', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 14  */  DEC'0', DEC'14', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 15  */  DEC'0', DEC'15', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 16  */  DEC'0', DEC'16', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 17  */  DEC'0', DEC'17', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 18  */  DEC'0', DEC'18', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 19  */  DEC'0', DEC'19', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1',
 /* 20  */  DEC'183', DEC'18', DEC'0', DEC'0', DEC'0', DEC'1', DEC'1');
 DECLARE CRF_POINT  CRF_POINT-STRUCTURE(200) INITIAL(
 /* 1  */ -807, 25, -566, 270, 0, 270,
 /* 2  */ -1107, 25, -566, 270, 0, 270,
 /* 3  */ -1107, 25, -566, 270, 0, 0,
 /* 4  */ -728, 70, -850, 90, 0, 135,
 /* 5  */ -941, 0, -584, 180, 0, 180,
 /* 6  */ -679, -212, -982, 90, 0, 0,
 /* 7  */ -680, -341, -982, 90, 0, 0,
 /* 8  */ -679, -212, -982, 90, 0, 0,
 /* 9  */ -1100, -124, -490, 270, 50, 0,
 /* 10  */ -1100, -124, -490, 90, 89, 180,
 /* 11  */ -1100, -124, -490, 270, 50, 0,
 /* 12  */ -807, 25, -615, 270, 0, 270,
 /* 13  */ -1107, 25, -615, 270, 0, 270,
 /* 14  */ -1107, 75, -615, 270, 0, 270,
 /* 15  */ -1001, -90, -490, 270, 315, 270,
 /* 16  */ -941, -90, -490, 270, 315, 270,
 /* 17  */ -1270, -147, -556, 14, 5, 359,
 /* 18  */ -1270, -147, -556, 14, 5, 359,
 /* 19  */ -1270, -147, -556, 14, 5, 359,
 /* 20  */ -1270, -147, -556, 14, 5, 359,
 /* 21  */ -1270, -147, -556, 14, 5, 359,
 /* 22  */ -1270, -147, -556, 14, 5, 359,
 /* 23  */ -1270, -147, -556, 14, 5, 359,
 /* 24  */ -1270, -147, -556, 14, 5, 359,
 /* 25  */ -1270, -147, -556, 14, 5, 359,
 /* 26  */ -1270, -147, -556, 14, 5, 359,
 /* 27  */ -1270, -147, -556, 14, 5, 359,
```

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A.2.35-2
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```
MEMBER NAME  CRFASC
 /* 28   */ -1270, -147, -556, 14, 5, 359,
 /* 29   */ -1270, -147, -556, 14, 5, 359,
 /* 30   */ -1270, -147, -556, 14, 5, 359,
 /* 31   */ -1270, -147, -556, 14, 5, 359,
 /* 32   */ -1270, -147, -556, 14, 5, 359,
 /* 33   */ -1270, -147, -556, 14, 5, 359,
 /* 34   */ -1270, -147, -556, 14, 5, 359,
 /* 35   */ -1270, -147, -556, 14, 5, 359,
 /* 36   */ -1270, -147, -556, 14, 5, 359,
 /* 37   */ -1270, -147, -556, 14, 5, 359,
 /* 38   */ -1270, -147, -556, 14, 5, 359,
 /* 39   */ -1270, -147, -556, 14, 5, 359,
 /* 40   */ -1270, -147, -556, 14, 5, 359,
 /* 41   */ -1270, -147, -556, 14, 5, 359,
 /* 42   */ -1270, -147, -556, 14, 5, 359,
 /* 43   */ -1270, -147, -556, 14, 5, 359,
 /* 44   */ -1270, -147, -556, 14, 5, 359,
 /* 45   */ -1270, -147, -556, 14, 5, 359,
 /* 46   */ -1270, -147, -556, 14, 5, 359,
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 /* 48   */ -1270, -147, -556, 14, 5, 359,
 /* 49   */ -1270, -147, -556, 14, 5, 359,
 /* 50   */ -1270, -147, -556, 14, 5, 359,
 /* 51   */ -1270, -147, -556, 14, 5, 359,
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 /* 53   */ -1270, -147, -556, 14, 5, 359,
 /* 54   */ -1270, -147, -556, 14, 5, 359,
 /* 55   */ -1270, -147, -556, 14, 5, 359,
 /* 56   */ -1270, -147, -556, 14, 5, 359,
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 /* 58   */ -1270, -147, -556, 14, 5, 359,
 /* 59   */ -1270, -147, -556, 14, 5, 359,
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 /* 66   */ -1270, -147, -556, 14, 5, 359,
 /* 67   */ -1270, -147, -556, 14, 5, 359,
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 /* 73   */ -1270, -147, -556, 14, 5, 359,
 /* 74   */ -1270, -147, -556, 14, 5, 359,
 /* 75   */ -1270, -147, -556, 14, 5, 359,
 /* 76   */ -1270, -147, -556, 14, 5, 359,
 /* 77   */ -1270, -147, -556, 14, 5, 359,
 /* 78   */ -1270, -147, -556, 14, 5, 359,
 /* 79   */ -1270, -147, -556, 14, 5, 359,
 /* 80   */ -1270, -147, -556, 14, 5, 359,
 /* 81   */ -1270, -147, -556, 14, 5, 359,
 /* 82   */ -1270, -147, -556, 14, 5, 359,
 /* 83   */ -1270, -147, -556, 14, 5, 359,
 /* 84   */ -1270, -147, -556, 14, 5, 359,
 /* 85   */ -1270, -147, -556, 14, 5, 359,
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MEMBER NAME CRFASC

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/* 86   */ -1270, -147, -556, 14, 5, 359,
/* 87   */ -1270, -147, -556, 14, 5, 359,
/* 88   */ -1270, -147, -556, 14, 5, 359,
/* 89   */ -1270, -147, -556, 14, 5, 359,
/* 90   */ -1270, -147, -556, 14, 5, 359,
/* 91   */ -1270, -147, -556, 14, 5, 359,
/* 92   */ -1270, -147, -556, 14, 5, 359,
/* 93   */ -1270, -147, -556, 14, 5, 359,
/* 94   */ -1270, -147, -556, 14, 5, 359,
/* 95   */ -1270, -147, -556, 14, 5, 359,
/* 96   */ -1270, -147, -556, 14, 5, 359,
/* 97   */ -1270, -147, -556, 14, 5, 359,
/* 98   */ -1270, -147, -556, 14, 5, 359,
/* 99   */ -1270, -147, -556, 14, 5, 359,
/* 100  */ -1270, -147, -556, 14, 5, 359,
/* 101  */ -1270, -147, -556, 14, 5, 359,
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/* 105  */ -1270, -147, -556, 14, 5, 359,
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/* 108  */ -1270, -147, -556, 14, 5, 359,
/* 109  */ -1270, -147, -556, 14, 5, 359,
/* 110  */ -1270, -147, -556, 14, 5, 359,
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/* 112  */ -1270, -147, -556, 14, 5, 359,
/* 113  */ -1270, -147, -556, 14, 5, 359,
/* 114  */ -1270, -147, -556, 14, 5, 359,
/* 115  */ -1270, -147, -556, 14, 5, 359,
/* 116  */ -1270, -147, -556, 14, 5, 359,
/* 117  */ -1270, -147, -556, 14, 5, 359,
/* 118  */ -1270, -147, -556, 14, 5, 359,
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/* 127  */ -1270, -147, -556, 14, 5, 359,
/* 128  */ -1270, -147, -556, 14, 5, 359,
/* 129  */ -1270, -147, -556, 14, 5, 359,
/* 130  */ -1270, -147, -556, 14, 5, 359,
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/* 133  */ -1270, -147, -556, 14, 5, 359,
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/* 136  */ -1270, -147, -556, 14, 5, 359,
/* 137  */ -1270, -147, -556, 14, 5, 359,
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/* 142  */ -1270, -147, -556, 14, 5, 359,
/* 143  */ -1270, -147, -556, 14, 5, 359,
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MEMBER NAME  CRFASC
  /* 144  */ -1270, -147, -556, 14, 5, 359,
  /* 145  */ -1270, -147, -556, 14, 5, 359,
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  /* 196  */ -1270, -147, -556, 14, 5, 359,
  /* 197  */ -1270, -147, -556, 14, 5, 359,
  /* 198  */ -1270, -147, -556, 14, 5, 359,
  /* 199  */ -1270, -147, -556, 14, 5, 359,
  /* 200  */ -1270, -147, -556, 14, 5, 359);
  DECLARE CRFS_PAUSE_FLAGS ARRAY(13) BIT(16) INITIAL(
```


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```
MEMBER NAME  CRFASC
 BIN'111111111111C111',                    029100AC
 BIN'1111111111111111',                    029200AC
 BIN'1111111111111111',                    029300AC
 BIN'1111111111111111',                    029400AC
 BIN'1111111111111111',                    029500AC
 BIN'1111111111111111',                    029600AC
 BIN'1111111111111111',                    029700AC
 BIN'1111111111111111',                    029800AC
 BIN'1111111111111111',                    029900AC
 BIN'1111111111111111',                    030000AC
 BIN'1111111111111111',                    030100AC
 BIN'1111111111111111',                    030200AC
 BIN'1111111111111111');                   030300AC
 CLOSE;                                    030400AC
```

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```
MEMBER NAME  CRTDIS
C*****************************************************************
C*                                                               *
C*                                                               *
C*      A.2.36          DISPATCHER COMPOOL (CRT_DIS)             *
C*                                                               *
C*      THIS COMPOOL DIRECTS THE DISPATCHER TO CALL THE          *
C*      APPROPRIATE MODULES BASED ON THE CURRENT CONFIG-         *
C*      URATION.                                                 *
C*                                                               *
C*****************************************************************
D  INCLUDE TEMPLATE CGE_DISPATCHER
C           !!!  READ   THIS  !!!!!
C      ANY PROGRAM USING THIS COMPOOL (CRTDIS)
C     MUST ALSO INCLUDE THE CGE_DISPATCHER TEMPLATE
C
 CRT_DIS:  COMPOOL RIGID;
C
C
C  ***************************************************************
C  ****                     DISPATCHER TABLES                ****
C  ***************************************************************
C
C
 DECLARE CRTD_DISP_TBL_NAME FDG-STRUCTURE;
 DECLARE CRTD_DISPATCH_TBL FDG-STRUCTURE(41)    INITIAL (
C
C
C  ********************************
C  **** TEMP DISPATCHER TABLE  ****
C  ********************************
C
C  RIT - TEMPERATURE MONITOR    1      1
          1,HEX'0001',8,
C
C  RDD - DEDICATED DISPLAY      4      2
          1,HEX'0001',10,
C
C  RNC - ENCODER FUNCTION       7      3
          1,HEX'0001',11,
C
C    END OF TABLE ENTRY        10      4
          0,HEX'0000',0,
C
C
C
C  ********************************
C  **** IDLE DISPATCHER TABLE  ****
C  ********************************
C
C  RKG - KINEMATIC DATA GEN.   13      5
          1,HEX'0001',1,
C
C  RFP - POSITION HOLD         16      6
          1,HEX'0001',5,
C
C  RHM - HEALTH MONITOR        19      7
          1,HEX'0001',7,
C
```


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```
MEMBER NAME  CRTCIS
C RIT - TEMPERATURE MONITOR    22      8
        1,HEX'0001',8,
C
C RTV - TOTAL VELOCITY         25      9
        1,HEX'0001',9,
C
C RDD - DEDICATED DISPLAY      28     10
        1,HEX'0001',10,
C
C RNC - ENCODER FUNCTION       31     11
        1,HEX'0001',11,
C
C   END OF TABLE ENTRY         34     12
        0,HEX'0000',0,
C
C
C
C ********************************
C **** SINGLE DISPATCHER TABLE ****
C ********************************
C
C RKG- KINEMATIC DATA GEN.     37     13
        1,HEX'0001',1,
C
C RFP - POSITION HOLD          40     14
        1,HEX'0001',5,
C
C RSC - SINGLE JOINT CONTROL   43     15
        1,HEX'0001',6,
C
C RHM - HEALTH MONITOR         46     16
        1,HEX'0001',7,
C
C RIT - TEMPERATURE MONITOR    49     17
        1,HEX'0001',8,
C
C RTV - TOTAL VELOCITY         52     18
        1,HEX'0001',9,
C
C RDD - DEDICATED DISPLAY      55     19
        1,HEX'0001',10,
C
C RNC - ENCODER FUNCTION       58     20
        1,HEX'0001',11,
C
C   END OF TABLE - SINGLE      61     21
        0,HEX'0000',0,
C
C
C
C ********************************
C **** MANUAL DISPATCHER TABLE ****
C ********************************
C
C RKG - KINEMATIC DATA GEN.    64     22
        1,HEX'0001',1,
C
C RJS - HAND CONTROLLER        67     23
```

MEMBER NAME CRCCOT

```
C**********************************************************************000100AB
C*                                                                     *000200AB
C*          A.2.37     RMS CONSTANTS COMPOOL (CRC_COT)                 *000300AB
C*                                                                     *000400AB
C*                                                                     *000500AB
C*      ITEMS UPDATABLE BY TM SPEC                                     *000600AB
C*                                                                     *000700AB
C*      WHEN UPDATING THIS COMPOOL, UPDATE BOTH THE VALUES AND THEIR   *000800AB
C*      CORRESPONDING ID'S.                                            *000900AB
C*                                                                     *001000AB
C*                                                                     *001100AB
C**********************************************************************001200AB
 CRC_COT_DUMMY: EXTERNAL COMPOOL;                                       001300AB
C****** REPLACES FOR DUMMY INITIAL VALUES                               001400AB
 REPLACE DUM_SCAL BY"0.0";                                              001500AB
 REPLACE DUM_INT BY"0";                                                 001600AB
C                                                                       001700AC
D INCLUDE CSSCOTR                                                       001800AC
 CLOSE CRC_COT_DUMMY;                                                   011600AB
 CRC_COT: COMPOOL RIGID;                                                011700AB
C                                                                       011800AB
 REPLACE CRCV_FIRST_SCALAR BY "CRSS_TRNS_RATE_PYLD_SEL_CRS$(1)";        011900AB
C                                                                       012000AB
C                                                                       012100AB
                 DECLARE                                                012200AB
 CRSS_TRNS_RATE_PYLD_SEL_CRS ARRAY(6) SCALAR INITIAL(CSSS_COT_937600,   012300AB
                                                     CSSS_COT_937611,   012400AB
                                                     CSSS_COT_937612,   012500AB
                                                     CSSS_COT_937613,   012600AB
                                                     CSSS_COT_937614,   012700AB
                                                     CSSS_COT_937615);  012800AB
C                (RJS,RAS,STM/STM)                                      012900AB
C              ITEM-PYLD MAX TRANS RATE COARSE                          013000AB
C              DESC-SELECTED PAYLOAD MAXIMUM RESULTANT TRANSLATION      013100AB
C                   RATE - COARSE                                       013200AB
C              FSSR-SEL_PL_TRANS_RATE_COARSE                            013300AB
C                                                             V93R7600C 013400AB
C                                                             V93R7611C 013500AB
C                                                             V93R7612C 013600AB
C                                                             V93R7613C 013700AB
C                                                             V93R7614C 013800AB
C                                                             V93R7615C 013900AB
C                                                                       014000AB
                 DECLARE                                                014100AB
 CRSS_ROT_RATE_PYLD_SEL_CRS ARRAY(6) SCALAR INITIAL(CSSS_COT_937601,    014200AB
                                                    CSSS_COT_937621,    014300AB
                                                    CSSS_COT_937622,    014400AB
                                                    CSSS_COT_937623,    014500AB
                                                    CSSS_COT_937624,    014600AB
                                                    CSSS_COT_937625);   014700AB
C                (RJS,RAS,STM/STM)                                      014800AB
C              ITEM-PYLD MAX ROT RATE COARSE                            014900AB
C              DESC-SELECTED PAYLOAD MAXIMUM RESULTANT ROTATION         015000AB
C                   RATE - COARSE                                       015100AB
C              FSSR-SEL_PL_ROT_RATE_COARSE                              015200AB
C                                                             V93R7601C 015300AB
C                                                             V93R7621C 015400AB
C                                                             V93R7622C 015500AB
```

```
MEMBER NAME  CRCCOT
C                                                                          V93R7623C
C                                                                          V93R7624C
C                                                                          V93R7625C
C
                 DECLARE
 CRSS_TRNS_RATE_PYLD_SEL_VRN ARRAY(6) SCALAR INITIAL(CSSS_COT_937605,
                                                     CSSS_COT_937631,
                                                     CSSS_COT_937632,
                                                     CSSS_COT_937633,
                                                     CSSS_COT_937634,
                                                     CSSS_COT_937635);
C                (RJS,STM/STM)
C            ITEM-SEL PL TRANS RATE VERNIER
C            DESC-SELECTED PAYLOAD MAXIMUM RESULTANT TRANSLATION
C                 RATE - VERNIER
C            FSSR-SEL_PL_TRANS_RATE_VERNIER
C                                                                          V93R7605C
C                                                                          V93R7631C
C                                                                          V93R7632C
C                                                                          V93R7633C
C                                                                          V93R7634C
C                                                                          V93R7635C
C
                 DECLARE
 CRSS_ROT_RATE_PYLD_SEL_VRN ARRAY(6) SCALAR INITIAL(CSSS_COT_937606,
                                                    CSSS_COT_937641,
                                                    CSSS_COT_937642,
                                                    CSSS_COT_937643,
                                                    CSSS_COT_937644,
                                                    CSSS_COT_937645);
C                (RJS,STM/STM)
C            ITEM-SEL PL ROT RATE VERNIER
C            DESC-SELECTED PAYLOAD MAXIMUM RESULTANT ROTATION
C                 RATE-VERNIER
C            FSSR-SEL_PL_ROT_RATE_VERNIER
C                                                                          V93R7606C
C                                                                          V93R7641C
C                                                                          V93R7642C
C                                                                          V93R7643C
C                                                                          V93R7644C
C                                                                          V93R7645C
C
                 DECLARE
 CRSS_TRNS_RATE_PL_SEL_VRN_COM ARRAY(6) SCALAR
                                          INITIAL(CSSS_COT_966741,
                                                  CSSS_COT_966742,
                                                  CSSS_COT_966743,
                                                  CSSS_COT_966744,
                                                  CSSS_COT_966745,
                                                  CSSS_COT_966746);
C                (RJS,STM/STM)
C            ITEM-SEL PL TRANS RATE VERN COM
C            DESC-SELECTED PAYLOAD MAXIMUM COMPONENT TRANSLATION
C                 RATE - VERNIER
C            FSSR-SEL_PL_TRANS_RATE_VERN_COM
C                                                                          V96R6741C
C                                                                          V96R6742C
C                                                                          V96R6743C
```

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MEMBER NAME CRCCCT

```
C                                                                    V96R6744C
C                                                                    V96R6745C
C                                                                    V96R6746C
C
            DECLARE
 CRSS_RCT_RATE_PL_SEL_VRN_CCM ARRAY(6) SCALAR
                                        INITIAL(CSSS_COT_966760,
                                                CSSS_COT_966761,
                                                CSSS_COT_966762,
                                                CSSS_COT_966763,
                                                CSSS_CCT_966764,
                                                CSSS_COT_966765);
C           (RJS,STM/STM)
C        ITEM-SEL PL RCT RATE VERN CCM
C        DESC-SELECTED PAYLCAD MAXIMUM COMPONENT ROTATION
C             RATE - VERNIER
C        FSSR-SEL_PL_RCT_RATE_VERN_CCM
C                                                                    V96R6760C
C                                                                    V96R6761C
C                                                                    V96R6762C
C                                                                    V96R6763C
C                                                                    V96R6764C
C                                                                    V96R6765C
C
            DECLARE
 CRSS_TRNS_RATE_PL_SEL_CRS_CCM ARRAY(6) SCALAR
                                         INITIAL(CSSS_COT_937650,
                                                 CSSS_COT_937651,
                                                 CSSS_COT_937652,
                                                 CSSS_COT_937653,
                                                 CSSS_COT_937654,
                                                 CSSS_COT_937655);
C           (RJS,STM/STM)
C        ITEM-SEL PL TRANS RATE CCARSE COM
C        DESC-SELECTED PAYLCAD MAXIMUM COMPONENT TRANSLATION
C             RATE - CCARSE
C        FSSR-SEL_PL_TRANS_RATE_CCARSE_CCM
C                                                                    V93R7650C
C                                                                    V93R7651C
C                                                                    V93R7652C
C                                                                    V93R7653C
C                                                                    V93R7654C
C                                                                    V93R7655C
C
            DECLARE
 CRSS_RCT_RATE_PL_SEL_CRS_CCM ARRAY(6) SCALAR
                                        INITIAL(CSSS_COT_966860,
                                                CSSS_CCT_966861,
                                                CSSS_COT_966862,
                                                CSSS_COT_966863,
                                                CSSS_COT_966864,
                                                CSSS_COT_966865);
C           (RJS,STM/STM)
C        ITEM-SEL PL RCT RATE CCARSE CCM
C        DESC-SELECTED PAYLOAD MAXIMUM COMPONENT ROTATION
C             RATE - COARSE
C        FSSR-SEL_PL_RCT_RATE_CCARSE_CCM
C                                                                    V96R6860C
```

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

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```
MEMBER NAME  CRCCOT
C                                                                                      V96R6861C  027200AB
C                                                                                      V96R6862C  027300AB
C                                                                                      V96R6863C  027400AB
C                                                                                      V96R6864C  027500AB
C                                                                                      V96R6865C  027600AB
C                                                                                                 027700AB
                    DECLARE                                                                      027800AB
 CRSS_HI_TEMP_LIM ARRAY(24) SCALAR INITIAL(CSSS_COT_966790,                                      027900AB
                                           CSSS_COT_966791,                                      028000AB
                                           CSSS_COT_966792,                                      028100AB
                                           CSSS_COT_966793,                                      028200AB
                                           CSSS_COT_966794,                                      028300AB
                                           CSSS_COT_966795,                                      028400AB
                                           CSSS_COT_966796,                                      028500AB
                                           CSSS_COT_966800,                                      028600AB
                                           CSSS_COT_966801,                                      028700AB
                                           CSSS_COT_966802,                                      028800AB
                                           CSSS_COT_966803,                                      028900AB
                                           CSSS_COT_966804,                                      029000AB
                                           CSSS_COT_966824,                                      029100AB
                                           CSSS_COT_966825,                                      029200AB
                                           CSSS_COT_966826,                                      029300AB
                                           CSSS_COT_966827,                                      029400AB
                                           CSSS_COT_966828,                                      029500AB
                                           CSSS_COT_966829,                                      029600AB
                                           CSSS_COT_966830,                                      029700AB
                                           CSSS_COT_966834,                                      029800AB
                                           CSSS_COT_966835,                                      029900AB
                                           CSSS_COT_966836,                                      030000AB
                                           CSSS_COT_966837,                                      030100AB
                                           CSSS_COT_966838);                                     030200AB
C                   (BIT,STM/STM)                                                                030300AB
C               ITEM-HI TEMP LIMIT                                                               030400AB
C               DESC-HIGH TEMPERATURE LIMITS                                                     030500AB
C               FSSR-PORT_HIGH_LIMIT_LED                                                         030600AB
C                    PORT_HIGH_LIMIT_ABE                                                         030700AB
C                    STRBD_HIGH_LIMIT_LED                                                        030800AB
C                    STRBD_HIGH_LIMIT_ABE                                                        030900AB
C                                                                                      V96T6790C  031000AB
C                                                                                      V96T6791C  031100AB
C                                                                                      V96T6792C  031200AB
C                                                                                      V96T6793C  031300AB
C                                                                                      V96T6794C  031400AB
C                                                                                      V96T6795C  031500AB
C                                                                                      V96T6796C  031600AB
C                                                                                      V96T6800C  031700AB
C                                                                                      V96T6801C  031800AB
C                                                                                      V96T6802C  031900AB
C                                                                                      V96T6803C  032000AB
C                                                                                      V96T6804C  032100AB
C                                                                                      V96T6824C  032200AB
C                                                                                      V96T6825C  032300AB
C                                                                                      V96T6826C  032400AB
C                                                                                      V96T6827C  032500AB
C                                                                                      V96T6828C  032600AB
C                                                                                      V96T6829C  032700AB
C                                                                                      V96T6830C  032800AB
C                                                                                      V96T6834C  032900AB
```

```
MEMBER NAME  CRCCOT
C                                                                          V96T6835C  033000AB
C                                                                          V96T6836C  033100AB
C                                                                          V96T6837C  033200AB
C                                                                          V96T6838C  033300AB
C                                                                                     033400AB
                DECLARE                                                               033500AB
 CRSS_LO_TEMP_LIM ARRAY(24) SCALAR INITIAL(CSSS_COT_966808,                           033600AB
                                           CSSS_COT_966809,                           033700AB
                                           CSSS_COT_966810,                           033800AB
                                           CSSS_COT_966811,                           033900AB
                                           CSSS_COT_966812,                           034000AB
                                           CSSS_COT_966813,                           034100AB
                                           CSSS_COT_966814,                           034200AB
                                           CSSS_COT_966817,                           034300AB
                                           CSSS_COT_966818,                           034400AB
                                           CSSS_COT_966819,                           034500AB
                                           CSSS_COT_966820,                           034600AB
                                           CSSS_COT_966821,                           034700AB
                                           CSSS_COT_966841,                           034800AB
                                           CSSS_COT_966842,                           034900AB
                                           CSSS_COT_966843,                           035000AB
                                           CSSS_COT_966844,                           035100AB
                                           CSSS_COT_966845,                           035200AB
                                           CSSS_COT_966846,                           035300AB
                                           CSSS_COT_966847,                           035400AB
                                           CSSS_COT_966850,                           035500AB
                                           CSSS_COT_966851,                           035600AB
                                           CSSS_COT_966852,                           035700AB
                                           CSSS_COT_966853,                           035800AB
                                           CSSS_COT_966854);                          035900AB
C               (RIT,STM/STM)                                                         036000AB
C           ITEM-LO_TEMP_LIMIT                                                        036100AB
C           DESC-LOW_TEMPERATURE_LIMITS                                               036200AB
C           FSSR-PORT_LOW_LIMIT_LED                                                   036300AB
C                PORT_LOW_LIMIT_ABE                                                   036400AB
C                STRBD_LOW_LIMIT_LED                                                  036500AB
C                STRBD_LOW_LIMIT_ABE                                                  036600AB
C                                                                          V96T6808C  036700AB
C                                                                          V96T6809C  036800AB
C                                                                          V96T6810C  036900AB
C                                                                          V96T6811C  037000AB
C                                                                          V96T6812C  037100AB
C                                                                          V96T6813C  037200AB
C                                                                          V96T6814C  037300AB
C                                                                          V96T6817C  037400AB
C                                                                          V96T6818C  037500AB
C                                                                          V96T6819C  037600AB
C                                                                          V96T6820C  037700AB
C                                                                          V96T6821C  037800AB
C                                                                          V96T6841C  037900AB
C                                                                          V96T6842C  038000AB
C                                                                          V96T6843C  038100AB
C                                                                          V96T6844C  038200AB
C                                                                          V96T6845C  038300AB
C                                                                          V96T6846C  038400AB
C                                                                          V96T6847C  038500AB
C                                                                          V96T6850C  038600AB
C                                                                          V96T6851C  038700AB
```

```
MEMBER NAME  CRCCCT
C                                                                     V96T6852C  038800AB
C                                                                     V96T6853C  038900AB
C                                                                     V96T6854C  039000AB
              DECLARE                                                            039100AC
 CRSS_TACH_TIME SCALAR  INITIAL(CSSS_COT_964913);                                039110AC
C                   (RYE/STM)                                                    039111AC
C             ITEM-TACH TIME                                                     039120AC
C             FSSR-TACH_TIME_CONSTANT                                            039121AC
C             DESC                                                               039130AC
C                                                                 V96W4913C      039131AC
                 DECLARE                                                         039140AC
 CRSS_TACH_GAIN   SCALAR   INITIAL(CSSS_COT_964912);                             039141AC
C                   (RYE/STM)                                                    039150AC
C               ITEM-TACH GAIN                                                   039151AC
C               FSSR-TACH_GAIN                                                   039160AC
C               DESC                                                             039161AC
C                                                               V96U4912C        039170AC
              DECLARE                                                            039171AC
 CRSS_INC_THRESH  SCALAR  INITIAL(CSSS_COT_964891);                              039172AC
C            (RVM/STM)                                                           039173AC
C            ITEM-INC THRESH                                                     039174AC
C            FSSR-INC_THRESH                                                     039175AC
C            DESC-RATE INCREMENT THRESHOLD FOR CONSISTENCY CHECK                 039176AC
C                                                                     V96U4891C  039177AC
              DECLARE                                                            039178AC
 CRSS_RATE_THRESH  SCALAR  INITIAL(CSSS_COT_964892);                             039179AC
C              (RVM/STM)                                                         039180AC
C            ITEM-RATE THRESH                                                    039181AC
C            FSSR-RATE_THRESH                                                    039182AC
C            DESC-RATE THRESHOLD FOR CONSISTENCY CHECK                           039183AC
C                                                                     V96U4892C  039184AC
              DECLARE                                                            039185AC
 CRSS_STALL  SCALAR  INITIAL(CSSS_COT_964893);                                   039186AC
C              (RVM/STM)                                                         039187AC
C            ITEM-STALL                                                          039188AC
C            FSSR-STALL                                                          039189AC
C            DESC-STALL TIME INTERVAL                                            039190AC
C                                                                     V96U4893C  039191AC
              DECLARE                                                            039192AC
 CRSS_JNT_DISP_UNL  ARRAY(6)  SCALAR  INITIAL(CSSS_COT_964894,                   039193AC
   CSSS_COT_964895,CSSS_COT_964896,CSSS_COT_964897,CSSS_COT_964898,              039194AC
   CSSS_COT_964899);                                                             039195AC
C              (RVM/STM)                                                         039196AC
C            ITEM-JNT DISP UNL                                                   039197AC
C            FSSR-JNT_DISP_UNL                                                   039198AC
C            DESC-JOINT DISPLACEMENT - UNLOADED                                  039199AC
C                                                                    V96U4894C-  039200AC
C                                                                    V96U4899C   039201AC
              DECLARE                                                            039202AC
 CRSS_JNT_DISP_COARSE  ARRAY(6)  SCALAR  INITIAL(CSSS_COT_964900,                039203AC
           CSSS_COT_964901,CSSS_COT_964902,CSSS_COT_964903,                      039204AC
           CSSS_COT_964904,CSSS_COT_964905);                                     039205AC
C              (RVM/STM)                                                         039206AC
C            ITEM-JNT DISP COARSE                                                039207AC
C            FSSR-JNT_DISP LOAD-C                                                039208AC
C            DESC-JOINT DISPLACEMENT - LOADED COARSE                             039209AC
C                                                                    V96U4900C-  039210AC
C                                                                    V96U4905C   039211AC
```

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MEMBER NAME CRCCOT

```
                DECLARE
 CRSS_JNT_DISP_VERN   ARRAY(6)  SCALAR  INITIAL(CSSS_COT_964906,
             CSSS_CCT_964907,CSSS_CCT_964908,CSSS_CCT_964909,
             CSSS_CCT_964910,CSSS_CCT_964911);
C                (RVM/STM)
C              ITEM-JNT DISP VERN
C              FSSR-JNT_DISP_LOAD_V
C              DESC-JOINT DISPLACEMENT - LOADED VERNIER
C                                                                   V96U4906C-
C                                                                   V96U4911C
                DECLARE
 CRSS_FILT1_GAIN  SCALAR  INITIAL(CSSS_CCT_964881);
C                (RVM/STM)
C              ITEM-FILT1 GAIN
C              FSSR-FILT1_GAIN
C              DESC-GAIN FOR COMMANDED MOTOR SPEED FILTER
C                                                                   V96U4881C
                DECLARE
 CRSS_FILT1_TIME  SCALAR  INITIAL(CSSS_COT_964882);
C                (RVM/STM)
C              ITEM-FILT1 TIME CCN
C              FSSR-FILT1_TIME_CONSTANT
C              DESC-TIME CONSTANT FOR COMMANDED MOTOR SPEED FILTER
C                                                                   V96W4882C
                DECLARE
 CRSS_FILT2_GAIN  SCALAR  INITIAL(CSSS_CCT_964883);
C                (RVM/STM)
C              ITEM-FILT2 GAIN
C              FSSR-FILT2_GAIN
C              DESC-GAIN FOR CONTROL ERROR FILTER
C                                                                    V96U4883C
                DECLARE
 CRSS_FILT2_TIME  SCALAR  INITIAL(CSSS_COT_964884);
C                (RVM/STM)
C              ITEM-FILT2 TIME CCN
C              FSSR-FILT2_TIME_CONSTANT
C              DESC-TIME CONSTANT FOR CONTROL ERROR FILTER
C                                                                   V96W4884C
                DECLARE
 CRSS_FILT3_GAIN  SCALAR  INITIAL(CSSS_COT_964885);
C                (RVM/STM)
C              ITEM-FILT3 GAIN
C              FSSR-FILT3_GAIN
C              DESC-GAIN FOR RATE INCREMENT FILTER
C                                                                   V96U4885C
                DECLARE
 CRSS_FILT3_TIME  SCALAR  INITIAL(CSSS_COT_964886);
C                (RVM/STM)
C              ITEM-FILT3 TIME CCN
C              FSSR-FILT3_TIME_CONSTANT
C              DESC-TIME CONSTANT FOR RATE INCREMENT FILTER
C                                                                   V96W4886C
                DECLARE
 CRSS_ERR_THRESH  SCALAR  INITIAL(CSSS_COT_964890);
C                (RVM/STM)
C              ITEM-ERR THRESH
C              FSSR-ERR_THRESH
C              DESC-CONTROL ERROR THRESHOLD FOR CONSISTENCY CHECK
```

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REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

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```
MEMBER NAME  CRCCOT
C                                                                     V96U4890C
C
 REPLACE CRCV_NUM_SCALAR BY "126";
C
C
C
C
C
C
 REPLACE CRCV_FIRST_INTEGER BY "CRSS_TM_WRR_RANGE$(1)";
C
C
                     DECLARE
 CRSS_TM_WRR_RANGE ARRAY(2) INTEGER INITIAL(CSSS_COT_964997,
                  (RYE1)                     CSSS_COT_964998);
C                                                               V96H4997C
 REPLACE CRCV_NUM_INTEGER BY "2";                               V96H4998C
C
C
C
C
C
C
C
C
 REPLACE CRCV_FIRST_DISCRETE BY "NULL";
C
C
 REPLACE CRCV_NUM_DISCRETE BY "0";
C
C
C
C
C
C
C
C
 REPLACE CRCV_FIRST_DBL_SCALAR BY "NULL";
C
C
 REPLACE CRCV_NUM_DBL_SCALAR BY "0";
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C******* ID'S
```

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MEMBER NAME CRCCOT

```
C
C
 REPLACE CRCV_FIRST_SCALAR_ID BY "CRSS_TRNS_RATE_PYLD_SEL_CRS_ID$(1)";
C
C
                 DECLARE
 CRSS_TRNS_RATE_PYLD_SEL_CRS_ID ARRAY(6) INTEGER DOUBLE INITIAL(937600,
                                                               937611,
                                                               937612,
                                                               937613,
                                                               937614,
                                                               937615);
C
                 DECLARE
 CRSS_ROT_RATE_PYLD_SEL_CRS_ID ARRAY(6) INTEGER DOUBLE INITIAL(937601,
                                                              937621,
                                                              937622,
                                                              937623,
                                                              937624,
                                                              937625);
C
                 DECLARE
 CRSS_TRNS_RATE_PYLD_SEL_VRN_ID ARRAY(6) INTEGER DOUBLE INITIAL(937605,
                                                               937631,
                                                               937632,
                                                               937633,
                                                               937634,
                                                               937635);
C
                 DECLARE
 CRSS_ROT_RATE_PYLD_SEL_VRN_ID ARRAY(6) INTEGER DOUBLE INITIAL(937606,
                                                              937641,
                                                              937642,
                                                              937643,
                                                              937644,
                                                              937645);
C
                 DECLARE
 CRSS_TRNS_RATE_PL_SEL_VRN_COM_ID ARRAY(6) INTEGER DOUBLE
                                                   INITIAL(966741,
                                                           966742,
                                                           966743,
                                                           966744,
                                                           966745,
                                                           966746);
C
                 DECLARE
 CRSS_ROT_RATE_PL_SEL_VRN_COM_ID ARRAY(6) INTEGER DOUBLE
                                                  INITIAL(966760,
                                                          966761,
                                                          966762,
                                                          966763,
                                                          966764,
                                                          966765);
C
                 DECLARE
 CRSS_TRNS_RATE_PL_SEL_CRS_COM_ID ARRAY(6) INTEGER DOUBLE
                                                   INITIAL(937650,
```


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MEMBER NAME CRCCCT

```
                                                                937651,
                                                                937652,
                                                                937653,
                                                                937654,
                                                                937655);
C
                   DECLARE
 CRSS_ROT_RATE_PL_SEL_CRS_CCM_ID ARRAY(6) INTEGER DOUBLE
                                                         INITIAL(966860,
                                                                966861,
                                                                966862,
                                                                966863,
                                                                966864,
                                                                966865);
C
                   DECLARE
 CRSS_HI_TEMP_LIM_ID ARRAY(24) INTEGER DOUBLE INITIAL(966790,
                                                      966791,
                                                      966792,
                                                      966793,
                                                      966794,
                                                      966795,
                                                      966796,
                                                      966800,
                                                      966801,
                                                      966802,
                                                      966803,
                                                      966804,
                                                      966824,
                                                      966825,
                                                      966826,
                                                      966827,
                                                      966828,
                                                      966829,
                                                      966830,
                                                      966834,
                                                      966835,
                                                      966836,
                                                      966837,
                                                      966838);
C
                   DECLARE
 CRSS_LO_TEMP_LIM_ID ARRAY(24) INTEGER DOUBLE INITIAL(966808,
                                                      966809,
                                                      966810,
                                                      966811,
                                                      966812,
                                                      966813,
                                                      966814,
                                                      966817,
                                                      966818,
                                                      966819,
                                                      966820,
                                                      966821,
                                                      966841,
                                                      966842,
                                                      966843,
                                                      966844,
```

MEMBER NAME CRCCCT

```
                                                                    966845,
                                                                    966846,
                                                                    966847,
                                                                    966850,
                                                                    966851,
                                                                    966852,
                                                                    966853,
                                                                    966854);
                 DECLARE
    CRSS_TACH_TIME_ID INTEGER DOUBLE INITIAL(964913);
C
                 DECLARE
    CRSS_TACH_GAIN_ID INTEGER DOUBLE INITIAL(964912);
C
                 DECLARE
 CRSS_INC_THRESH_ID INTEGER DOUBLE INITIAL(964891);
C
                DECLARE
 CRSS_RATE_THRESH_ID INTEGER DOUBLE INITIAL(964892);
C
                DECLARE
 CRSS_STALL_ID  INTEGER  DOUBLE  INITIAL(964893);
C
                DECLARE
 CRSS_JNT_DISP_UNL_ID ARRAY(6) INTEGER DOUBLE INITIAL(964894,964895,
               964896,964897,964898,964899);
C
                DECLARE
 CRSS_JNT_DISP_COARSE_ID ARRAY(6) INTEGER DOUBLE INITIAL(964900,964901,
               964902,964903,964904,964905);
C
                DECLARE
 CRSS_JNT_DISP_VERN_ID  ARRAY(6) INTEGER DOUBLE INITIAL(964906,964907,
               964908,964909,964910,964911);
C
                DECLARE
 CRSS_FILT1_GAIN_ID INTEGER DOUBLE INITIAL(964881);
C
                DECLARE
 CRSS_FILT1_TIME_ID INTEGER DOUBLE INITIAL(964882);
C
                DECLARE
 CRSS_FILT2_GAIN_ID INTEGER DOUBLE INITIAL(964883);
C
                DECLARE
 CRSS_FILT2_TIME_ID INTEGER DOUBLE INITIAL(964884);
C
                DECLARE
 CRSS_FILT3_GAIN_ID INTEGER DOUBLE INITIAL(964885);
C
                DECLARE
 CRSS_FILT3_TIME_ID INTEGER DOUBLE INITIAL(964886);
C
                DECLARE
 CRSS_ERR_THRESH_ID INTEGER DOUBLE INITIAL(964890);
C
C
 REPLACE CRCV_FIRST_INTEGER_ID BY "CRSS_TM_WRP_RANGE_ID$(1)";
```

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```
MEMBER NAME  CRCCCT
C
C
                 DECLARE
 CRSS_TM_WRR_RANGE_ID ARRAY(2) INTEGER DOUBLE INITIAL(964997,
                                                      964998);
C
C
C
C
C
C
C
C
 REPLACE CRCV_FIRST_DISCRETE_ID BY "NULL";
C
C
C
C
C
C
C
C
 REPLACE CRCV_FIRST_DBL_SCALAR_ID BY "NULL";
C
C
 CLOSE CRC_OUT;
```

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APPENDIX B

I/O DATA TABLES

Reference Volume II 'Systems Services' Part 1, FCOS, Appendix G

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APPENDIX C

TRACEABILITY MATRIX

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SYSTEMS MANAGEMENT DDS/CPDS CROSS REFERENCE

DDS	CPDS/FSSR PART B
1	General
2	General
3	General
3.1	General
3.1.1	General
3.1.2	General
3.1.3	General
3.1.4	General
3.2	3.0, 6
3.2.1	3.0, 3.1, 6
3.2.1.1	General
3.2.1.3	4.1
3.2.1.3.1	4.1
3.2.1.3.2	4.1
3.2.1.4	4.1.1.2, 4.2
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3.2.1.8	4.2.5
3.2.1.9	6.0
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3.2.1.11	4.1.2.4, 6
3.2.1.12	6.1
3.2.1.13	6.2
3.2.1.14	6.7
3.2.1.15	6.12
3.2.1.16	6.15
3.2.1.17	6.16
3.2.1.18	6.9
3.2.1.19	6.10
3.2.1.20	5.1.5, 6.11
3.2.1.21	6.14
3.2.1.22	4.1.5, 5.1.4, 6.3, 6.6
3.2.1.23	CR2267, CR2141
3.3	5.1
3.3.1	5.1.1
3.3.1.1	4.4, 5.1.1
3.3.1.2	4.4, 5.1.1
3.3.1.3	5.1.1
3.3.2	4.3, 5.1.2
3.3.2.1	4.3, 5.1.2
3.3.2.2	4.1.5, 4.3, 5.1.2
3.3.3	4.5, 5.1.3
3.3.1	4.5, 5.1.3
3.3.3.3	4.5, 5.1.3

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SYSTEMS MANAGEMENT DDS/CPDS CROSS REFERENCE
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3.3.3.5	4.5, 5.1.3
3.3.4	5.1.4, 6.3, 6.6
3.3.5	5.1.5, 6.11
3.3.6	5.1.7
3.3.6.1	5.1.7
3.3.6.2	5.1.7
3.3.6.3	5.1.7
3.3.7	4.8

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SYSTEMS MANAGEMENT CPDS/DDS CROSS REFERENCE

CPDS/FSSR PART B	DDS
1.0	General
1.1	General
1.2	General
1.3	General
2.0	General
3.0	3.2, 3.2.1
3.1	3.2.1
3.1.1	3.2.1
3.1.2	3.2.1
4.0	General
4.1	-
4.1.1	3.2.1.3, 3.2.1.10, 3.3.3
4.1.2	3.2.1.3, 3.2.1.10, 3.2.1.11
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4.1.5	3.2.1.9, 3.2.1.22, 3.3.2.2
4.2	3.2.1.3, 3.2.1.4, 3.2.1.6, 3.3.1
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4.2.2	3.2.1.6
4.2.3	3.2.1.6
4.2.4	3.2.1.6
4.2.5	3.2.1.7, 3.2.1.8
4.3	3.3.2
4.3.1	3.3.2
4.3.2	3.3.2
4.4	3.3.1
4.5	3.3.3.4
4.6	General
4.7	-
5.0	-
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SYSTEMS MANAGEMENT CPDS/DDS CROSS REFERENCE

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SYSTEMS MANAGEMENT DDS/RMS LEVEL C FSSR

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4.15.A.7	3.3.8.17
4.15.A.8	3.3.8.14
4.15.A.9	3.3.8.14
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4.19.F	3.3.8.4
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4.21.A	3.3.8.4

D. INTERPROCESS VARIABLE DEFINITION

This appendix lists variables which are referenced at two or more priority levels and the modules which update or reference them. If the module listed is assuming the priority of some other process, the three-character ID of that process is listed in parentheses following the ID of the module. Where control over how the variables are updated and referenced is necessary, e.g., to maintain time homogeneity, this control is discussed.

If two or more variables share the same table locations, references, and controls, these variables are listed as one group. A reference to the appendix describing the variable is listed with each location.

No attempt is made to list all variables which are asynchronously referenced by the cyclic display processor.

INTERPROCESS VARIABLE DEFINITION

GRP #	ITEMS	LOCATION (REFERENCE)	UPDATE MODULES (PROCESS)	REFERENCE MODULES (PROCESS)	CONTROL
1	Ready Flag 1 Ready Flag 2	CMT (A.2.11)	SDA SPM	SPM SDA	Flags set by SDA to indicate to SPM which half of the PPB is ready to be processed. When its processing is complete, SPM resets the flags to indicate to SDA that the PPB half is available for new data. The flags are updated and referenced separately and are not time homogeneous, so no UPDATE block protection is needed.
2	Error Count	FCMCOM (FCOS COMPOOL)	SDA SGA (SDA) SGA (SSP)	SGA (SDA) SGA (SSP)	A count maintained by the SGA module of the number of PMU read errors which have occurred. The count is set to zero by SDA when an error free data cycle (10 SDA read cycles) has occurred. Since the SGA module is exclusive, updates to the error count by that module are serial and and therefore require no UPDATE block protection. When a PMU I/O error occurs, FCOS checks error count. If the value is 3 or less, FCOS creates an entry in their I/O Error Log Table. If greater than 3, no entry is created in the I/O Error Log Table.
3	Parameter Statuses Parameter Values	PPB (A.2.2)	SDA SDS (SDA) SFS (SDA)	SFD (SPM) SPM	SDA updates one half of the PPB while SPM or SFD processes the other half. Control of this interface is accomplished through use of the PPB half ready indicators. This interface is discussed in Sections 3.2.1.3.1 (SDA) and 3.2.1.4 (SPM). Because of this interface, no UPDATE block protection is needed.
4	Parameter Statuses Parameter Values	Non-FDA CDA (A.2.7)	SDA SDS (SDA) SFS (SDA)	SPP (SPM) CRT	SDA places acquired data in Non-FDA CDA. SPP references values and statuses of precondition inputs (see Section 3.2.1.5) and the SMM (display) function (see Section 3.1.4) references values and statuses of parameters on displays. Neither function has time homogeneity requirements, so no UPDATE block protection is needed.
5	Parameter Statuses Parameter Values	FDA CDA (A.2.7)	SFD (SPM) SPM	SPP (SPM) CRT	SFD (Section 3.2.1.6) and SPM (Section 3.2.1.4) move data from the PPB to the FDA CDA. The references and control of this data is the same as that of group 4 above.
6	FDA enable/inhibit indicator	CMT (A.2.11)	STM	SPM	Flag updated by STM as the result of display inputs. When this flag is on, FDA processing is suspended by SPM. See Section 3.2.1.4 for a discussion of actions taken by SPM. Since the flag is updated and referenced in single operations, no UPDATE block protection is needed.
7	Parent Word Parameter Count	PIT (A.2.1)	SFD (SPM) STM SPP (SPM)	SFD (SPM)	The number of FDA discretes within the parent word which have reached their maximum noise count. The parameter count is normally maintained by SFD. The count is also decremented by STM when it updates the maximum noise count for a discrete in the parent word as the result of display inputs and by SPP when a parameter completes group warmup.

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INTERPROCESS VARIABLE DEFINITION

GRP #	ITEMS	LOCATION (REFERENCE)	UPDATE MODULES (PROCESS)	REFERENCE MODULES (PROCESS)	CONTROL
8	Analog/EU Limit Values	LIT (A.2.8)	STM	SFD (SPM)	STM updates analog and EU limit values in the LIT in response to display inputs. SFD references these values as part of FDA processing.
9	PIT (A.2.1)	PIT (A.2.1)	STM	SFD (SPM)	STM updates discrete limit values in the PIT in response to display inputs. SFD uses these limits in FDA processing.
10	Current Noise Count Hard Fail Indicator	PIT (A.2.1)	STM	SFD (SPM)	Current Noise Count and Hard Fail Flag are normally maintained by SFD. When STM updates a limit value or when SPP selects a new limit set, Current Noise Count is set to zero and Hard Fail Flag is reset.
11	Maximum Noise Count Annunciation Inhibit	PIT (A.2.1)	STM	SFD (SPM)	Maximum Noise Count and Annunciation Inhibit are updated by STM in response to display updates. Both are referenced as part of the processing of various Special
12	Constants Values	COT (A.2.12) CRC(A.2.37)	STM	SSC (SSP) SSS (SSP) SSA (SSP) SSF (SSP) SSM (SSP) SSB (SSP) RAS (REX) RJS (REX)	Constants values are updateable by STM. They are referenced as part of the processing of various Special Processes and RMS.
13	Power on/off items Auto Mode item Manual Mode items Bypass Switch items	CMT (A.2.11)	SBD (SM2)	SSB (SSP)	These variables are set by SBD as a result of display inputs and are referenced by SSB as part of its cyclic processing. SSB also resets the Auto Mode item when an Auto Sequence completes.
14	Auto S-band Antenna select item S-band site select item S-band TDRS select item KU-band TDRS select item	CMT (A.2.11)	SAM (SM2)	SSM (SSP)	These variables are set by SAM as a result of display inputs and are referenced by SSM as a result of its cyclic processing.
15	AM ICC Input Buffer	CMT (A.2.11)	ICC Router	SSM (SSP)	These variables are GNC parameters used by SSM. The request to acquire this data via ICC is made one Special Processes Executive executive before SSM is invoked. SSM moves the data to a local area as described in Section 3.2,1.22C to preserve time homegeneity.
16	Item Indicator Parm ID Limits List ID	CMT (A.2.11)	SCS	SCM	These variables are set and SCM is invoked by SCS as a response to display inputs. SCM used these variables to control its processing. SCS does not update these variables while SCM is processing, so no UPDATE block protection is needed. See Section 3.3.2.1 for a discussion of the interface.

INTERPROCESS VARIABLE DEFINITION

GRP #	ITEMS	LOCATION (REFERENCE)	UPDATE MODULES (PROCESS)	REFERENCE MODULES (PROCESS)	CONTROL
17	Control Switch Position Indicator	CMT (A.2.11)	SSB (SSP)	SBD (SM2)	This indicator is set by SSB and used by SSB and SBD to indicate the current position of the PBD Control Switch.
18	FDA enable/inhibit indicator	CMT (A.2.11)	STM	SPM	This indicator is set by STM as a result of display inputs and referenced by SPM to determine whether to inhibit FDA processing. Since it is referenced only once by SPM furing a single execution, no UPDATE block protection is needed.
19	Parameter Processing Buffer half indicator	CMT (A.2.11)	S2I (SM2) SPM	SPM	This indicator is used by SPM to determine which PPB half to process. It is set to 1 by S2I at OPS initialization. Since SPM is not executing at OPS initialization, no UPDATE block protection is needed.
20	Performance Monitor Control Cancel Flag	CMT (A.2.11)	S2I (SM2)	SPM	Flag used by SPM to determine whether to terminate processing. This flag is set by S2I at OPS termination. Since it is referenced only once by SPM during a processing cycle, no UPDATE block protection is needed.
21	Data Acquisition Read Cycle Counter	CMT (A.2.11)	S2I (SM2)	SDA	Counter maintained by SDA to determine current read cycle. The counter is set to one by S2I at OPS initialization. No UPDATE block protection is needed since SDA is not executing at OPS initialization.
22	Special Processes Executive Cycle Number	CMT (A.2.11)	S2I (SM2)	SSP	Counter maintained by SSP to determine the current Executive cycle. The counter is set to one by S2I at OPS initialization. No UPDATE block protection is needed since SSP is not executing at OPS initialization.
23	Control Timer Pump Indicator	CMT (A.2.11)	S2I (SM2) SSS (SSP)	SSS (SSP)	Parameters used by SSS to control time intervals between successive 'on' and 'off' commands to the water coolant loop pumps. These parameters are reset by S2I at OPS initialization. No UPDATE block protection is required since SSS is not executing at OPS initialization.
24	TFL Invalid Format ID TFL Termination Flag	CMT (A.2.11)	SLI (SLS)	VTF	Parameters used by VTF and set by SLI as part of the Communications/Instrumentation SPEC cleanup and initialization processing.
25	PBD Active/Inactive Flag	CMT (A.2.11)	S2I (SM2)	SSP	Flag indicating to SSP whether or not to invoke the PBD module. The flag is turned on and off by S2I at Mode 202 initialization and cleanup, respectively. Since the flag is referenced only once by SSP per execution no UPDATE block protection is needed.

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INTERPROCESS VARIABLE DEFINITION

GRP #	ITEMS	LOCATION (REFERENCE)	UPDATE MODULES (PROCESS)	REFERENCE MODULES (PROCESS)	CONTROL
26	FCOS Transaction Error Flag	CZ1	FIOCMPLT FIOPDISP FIOERRLC	RQC(REX)	This flag is set by FCOS whenever an I/O error is detected. When this flag is ON, RMS will not process the input data.
27	Auto Mode Flag Manual Mode Flag	CMT (A.2.11)	S2I (SM2) SSB (SSP)	SSB (SSP)	These flags are maintained by SSB to indicate which type of PBD activity is taking place. Both are reset at Mode 202 initialization. No UPDATE block protection is needed since SSB is not executing at Mode 202 initialization.
28	PBD Common Fail Indicator	SPOB (A.2.16)	S2I (SM2) SSB (SSP)	SSO (SSP)	Flag set by SSB to cause SSO to annunciate an error. The flag is reset at Mode 202 termination. No UPDATE block protection is needed since SSB and SSO execute sequentially.
29	Hyd Fluid Init Flag	CMT (A.2.11)	S2I (SM2) SST (SSP)	SST (SSP)	Flag used by SST to determine if OPS transition has occurred. Turned on by S2I at OPS initialization, turned off first time through SST. No UPDATE block protection is needed since SST is not executing at OPS initialization.
30	Uplink Cancel Flag	CMT(A.2.11)	S2I(SM2)	SUL	Flag used by SUL to determine whether to terminate processing, set by S2I at OPS termination. No UPDATE block protection is needed since SUL references this flag only once per execution.
31	Ku-Band Uplink Command Word	CMT (A.2.11)	SUL	SSM(SSP)	Word passed to SSM by SUL as the result of an uplink load. SSM takes the applicable bits in this word and updates the corresponding bits in the Special Process Output Buffer. Since only one word is involved and all data movement is via one HAL statement, no UPDATE block protection is necessary.
32	Uplinked Constants Values	COT (A.2.12)	STM SUL	SSM(SSP)	Variables updateable by STM similarly to those in group 12 above, but in addition updateable by SUL. Since no time-homogeneity requirements exist for these variables, no UPDATE block protection is required.
33	TM Spec Active Flag	CMT(A.2.11)	STI(STS)	SUL	Flag set by STI indicating to SUL that the TM spec is active. This flag is checked by SUL before processing TMBU data. Since this flag is set by STI before STS WAIT's for Keyboard entries, and since SUL sets a flag which STS checks before accepting Keyboard entries, no UPDATE protection is needed.
34	TM Uplink Active Flag	CMT(A.2.11)	SUL	STS	Flag set by SUL indicating to STS that a TMBU load is being processed by SUL. When this flag is ON, STS ignores Keyboard entries. Since the TM Spec Active Flag is checked by SUL before this flag is set and since there is a WAIT on keyboard entries between setting that flag and checking this one. No UPDATE block protection is needed

INTERPROCESS VARIABLE DEFINITION

GRP #	ITEMS	LOCATION (REFERENCE)	UPDATE MODULES (PROCESS)	REFERENCE MODULES (PROCESS)	CONTROL
35	TM Uplink Error Flag	CMT(A.2.11)	STM SUL	SUL	Flag set to OFF by SUL before first invocation of STM for each TMBU data set and set to ON by STM whenever an error is encountered processing TMBU data. Since SUL WAIT's for STM to complete before resuming execution, no UPDATE protection is required.
36	TM Input Values	CMT(A.2.11)	STS SUL	STM	Variables set by either STS or SUL as a means of passing data to STM. Since interlocks exist to prevent STS and SUL from concurrently invoking STM and since neither STS or SUL update these variables before STM is complete, no UPDATE protection is required.
37	Power ON/OFF Flag	CMT(A.2.11)	SSB (SSP) SBD(SM2)	SSB (SSP)	Flag indicating to SSB whether power commands need to be enabled or disabled to the PBD.

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INTERPROCESS VARIABLE DEFINITION

GRP #	ITEMS	LOCATION (REFERENCE)	UPDATE MODULES (PROCESS)	REFERENCE MODULES (PROCESS)	CONTROL
50	Keyboard item number Keyboard item data Keyboard DEU number	CZ1 Compool	DMC (DMC)	RMC (RMC)	Item number, DEU number, and data passed to RMC by UI when entries are made on the orbiter keyboard. No UPDATE block protection is needed because UI rejects additional keyboard inputs to RMC while RMC is processing.
51	RMS SPEC initialization flag	A.2.32	RMC (RMC) REX (REX)	REX (REX)	This flag indicates that RMS SPEC initialization is required. No UPDATE protection is needed because REX runs at a higher priority than RMC.
52	Item entry flag	A.2.32	RMC (RMC) REX (REX)	REX (REX)	This flag indicates that item entry processing is required. No UPDATE protection is required because RMC WAITs for TIME_REX (.08) seconds before processing the next keyboard entry.
53	Item number Item data DEU number	A.2.32	RMC (RMC)	RUD (REX)	This is the item number and the item data that was entered on the keyboard and the keyboard number. No UPDATE protection is needed because RMC WAITS for TIME_REX (0.8) seconds before processing the next keyboard entry.
54	SIP start time	CZ1 Compool	AIB (AIE)	RMC (RMC)	The time used to synchronize and phase all tasks in the GPC.
55	Arm Init Flag	A.2.32	RUD (REX)	RPO (RPO)	Arm Init Flag used by RPO to determine currently active arm. No UPDATE protection is needed because RPO uses the flag as an input - does not update.
56	Desired POR position & attitude	A.2.32	RUD (REX)	RPO (RPO)	End items which are validated by RPO when RUD receives them during OPR CMD Auto Mode (Item 21). No UPDATE protection is needed because RPO uses the item as an input - does not update.
57	OPR CMD Check Index	A.2.32	RUD (REX) RPO (RPO) RXY (REX)	RAS (REX)	Item on the SPEC (094) whose status is either "BLANK", "Fail", or "Good". No UPDATE protection is needed because neither RXY nor RUD will update the item while RPO is active.
58	RMS EE SEL	A.2.32	RUD (REX)	RPO (RPO) RCD (REX)	EE selected is used by RPO as input and not updated. Used to determine which end-effector is currently assigned to the arm initiated. UPDATE protection is not required.
59	Good Arm Init	A.2.32	RPO (RPO)	RAS (REX)	AIF is set equal to the Arm Init Flag when RPO begins. It is output to RAS for verification check between Good Arm Init and Arm Selected.
60	(Deleted)				
61	Good POR POS DES	A.2.32	RPO (RPO)	RAS (REX)	When an operator commanded sequence has been verified, the Good POR position desired is output to RAS for use. UPDATE protection is not required.

INTERPROCESS VARIABLE DEFINITION

GRP #	ITEMS	LOCATION (REFERENCE)	UPDATE MODULES (PROCESS)	REFERENCE MODULES (PROCESS)	CONTROL
62	Good POR ATD DES	A.2.32	RPO (RPO)	RAS (REX)	When an operator commanded sequence has been verified, the Good POR attitude desired is output to RAS for use. UPDATE protection is not required.
63	Good PL Init	A.2.32	RPO(RPO)	RAS (REX)	PID is set equal to Payload Init ID when RPO begins. It is output to RAS for verification check between Good PL Init and the selected payload.
64	PL Init ID	A.2.32	RUD(REX)	RPO(RPO) RXY(REX)	Payload init identifier used by RPO to select the correct point of resolution coordinates. No UPDATE protection is needed because RPO uses this a input only.

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APPENDIX E

DATA ITEM DESCRIPTOR

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1 OPS 2 Control Segment	
1	Item entry	KEY	Value obtained from UI indicating an item entry has been made.	Integer
2	Init/Cleanup Request	N/A	Literal value passed to OPS 2 Initialization/Cleanup routine indicating request. See Section 3.2.1.1, Appendix E for further description.	

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.2.1.1 OPS2 Initialization/Cleanup</u>	
5	Init/Cleanup Request	S2I_ID	Initialization/Cleanup request passed in call list to the OPS 2 Initialization/Cleanup Routine: 1 - OPS 2 Initialization 2 - Mode 201 Initialization 3 - Mode 201 Cleanup 4 - Mode 202 Initialization 5 - Mode 202 Cleanup 6 - OPS 2 Cleanup	Integer
38	Pointer to next halfword	S2I_BUFR_IND	Index to Checkpoint buffer at which to start dispersing data	Integer
39	Size of LIT	S2I_LIT_SIZE	Number of halfwords to be moved from Checkpoint buffer to LIT	Integer
40	Number of words	S2I_NUM_SCALARS	Number of halfwords to move from Checkpoint buffer to scalar position of COT	Integer
50	SYS SUMM Variables	CZ1V_SYSUM_PAGE$(3,1) CZ1V_SYSUM_PAGE$(3,2)	Variables in Common Compool (CZ1_COMMON) used by UI to present the appropriate System Summary display for SM.	ARRAY (3,2) Integer
51	Restore Enable	CZ1B_CKPT_RETRV_ENA	Flag in Common Compool (CZ1_COMMON) set by UI indicating to SM that a restore operation was requested by the crew. Ops Init/Clnup resets to clear enable on UI display.	BIT(16)
52	ICC Status Flag	ICC_CZ1B_CKPT_RETRV_ENA	ICC Status flag in Common Compool (CZ1_COMMON) indicating restore enable to be cleared on DPS Utility display.	BIT(32)
60	DEU NO	S2I_DEU_NO	DEU Number passed from control segment to annunciate class 5 error message	Integer
62	Fault Summary Message Flag	CDLB_SM_RECORDER_FLAG	Set By UI In CDL_ANNUN when a new fault summary message is generated.	BIT(1)
63	AM ICC Enable Flag	ENABLE_AM_DATA_MSG	Antenna Management ICC enable Flag	BIT(1)
64	Mass Memory Address Table	CZ1V_MM_ADDR_TBL$(2:)	Mass Memory Address Table in Common Compool (CZ1_COMMON)	Integer
65	Uplink Control Site In View Flag	CZ1B_D_UL_CNTL$4	Flag used by UI to determine whether to accept Uplink (based on whether a site is in view)	
66	Uplink Control ICC Enable	ICC_CZ1B_D_UL_CNTL	Replace macro which causes Uplink control flag (including Uplink Control Site in View Flag) to be ICC'ed.	

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.2.1.3.1 Basic Data Acquisition</u>	
1	Gen Acquisition Call List	SDA_CALL_LIST	Data passed to General Data Acquisition to provide information needed to perform the requested read. This data consists of #2-9.	N/A
2	Dart Index	SDA_DART_HDR	Address of next dart header entry to be processed	Name
3	Dart Address	SDA_DART_ADDR	Address of Dart	Name
4	IO STAT Address	SDA_IOB_ADDR	Not used by Basic Data ACQ	Name
5	INB Address	SDA_INB_ADDR	Address of INB	Name
7	PLMDM IO List Address	SDA_IOLST_ADDR	Address of FCOS IO Parm List for PLMDM Read	Name
8	PLMDM Read Flag	SDA_PLREAD	On = Read PLMDM Data	Bit 1
9	SP call flag	SDA_SP_CALL_FLG	Init Off=DA Call to Gen Acq.	Bit 1
12	Error Count	CSAV_CMT_ERROR_COUNT	Count of the number of I/O errors encountered during PMU word acquisition. Whenever an error occurs, the count is incremented by Annuciation Control. When the count reaches three, an error is annunciated. The count is set to zero by Basic Data Acquisition after an error-free data cycle. Located in FCOS compool FCMCOM.	Integer

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.2.1.3.2 General Data Acquisition</u>	
1	Gen Data Acquisition Call List	SGA_CALL_LIST	Data passed to Gen Data Acquisition from the calling programs to provide information needed to perform the requested reads. This data consists of #'s 2-9.	N/A
2	Dart Index	SGA_DART_HDR	Address of next dart header entry to be processed	Name
3	Dart Address	SGA_DART_ADDR	Address of dart	Name
4	IO Stat Address	SGA_IOB_ADDR	Address of IO status area (for spec process DA only)	Name
5	INB Address	SGA_INB_ADDR	Address of Input Buffer	Name
7	PLMDM IO List Address	SGA_IOLST_ADDR	Address of FCOS IO Parm list for PLMDM read	Name
8	PLMDM Read Flag	SGA_PLREAD	On=Read PLMDM Data	Bit 1
9	SP Call Flag	SGA_SP_CALL_FLG	On=Special Processes call	Bit 1
10	Error Count	CSAV_CMT_ERROR_COUNT	Count of the number of I/O errors encountered during PMU word acquisition. Whenever an error occurs, the count is incremented. When the count reaches three, an error is annunicated. The count is set to zero by Basic Data Acquisition after an error-free data cycle. Located in FCOS compool FCMCOM.	Integer
13	Max Chain Length	CSAK_MAX_CHAIN	The maximum number of CWs that can be read off the PMU with one read. This value is a restriction imposed by FCOS. A replace statement for this variable is used in General Data Acquisition.	
16	I/O Error Log PTR	N/A	Used to indicate absence/presence of IO ERROR. Positive nonzero #; PMU IO error occurred; pointer to FCOS IO Error Log Table entry was created. Zero; No IO error occurred; Negative #; IO error occurred; no IO Error Log Table entry was created.	
17	Error Retry Counter	SGA_ERR_RETRY	Used to limit error retry of read	Integer
18	# Dart Entries	SGA_NIM_ENT	Number of dart entries left to be processed	Integer
19	# Parms	SGA_NUM_PARMS	Number of parms per CWS	Integer
25	FCOS I/O Parm List	SGA_IO_PARM_LST	List passed to FCOS for reads. Includes #'s 2,5,15	N/A
26	COMFAULT Bits	CZEB_COMM_FAULT	Contains I/O status for FCOS Fixed BCE programs. Each bit represents one element. 0=Good, 1=Error. Located in CZ1 Common COMPOOL	BOOLEAN
27	Invalid Status Flag	SGA_INVAL_STAT	ON=PMU READ ERROR.	Bit 1

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
28	# Comfault Bits	SGA_NUM_COMFAULT_BITS	Number of Comfault bits to be checked for possible PLMDM read error.	Integer
29	IOB Index	SGA_IOB_INDEX	Index to status area in SPINB	Integer

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.4 PM Control	
10	CDA Indexes	SPM_CDAA_INDEX SPM_CDAE_INDEX SPM_CDAP_INDEX	Pointer to current CDA entry being processes.	Integers
11	PPB Indexes	SPM_PPBA_INDEX SPM_PPBE_INDEX SPM_PPBP_INDEX	Pointer to current PPB entry being processed.	Integers

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.5 Precondition Processing	
16	Number of Limit	SPP_PRECON_NO_LS_SEL	Internal value representing the number of limit sets selected for a precondition group.	Integer
17	Invalid Indicator	SPP_INVALID_IND	Internal indicator used to exit set solution processing when a precondition input parameter has an invalid PSI.	BOOLEAN
18	Number of Sets	SPP_PCT_NUM_SETS	Internal valve representing the number of limit sets for precondition group	Integer
21	Status Flag	Q	Internal variable representing out of limit status of a parameter	Integer
24	Partial Set Solution	SPP_PRECON_SET_SOL1	Set selection based on parameters within parenthesized group.	BIT(1)
25	Set Solution	SPP_PRECON_SET_SOL	Internal value representing the precondition logical sum	BIT(1)
26	Parm Condition Flag	SPP_COND_SAVE	Set according to OP code and status flag	BIT(1)
28	Limit Set Selected	SPP_PRECON_LS_SEL	Number 1,2, or 3 equal to the selected limit set.	Integer

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DATA ITEM D ⁝⁹TOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.6 Fault Detection and Annunciation	
1	Analog PPB Pointer	SFD_PPBA_HALF	Pointer to appropriate portion of analog PPB (call list parameter)	Integer
2	EU PPB Pointer	SFD_PPBE_HALF	Pointer to appropriate portion of EU PPB (call list parameter)	Integer
3	Discrete Parent PPB Pointer	SFD_PBBP_HALF	Pointer to appropriate portion of discrete PPB (call list parameter)	Integer
4	Pit Index	SFD_PIT	Pointer to current pit entry being processed	Integer
5	PPB Index	SFD_PPB	Pointer to current PPB entry being processed	Integer
6	Parameter type indicator	SFO_PARM_TYPE	Indicator for type of parameter being processed ie analog or EU	Integer
12	Limit Status Indicators (High/Low)	SFD_LIMIT_HI SFD_LIMIT_LO	Temporary locations for limit high and low status for parameter being processed.	BIT(1)
16	Current Limit Table Index	SFD_LIM	Pointer to limit table (LIT) entry used for limit sensing analog and EU parameters	Integer
32	Current Limit Status for Discrete	SFD_DISCRETE_STATUS	Temporary location containing limit status for discrete parameter being processed.	BOOLEAN

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.7 Forward Scaling	
1	Forward Scaling Call List		Data passed to Forward Scaling from the calling programs to provide information needed to scale the requested parameters. This data consists of: • Address pointer into SXT • Number of parameters to be scaled.	
2	Address Pointer Into SXT	SFS_SXT	Pointer into appropriate SXT as determined by calling program.	Name Scalar
3	Number of Parameters to be called	SFS_NUM_PARMS	Number of SXT entries to be processed as determined by calling program	Integer
4	Pointer to Analog Input Value	SXT_ANA_VAL	Pointer to analog value to be scaled acquired from SXT.	Name Integer
5	Pointer to EU Output Location	SXT_EU_VAL	Pointer to location for scaled EU value acquired from SXT.	Name Scalar
6	Pointer to Coefficients	SXT_SAT_PTR	Pointer to entry in SAT containing highest order coefficients, acquired from SXT	Name Scalar
7	Pointer to Status Word	SXT_STATUS	Pointer to parameter's status word acquired from SXT	Name Bit(16)
8	Curve Order	SFS_CO	Parameters curve order acquired from SAT	Integer
9	I/O Status Indicator	IO (SXT_STATUS)	I/O bit of parameters status word	Bit(1)
10	Off-Scale Indicator Low High	 SCALE_LO(SXT_STATUS) SCALE_HI(SXT_STATUS)	Scaling off-scale indicator in the status word	Bit (1)
11	Coefficients	SFS_COEF	Parameters coefficients acquired from SAT	Scalar
12	EU Value	SFS_EU	Solution value of scaling equation	Scalar
13	PCM	SFS_PCM	Input value to be scaled	Integer
14	PMU Indicator	PMU_IND(SXT_STATUS)	PMU indicator in parameters status word	Bit(1)

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.8 Backward Scaling	
1	Backward Scaling Call List		Data passed to Backward Scaling from the calling programs to provide information needed to backward scale the requested parameter. This data consists of: • Coefficient pointer (input) • EU Value (input) • Status indicators (output) • PCM value (output)	
2	Coefficient Pointer	SBS_SAT_PTR	The pointer to the coefficients used to scale the EU value.	Name Scalar
3	EU Vlaue	SBS_EU_VAL	The input value to be scaled in engineering units.	Scalar
4	Off scale flag	SBS_OFF_SCALE	Indicator set when the PCM value computed is offscale high or off-scale low.	Bit(1)
5	PCM Value	SBS_PCM_VAL	The resultant value in PCM units after backward scaling is performed.	Integer
6	Coefficients	COEF	Coefficient is acquired from SAT	Scalar

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.2.1.9 Special Processes Executive</u>	
4	Negmax	NEGMAX	Value = -32768. Used as a method to multiply frequency by -1 and store into phase.	Integer

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.10 Special Processes Data Acquisition	
1	Gen Acquisition Call List	SSD_CALL_LIST	Data passed to General Data Acquisition to provide information needed to perform the requested read. This data consists of #2-9.	N/A
2	Dart Index	SSD_DART_HDR	Address of next dart header entry to be processed.	Name
3	Dart Address	SSD_DART_ADDR	Address of Dart	Name
4	IO Stat Address	SSD_IO_ADDR	Address of IO status area	Name
5	INB Address	SSD_INB_ADDR	Address of INB	Name
7	PLMDM IO List Address	SSD_IOLST_ADDR	Address of FCOS IO Param list for PLMDM read	Name
8	PLMDM Read Flag	SSD_PLREAD	On = read PLMDM data	Bit 1
9	SP Call Flag	SSD_SP_CALL_FLG	Init on = SP call to Gen Acq.	Bit 1

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.2.1.11 Special Processes Data Out</u>	
8	FMPT Pointer Table	SSO_FMPT_PTABLE	Table of pointers to FMPT to annunciate errors. There is one entry per annunciation indicator.	Array Integers

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.2.1.12 APU Fuel Quantity</u>	
34	Average Value of Specific Gas Constant	SSA_RGCF	Average value of specific gas constant, flight condition used in APU fuel computation. Value = 2.6932	Scalar
35	Tank Expulsion Efficiency	SSA+EFF	Tank expulsion efficiency. Value = 1	Scalar
36	Gaging Error	SSA_GE	Gaging error. Value = 0.0	Scalar
37	Tank Volume	SSA_Vol	Tank Volume. Value = 6.5905	Scalar
38	Mass of Minimum Usable Fuel	SSA_WPF	Mass of minimum usable fuel. Value = 350.0	Scalar
48	APU Fuel Quantity (Local)	SSA_TEMP_APU_FUEL_QUANTITY	The value of the computed fuel quantity used as a temporary location.	Scalar
49	APU Fuel Quantity Status	SSA_TEMP_APU_FUEL_QUANTITY_STAT	The value of the computed fuel quantity status used as a temporary location.	BOOLEAN

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.13 Fuel Cell Computation	
31	Power Level Computation Array	SSF_POWER_LEVEL_COMP_ARRAY	An internal array used as temporary storage for each of the three fuel cell's power level computations.	Array(3) Scalar

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.14 Hydraulic Water Boiler Quantity	
28	Quantity of GN2 in GN2 Tank	SSH_N2_QUANTITY	Quantity of GN2 present in the GN2 storage tank.	Scalar
29	Hydr Water Boiler Quantity	SSH_TEMP_VR	Temporary location of output quantity before making the 0-100 range check.	Scalar
39	Hydr Sys A Const	SSH_A_CONST	Computation Constant. Value=8.0252E-2	Scalar
40	Hydr Sys B Const	SSH_B_CONST	Computation Constant. Value= -2.2014E-5	Scalar
41	Hydr Sys C Const	SSH_C_CONST	Computation Constant. Value= -2.0462E-6	Scalar
42	Hydr Sys D Const	SSH_D_CONST	Computation Constant. Value=- 1.9779E-10	Scalar
43	Intermediate Meter Reading	SSH_QUANT_METER	Temporary integer location of output quantity used in the EU(Scalar) to PCM (integer) conversion process before storing PCM output in the Special Processes Output Buffer (SPOB)	Integer

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
23	Temporary Press	SSN_TEMP_PRESS	3.2.1.15 O2/N2 Quantity Local variable used to store part of N2 equation for use in subsequent processing. 3.2.1.16 H_2O Pump Delta Pressure (no entries)	Scalar

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.17 Recorder Tape Position	
31	Fault Summary Message Indicator	CDLB_SM_RECORDER_FLAG	Indicator in CDLANNUN set by System Software annunciation when a new fault summary message is generated.	
97	Tape Position Table	SSR_TAPE_POS_TBL	(see table below)	Array (32) Integer

Entry	Value (Tape Position)	Corresponds to Input Binary Value (X)
1	0	0
2	52	16
3	26	8
4	77	24
5	13	4
6	65	20
7	39	12
8	90	28
9	6	2
10	58	18
11	32	10
12	84	26
13	19	6
14	71	22
15	45	14
16	97	30
17	3	1
18	55	17
19	29	9
20	81	25
21	16	5
22	68	21
23	42	13
24	94	29
25	10	3
26	61	19
27	35	11
28	87	27
29	23	7
30	74	23
31	48	15
32	100	31

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.18 Fuel Cell Purge	
9	X Minute Delay Time	SSC_X_MIN_DELAY	Time allotted for purge lines to warm up before annunciating a failure. Stored in seconds. Value = 1620 seconds (27 minutes)	Scalar
10	FCP Control Timer	SSC_FCP_CONTROL_TIMER	Used to control the various timing sequences throughout the Fuel Cell Purge Sequence. The various timers are described as follows: X timer - Used to control time allotted for purge lines to reach pre-defined temperatures on X minute delay time and activated when purge line heaters turned on. Open W Timer - Used to determine when to perform the valve open verification check. Based on w second delay time and activated when purge valve commanded open. Close W Timer - Used to determine when to perform the valve close verification check. Based on w second delay time and activated when purge valve commanded closed. Y Timer - Used to determine when to close purge valve. Based on 'y minute time' and activated when purge valve verified to be open. Z Timer - Used to determine when to terminate the purge line heater on commands. Based on 'z minute time' and activated when last valve is verified closed.	Scalar
11	W second delay time	SSC_W_SEC_DELAY	Elapsed time between commanding a purge valve open (or closed) and performing the valve open (or closed) verification check. Value = 10 seconds.	Scalar
13	Z minute Time	SSC_Z_MIN_TIME	Elapsed time between the close verification of the last FCP valve and termination of the purge line heater on commands. Stored in seconds. Value = 3300 seconds (55 Minutes)	Scalar
19	Active FCP Timer	SSC_ACT_FCP_TIME	Integer indicating which FCP timer, if any, is active: o = No timer is active 1 = X timer 2 = Open W timer 3 = Y timer 4 = Close W timer 5 = Z timer	Integer
20	FC selected	SSC_FC_SELECTED	Indicates which FC is selected, if any: 0 = No FC selected 1 = FC 1 selected 2 = FC 2 selected 3 = FC 3 selected	Integer
39	$\Delta 3$	SSC_DELTA_THREE	Constant for O_2 to be used in open verification check. Value = 0.9.	Scalar

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
40	$\Delta 4$	SSC_DELTA_FOUR	Constant for H_2 to be used in open verification check. Value = 0.3.	Scalar
41	$\Delta 1$	SSC_DELTA_ONE	Constant for O_2 to be used in close verification check. Value =0.9.	Scalar
42	$\Delta 2$	SSC_DELTA_TWO	Constant for H_2 to be used in close verification check. Value = 0.3.	Scalar

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.19 Hydraulic Fluid Temperature Control	
2	Total Prior Assign	SST_NO_ASSN_PRIOR	Total number of pumps assigned a priority (initially 0, range 0 to 3)	Integer
3	Prior No. 1 Pump	SST_NO1_PUMP	Hydr pump system number which was assigned a 1 priority	Integer
5	Sys 1 Prior No.	SST_PRIOR$(1)	Priority no assigned to Sys. 1	Integer
6	Sys 2 Prior No.	SST_PRIOR$(2)	Priority no assigned to sys. 2	Integer
7	Sys 3 Prior No.	SST_PRIOR$(3)	Priority no assigned to sys. 3	Integer
9	XTIMER	SST_XTIMER	Earliest SP time a pump may be turned off.	Scalar Double
11	ZTIMER	SST_ZTIMER	SP time at which the pump is turned on after delay time.	Scalar Double
151	Temp Sensor Count	SST_TEMP_Count	A count of temperature sensors to be tested in limit sense operation of each hydraulic system. Initial value - (20,17,16)	Array (3) Integer
152	Hydr Pump Index (I)	SST_I	Index No. for the sytems - Range from 1 to 3 - Initial (1)	Integer

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.2.1.20 Payload Bay Doors</u>	
189	Current Latch Groups/ Door Pointer	SSB_CURRENT_LATCH_DOOR_ POINTER	A pointer to the latch group or door currently being processed during an auto sequence.	Integer
190	Previous Switch Position	SSB_PREVIOUS_SWITCH_POS	An indicator used in Auto Mode processing that indicates the position of the PBD Control Switch during the previous execution: 1 = Open, 2 = close, 0 = stop	Integer
191	Open/Close Feedback Indicator	SSB_OPEN_CLOSE_FEEDBACK_ INDIC	An indicator that is set on when the latch group or door that is currently being processed becomes open or closed.	Boolean
192	Switch Open Indicator	SSB_SWITCH_OPEN_INDICATOR	An intermediate value used in PBD switch position determination that contains the status of the PBD open feedback discretes.	Boolean
193	Switch Close Indicator	SSB_SWITCH_CLOSE_INDICATOR	An intermediate value used in PBD switch position determination that contains the status of the PBD close feedback discretes.	Boolean
194	Latch/Door Input Parameter 1	SSB_LATCH_DOOR_INPUT_PARM_ 1	An input parameter to PBD latch status and PBD door status used as a common input for each latch group and door.	Boolean
195	Latch/Door Input Parameter 2	SSB_LATCH_DOOR_INPUT_PARM_ 2	See above description for PARM 1.	Boolean
196	Latch/Door Input Parameter 3	SSB_LATCH_DOOR_INPUT_PARM_ 3	See above description for PARM 1.	Boolean
197	Latch/Door Input Parameter 4	SSB_LATCH_DOOR_INPUT_PARM_ 4	See above description for PARM 1.	Boolean
198	Latch Computed Value	SSB_LATCH_COMPUTED_VALUE	The output value resulting form a call to PBD latch status that contains the text for the status of the latch group currently being processed.	Char(2)
199	Door Computed value	SSB_DOOR_COMPUTED_VALUE	The output value resulting from a call to PBD Door status that contains the text for the status of the door currently being processed.	Char(3)
200	Current Latch Groups/ Door Expiration Time	SSB_LATCH_DOOR_EXPIR_TIME	Computed time that the latch group or door currently being processed is assumed to have failed to open or close if proper feedback signals are not received.	Scalar
201	Commands Enabled Array	SSB_COMMANDS_ENABLED_ARRAY	An array that contains the status of commands enabled during an auto open or close sequence.	Array(6,2) Integer
202	PBD More Work Indicator	SSB_PBD_MORE_WORK_IND	An indicator used to alert auto sequence processing as to whether additional work can be done during this execution.	Boolean
203	Timer Constants Array	SSB_TIMER_CONSTANTS_ARRY	An array of values which represent each latch group and door's maximum time allowed to open or close during an auto sequence. Values are: (40, 40, 60, 126, 60, 126).	Array(6) Scalar
204	Mode Transition Enable/ Inhibit Event	CZ1E_OPS_MODE_INHIBIT$3	An event in UI compool table CZ1_COMMON used to inhibit OPS/MODE transition whenever the PBD control switch is not in the stop position	Array(3) Event

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			and enable OPS/MODE transition whenever it is,	
205	OPEN/CLOSE Complete Ind.	SSB_OPEN_CLOSE_COMPLETE	An Indicator Set To Indicate When The Latch Groups And Doors Are Fully Closed 1 = Fully Open 2 = Fully Closed 0 = None Of The Above	Integer
206	Power Disable Ind.	SSB_POWER_DISABLE_IND	An Indicator Set When a Power Off Request is Processed To Alert PBD Cyclic To Turn Off the Reset Masks For the Power Enable/Disable 'B' Commands On the Next Execution.	Boolean
			3.2.1.21 Standby Water Coolant Temperature Control (No Entries)	

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.2.1.22 Antenna Management	
1	Geocentric Horizon	SSM_GEO_HORIZON	Geocentric horizon in Greenwich True of Date Cartesian Coordinates Units - Radians.	Scalar
2	Geocentric Earth Radius	CSMK_GEO_EARTH_RAD	Geocentric earth radius. Units - Feet. Initial value - 20, 925, 874	Scalar
7	Sine of Pitch Angle	SSM_SIN_PTCH	Sine of orbiter earth-relative pitch angle. Units - none.	Scalar
8	Sine of Yaw Angle	SSM_SIN_YAW	Sine of orbiter earth-relative yaw angle. Units - none.	Scalar
9	Sine of Roll Angle	SSM_SIN_ROLL	Sine of orbiter earth-relative roll angle. Units - none.	Scalar
10	Cosine of Pitch Angle	SSM_COS_PTCH	Cosine of orbiter earth-relative pitch angle. Units - none.	Scalar
11	Cosine of Yaw Angle	SSM_COS_YAW	Cosine of orbiter earth-relative yaw angle. Units - none.	Scalar
12	Cosine of Roll Angle	SSM_COS_ROLL	Cosine of orbiter earth-relative roll angle. Units - none.	Scalar
16	Coordinates Transformation Matrix	SSM_TRANSFORMATION_MATRIX	Coordinates transformation matrix to the Orbiter Body Axis coordinates system from the Greenwich True of Date coordinates. Units - none.	MATRIX(3,3)
16f	Delta Time	SSM_DELTA_TIME	Complete delay time used to compute the attitude compensation matrix. Units - seconds.	Scalar
16g	Attitude Compensation Matrix	SSM_ATT_COMP_MATRIX	Matrix used in computation of LOS angles to compensate for data transport delay. Units - none.	MATRIX(3.3)
16e	Clocktime	CLOCKTIME	Current time. Used to compute transport delay time	Scalar Double
17	Line-of-Sight Unit Vector to East TDRS	SSM_TDRS_LOS	Line-of-sight unit vector from orbiter to TDRS in Greenwich True of Date coordinates. Units - none.	VECTOR(3)
18	Line-of-Sight Unit Vector to East TDRS	SSM_TDRS_UNIT_LOS$(2;*)	Line-of-sight unit vector from Orbiter to East TDRS in Orbiter body axis coordinates. Units - none.	VECTOR(3)
19	Line-of-Sight Unit Vector to West TDRS	SSM_TDRS_UNIT_LOS$(1:*)	Line-of-sight unit vector from Orbiter to west TDRS in Orbiter body axis coordinates. Units - None.	VECTOR(3)
24	Total Number of Daily Rotations Since TDRS Ascending Node Crossing	SSM_OMEGA_DELTA_T	Difference between time tag of NAV state vector and time of TDRS Ascending Node Crossing multiplied by the rotation rate of the earth. Units - rotations.	Scalar
28	Geocentric Latitude of TDRS	SSM_TDRS_GE)_LAT	Geocentric Latitude of TDRS. Units - Radians	Scalar
29	Geocentric Longitude of TDRS	SSM_TDRS_GEO_LONG	Geocentric longitude of TDRS. Units- Radians	Scalar

TABLE NAME:

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
32	Fractional Part of Uncompleted Rotation	SSM_FRACTION_ROTATION	Fractional Part of Uncompleted Earth Rotation. Units - Radians	Scalar
45	TDRS Elevation from Vertical	SSM_TDRS_ELEV_VERT	Angle between orbiter to earth vector and TDRS position vector in Greenwich True of Date coordinates. Units - Radians.	Scalar
46	TDRS Elevation Above Horizon	SMM_TDRS_ELEV_HORIZ	TDRS elevation above the geocentric horizon. Units - Degrees	Scalar

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
50	Line-of-Sight Computations CALL List		Data passed to and from the internal procedure SSM_LOS_COMP. This data includes: o Line-of-sight vector to target (input) o Line-of-sight unit vector (output) o Line-of-sight roll angle to target - degrees (output) o Line-of-sight pitch angle to target - degrees (output) o Line-of-sight roll angle to target - rasters (output) o Line-of-sight pitch angle to target - rasters (output)	
51	Line-of-sight vector to target	SSM_TGT_LOS	Line-of-sight unit vector from orbiter to target in Greenwich true of date coordinates. Input to SSM_LOS_COMP. Units - none.	VECTOR(3)
52	Line-of-sight unit vector	SSM_TGT_UNIT_LOS	Line-of-sight unit vector from orbiter to target in Orbiter Body Axis Coordinates. Output from SSM_LOS_COMP. Units - none.	VECTOR(3)
53	Line-of-Sight Unit Vector X-component	SSM_TGT_UNIT_LOS$1	X-component of line-of-sight unit vector. Internal to SSM_LOS_COMP. Units - none.	Scalar
54	Line-of-sight Unit Vector Y-component	SSM_TGT_UNIT_LOS$2	Y-component of line-of-sight unit vector. Internal to SSM_LOS_COMP. Units - none.	Scalar
55	Line-of-sight Unit Vector Z-component	SSM_TGT_UNIT_LOS$3	Z-component of line-of-sight unit vector. Internal to SSM_LOS_COMP. Units - none.	Scalar
56	Line-of-sight Roll Angle to target - degrees	SSM_TGT_ROLL_DEG	Roll look angle to target from Orbiter Z-body axis measured positively around the X-axis. Output from SSM_LOS_COMP. Units - degrees.	Scalar
57	Line-of-Sight Pitch Angle to Target-Degrees	SSM_TGT_PTCH_DEG	Pitch look angle to target from Orbiter Z-body axis measured positively around the Y-axis. Output from SSM_LOS_COMP. Units - degrees.	Scalar
58	Line-of-Sight Roll Angle to Target - Rasters	SSM_TGT_ROLL_RAS	Line-of-sight roll angle to target - degrees converted to units required to drive a dynamic symbol on the Antenna Management Display. Outputs from SSM_LOS_COMP. Units - Rasters.	Scalar
59	Line-of-Sight Pitch Angle to Target - Rasters	SSM_TGT_PTCH_RAS	Line-of-sight pitch angle to target - degrees converted to units required to drive a dynamic symbol on the Antenna Management Display. Output from SSM_LOS_COMP. Units - Rasters.	Scalar
60	Orbiter Position Vector Magnitude	SSM_ORB_POS_MAG	Magnitude of Orbiter Position Vector in Greenwich True of Date coordinates Units - Feet.	Scalar
61	Orbiter Unit Vector	SSM_ORB_UNIT	Unit vector, in Greenwich True of Date coordinates, corresponding to Orbiter position vector. Units - None.	VECTOR(3)
62	TDRS Index	SSM_TDRS_INDEX	Loop counter used to index to either East or West TDRS. Units - None	Integer
68	Previous Ku-Band TDRS Select Item	SSM_KUBAND_PREV_TDRS_SEL	Value of Ku-Band TDRS Select Item on last previous execution. Units - none. Initial value - 0.	Bit(16)

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
70	TDRS Used for Ku-Band	SSM_KUBAND_TDRS_USED	TDRS used in Ku-Band steering (1 = west, 2 - East). If a TDRS is is selected for Ku-band, it is used. Otherwise, the TDRS not last selected for Ku-Band is used. Units - none. Initial value - 0.	Integer
71	TDRS Not Last Selected for Ku-Band	SSM_KUBAND_TDRS_NOT_LAST_SEL	The TDRS which was not last selected for Ku-Band (1 = West, 2 = East) e.g., if the west TDRS is selected, the TDRS not last selected becomes east. Units - none. Initial value - 2.	Integer
72	TDRS Selection Call List		Data passed to and from the internal procedure SSM_TDRS_SELECTION. This data includes: o TDRS Select Item (input) o Previous TDRS Select Item (input) o TDRS Selected (input/output)	
73	TDRS Select Item	SSM_TDRS_SEL	Indication of which TDRS to select. Input to SSM_TDRS_SELECTION. Units - none.	Bit (16)
74	TDRS Select Auto	SSM_TDRS_SEL$1	Indication to automatically select TDRS. Input to SSM_TDRS_SELECTION. Units - none.	
75	TDRS Select West	SSM_TDRS_SEL$3	Indication to select west TDRS. Input to SSM_TDRS_SELECTION. Units - none.	
76	Previous TDRS Select Item	SSM_TDRS_PREV_SEL	Value of TDRS Select Item on last previous execution. Input to SSM_TDRS_SELECTION. Units - none.	Bit (16)
77	Previous TDRS Select Auto	SSM_TDRS_PREV_SEL$1	Value of TDRS Select Auto on last previous execution. Input to SSM_TDRS_SELECTION. Units - none.	
78	TDRS Selected	SSM_TDRS_SELECTED	TDRS selected based on TDRS select item and previous TDRS select item. (0=none, 1=west, 2=east). Input to and output from SSM_TDRS_SELECTION. Units - none.	Integer
82	Line-of-Sight Unit Vector to Ku-Band Target	SSM_KUBAND_TGT_LOS	Line-of-sight unit vector to GNC target or TDRS used by Ku-Band. First in Oribter Body Axis Coordinates, and then biased to Ku-Band Antenna Coordinates. Units - none.	VECTOR(3)
83	Line-of-Sight Unit Vector to Ku-Band Target X-component.	SSM_KUBAND_TGT_LOS$1	X-component of line-of-sight unit vector to Ku-band target. Units - none.	Scalar
84	Line-of-sight Unit Vector to Ku-Band Target Y - component.	SSM_KUBAND_TGT_LOS$2	Y-component of Line-of-sight unit vector to Ku-Band Target. Units - none.	Scalar
85	Line-of-Sight Unit Vector to Ku-Band Target Z-component	SSM_KUBAND_TGT_LOS$3	Z-component of line-of-sight unit vector to KU-Band Target. Units - none	Scalar

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
105	Acquisition Sequence Flag	SSM_KUBAND_ACQ_SEQ	Flag indicating whether or not a Ku-Band acquisition sequence is in progress. ON = sequence in progress, OFF = sequence not in progress Units - none. Initial Value - Off.	Bit(1)
106	TDRS Used For Ku-Band Last Cycle	SSM_KUBAND_TDRS_USED_LAST	Value of TDRS used for Ku-Band during the last previous execution. (1=west, 2=east). Units - none. Initial value - 0.	Integer
110	GNC Pointing Flag Last Cycle	SSM_GNC_POINTING_LAST CYCLE	Value of GNC Pointing flag during the last previous execution. Units - none. Initial value - OFF.	Bit(1)
112	Search-In-Progress Flag	SSM_SEARCH_IN_PROGRESS	Flag indicating whether or not a Ku-Band search has been initiated. ON=search has been initiated and has not terminated, Off = search has either not been initiated or has been initiated and has subsequently terminated. Units - none. Initial value - OFF.	Bit (1)
113	Time to Initiate Search	SSM_SEARCH_INIT_TIME	Value of Special Processes Current Time at which Search-Initiate Discrete is to be set. Computed from Special Processes Current Time and x-second delay at beginning of acquisition sequence. Units - seconds.	Scalar
117	Search Discrete Previous Cycle	SSM_KUBAND_SEARCH_LAST_ CYCLE	Value of Search Discrete during last previous execution. Units - none Initial value - OFF.	Bit (1)
119	AM ICC Enable Flag	ENABLE_AM_DATA_MSG	Flag in the ICC Message table which indicates to the ICC Router whether the AM ICC Buffer will accept data. 1=AM ICC Buffer not in use and will accept data, 0=AM ICC Buffer in use and will not accept data. Units - none. Initial value - 1.	Bit (1)
121	Previous S-Band TDRS Select Item	SSM_SBAND_PREV_TDRS_SEL	Value of S-Band TDRS Select Item on last previous execution. Units - none. Initial value - 0.	Bit (16)
166	Current Site Pointer	SSM_CURRENT_SITE_PTR	Index into site vectors and site inhibit flags. Points to information for site currently under consideration. Units - none. Initial Value - 1.	Integer
167	Sine of Site Visibiltiy	SM_SIN_SITE_VIS	Sine of site visibility above horizon (TM constant) during current execution. Units - None.	Scalar
169	Site Selected Flag	SSM_SITE_SEL_FLAG	Flag indicating that a site was been selected during the current execution. Initialized to OFF during each execution. Units - none	Bit (1)
170	Site Counter	SSM_SITE_CTR	Count of number of sites considered during current execution. Consideration of sites is stopped when count passes 16. Units - none.	Integer
186	Line-of-sight Vector to Site	SSM_SITE_LOS	Line-of-Sight unit vector to current site in Greenwich True of Date coordinate system. Units - none.	VECTOR(3)
244	Sine of Elevation Angle	SSM_SIN_SITE_ELEV	Sine of elevation angle to current site. Units - none.	Scalar

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
250	No Quad Selected Flag	SSM_NO_QUAD_SEL	Internal flag indicating whether a quad antenna is selected at the RF Switches. ON = No Quad Selected. OFF = Quad selected. Units - none.	BOOLEAN
251	No Hemi Selected Flag	SSM_NO_HEMI_SEL	Internal flag indicating whether a hemi antenna is selected at the RF switches. ON = No Hemi selected. OFF = Hemi selected. Units - none.	BOOLEAN
253	Quad Selected by GPC	SSM_QUAD_SEL_BY_GPC	Quad antenna selected by GPC (1=upper right, 2 = Lower right, 3 = Lower Left, 4 = Upper left). Units - none. Initial vlaue - 0.	Integer
257	Hemi Selected by GPC	SSM_HEMI_SEL_BY_GPC	Hemi antenna selected by GPC (1 = upper Hemi, 2 = lower Hemi). Units - none. Initial Value - 0.	Integer
258	Target Quadrant	SSM_TARGET_QUADRANT	Quadrant containing line-of-sight roll angle to S-Band target (TDRS or ground site). Units - None.	Integer
259	Quad Antenna Quadrant Array	SSM_QUAD_ANT_QUADRANT	Array used to assign Quad selected by GPC using target quadrant as an index: Target Quadrant — Quad Selected by GPC 1 — 4 2 — 3 3 — 2 4 — 1 Units - none. Initial values - (4,3,2,1).	Array(4) Integer
260	Hemi Antenna Quadrant Array	SSM_HEMI_ANT_QUADRANT	Array used to assign Hemi selected by GPC using target quadrant as an index: Target Quadrant — Hemi Selected by GPC 1 — 1 2 — 2 3 — 2 4 — 1 Units - none. Initial Values - (1,2,2,1).	Array(4) Integer
298	Converted Line-of-Sight Roll Angle to Target	SSM_TGT_ROLL_CON	Line-of-sight roll angle to target-degrees converted from a range of (-180,180) to a range of (0,360). Units - degrees.	Scalar
299	Quadrant Number	SSM_QUADRANT_NUM	Number used to determine target quadrant. Computed using converted LOS roll angle to target. Units - None.	Scalar
300	Fractional part of Quadrant Number	SSM_FRAC_QUAD	Number used to determine if target point is in a transition region. Units - none.	Scalar

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
317	(Deleted)			
318	Uplink Control Site In View Flag	CZ1B_D_UL_CNTL$4	Flag used by UI to determine whether to accept Uplink (based on whether a site is in view)	
319	Uplink Control ICC Enable	ICC_CZ1B_D_UL_CNTL	Replace macro which causes Uplink Control Flag (including Uplink Control Site In View Flag) to be ICC'ed.	

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.1.2.23 Uplink Processor	
2	SM Uplink Event		Event set by the UI Uplink Processor when an uplink load is to be processed by the SM major function. Reset by SM when the load is moved from the Two-Stage Buffer. Contained in CDU_LNK COMPOOL. Initial Value - OFF.	Event Latched
3	Two-Stage Buffer		Area containing uplink load passed from UI to application. Contained in CDU_LNK COMPOOL. Initial Value - 0.	Array(67) Bit(16)
4	SM Uplink Buffer	SUL_BUFFER	Area to which uplink load is moved by SM for processing of load. Units - None. Initial Value - 0.	Array(67) Bit(16)
5	Op Code	SUL_OP_CODE	Value indicating the type of uplink load received. REPLACE name for SUL_BUFFER$(1:8 TO 14).	
6	MMU Patch Op Code	SUL_MMU_OP	Value of MMU Patch Op Code. REPLACE name for 6.	
7	Ku-Band Antenna Control Op Code	SUL_KU_CMTL_OP	Value of Ku-Band Antenna Control Op Code. REPLACE name for 7.	
8	TDRS state Vector Load OP Code	SUL_TDRS_STATE_OP	Value of TDRS State Vector Load Op Code. REPLACE name for 22.	
9	Ku-Band Bias Matrix Load Op Code	SUL_KU_BIAS_OP	Value of Ku-Band Bias Matrix Load Op Code. REPLACE name for 23.	
10	Payload Data Load Op Code	SUL_PL_DATA_OP	Value of Payload Data Load Op Code. REPLACE name for 26.	
11	PSP Configuration Op Code	SUL_PSP_CON_OP	Value of PSP Configuration Op Code. REPLACE name for 27.	
12	TM Block Update Op Code	SUL_TMBU_OP	Value of TM Block Update Op Code. REPLACE name for 32.	
14	Ku-Band Uplink Reset Mask	SUL_KU_CNTL_RESET	Part of Ku-Band Antenna Control load. Mask of bits to be turned off in the Ku-Band Uplink Command Word. REPLACE name for SUL_BUFFER$(2:)	
15	Ku-Band Uplink Set Mask	SUL_KU_CNTL_SET	Part of Ku-Band Antenna Control load. Mask of bits to be turned on in the Ku-Band Uplink Command Word. REPLACE name for SUL_BUFFER$(3:)	
18	Uplink Inclination of East TDRS	SUL_INCL_EAST_TDRS	Part of TDRS State Vector Load. New Value of Inclination of East TDRS Orbital Plane. REPLACE name for SUL_BUFFER$(2 TO 3:).	
19	Uplink Inclination of West TDRS	SUL_INCL_WEST_TDRS	Part of TDRS State Vector Load. New value of Inclination of West TDRS Orbital Plane. REPLACE name for SUL_BUFFER$(12 TO 13:).	
22	Uplink Longitude of East TDRS	SUL_LONG_EAST_TDRS	Part of TDRS State Vector Load. New value of Longitude of East TDRS Ascending Node. REPLACE name for SUL_BUFFER$(4 TO 5:).	

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
23	Uplink Longitude of West TDRS	SUL_LONG_WEST_TDRS	Part of TDRS State Vector Load. New value of Longitude of West TDRS Ascending Node. REPLACE name for SUL_BUFFER$(14 TO 15:).	
26	Uplink Time of East TDRS Crossing	SUL_TIME_EAST_TDRS	Part of TDRS State Vector Load. New value of Time of East TDRS Ascending Node Crossing. REPLACE name for SUL_BUFFER$(6 TO 9	
27	Uplink Time of West TDRS Crossing	SUL_TIME_WEST_TDRS	Part of TDRS State Vector Load. New Value of Time of West TDRS Ascending Node Corssing. REPLACE name for SUL_BUFFER$(16 TO 19:).	
30	Uplink East TDRS Position Magnitude	SUL_EAST_TDRS_POS_MAG	Part of TDRS State Vector Load. New value of East TDRS Position Vector Magnitude. REPLACE name for SUL_BUFFER$(10 TO 11:).	
31	Uplink West TDRS Position Magnitude	SUL_WEST_TDRS_POS_MAG	Part of TDRS State Vector Load. New value of West TDRS Position Vector Magnitude. REPLACE name for SUL_BUFFER$(20 TO 21:).	
33	Ku-Band Uplink Bias Matrix	SUL_KU_BIAS_MATRIX	Data portion of Ku-Band Bias Matrix Load. New value of Ku-Band Bias Correction Matrix. REPLACE name for SUL_BUFFER$(2 TO 19:).	
37	Number of Data Sets	SUL_TMBU_NUM_DS	Part of TM Block Update Load. Number of data sets in load. REPLACE name for SUL_BUFFER$(3:13 TO 16).	
38	Data Set Index	SUL_DS_INDEX	Loop counter which points to TMBU data set currently being processed.	Integer
39	Valid Data Set Type Flag	SUL_VAL_DS_FLAG	Internal flag set to ON when Data Set Type is determined to be valid.	Boolean
40	Type Index	SUL_TYPE_INDEX	Loop counter which points to entries in the Valid DS Type Array for comparison to the Data Set Type currently being processed.	Integer
41	Valid DS Type Array	SUL_VAL_DS_TYPE	Array containing values of all valid data set types. Initial Value - (2,3,4,5,6,7,11,12,17)	Array(9) Integer
43	Data Set Type	SUL_DS_TYPE(Q)	Part of TM Block Update Load. Indicates the type of data set Q. REPLACE name for SUL_BUFFER$(4 Q:1 TO 8)	
44	TM Constant Value Item Number	CSTK_CON_VAL_ITEM	Value of item representing a TM Constant Value. REPLACE name for 17.	
47	TMBU Parameter ID	SUL_TMBU_PARMID(Q)	Part of TM Block Update Load. Identifies parameter to be updated as part of data set Q. REPLACE name for SUL_BUFFER$(4 Q:9 TO 16) SUL_BUFFER$(4 Q + 1).	
49	Table Maintenance Process Event	STM_TABLE_MAIN	Event associated with the Table Maintenance Process by FCOS. Event is ON when the Table Maintenance Process is executing or awaiting execution and returns to OFF when the process completes.	Event
51	TMBU Parameter Value	SUL_TMBU_PARM_VALUE(Q)	Part of TM Block Update Load. New value of parameter updated by data set Q. REPLACE name for SUL_BUFFER$(4 Q + 2 TO 4 Q + 3:).	

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
52	TM Constant ID Item Number	CSTK_CON_ID_ITEM	Value of item representing a TM Constant ID. REPLACE name for 16.	
53	TM Parameter ID Item Number	CSTK_PARM_ID_ITEM	Value of item representing a TM parameter ID. REPLACE name for 1.	
55	Header Buffer	CDHV_PATCH_REQUEST	Structure of input parameters to the MM utility program. Stored in VU compool CDH_MM_ UTILITY.	
56	MM Utility Buffer	CDIV_RW_BUFFER	Buffer used for MM Utility I10 & input messages stored in VU compool CDH_MM_UTILITY	
57	Patch Comp	CDHB_PATCH_COMP	Bit within MM Utility Program. Input structure which causes an MM-to-MM Compare stored in VU compool CDH_MM_UTILITY	
58	Patch Dump	CDHB_PATCH_DUMP	Bit within MM Utility Program. Input structure which causes and MM-to-MM Dump. Stored in VU Compool CDH_MM_UTILITY	
59	MM Request OP Code	CDHB_PATCH_OPCODE	OP Code for MM Utility operations. Stored in VU compool CDH_MM_UTILITY	
60	GND/Display Mode Indicator	CDHV_PATCH_RHW	Router Header Word in LDB inputs to MM utility stored in VU compool CDH_MM_UTILITY	
61	Uplink Message Flag	CDHB_UL_MSG	Indicator to MM utility for unique uplink message handling. Stored in VU compool CDH_MM_UTILITY	

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.3.1.1 Table Maintenance Control Segment</u> (No entries)	

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.1.2 Table Maintenance Process	
19	COT Index	STM_COT_INDEX	Saved COT Index	Integer
21	Invalid Indicator	STM_INVALID_IND	Indicates value entered is invalid.	Boolean
24	Number of Limit Sets Save	STM_LIM_SET_SAVE	Saved number of limit sets	Integer
25	Class 2 limit indicator	STM_CLASS2_LIM_IND	Class 2 for PARM when ON	Boolean
26	Class 0, 3, 4 Limit Indicator	STM_CLASS034_LIM_IND	Class 0, 3, or 4 for Parm when ON	Boolean
31	ID Found Flag	STM_ID_FOUND	ON when an ID entry number is found	Boolean
33	ITEM Type	STM_ITEM_TYPE	Array of 8 containing consecutive numbers starting with 1. Item Type No. — Definition 1 — Parameter ID 2 — Limit 3 — Noise Filter 4 — Parameter Annunciation Status 5 — FDA Status 6 — Constant ID 7 — Constant Value 8 — Checkpoint Execute	Integer (9)
34	ITEM Table	STM_ITEM_TABLE	Array of 20 containing constant element numbers running from 1 to 9 Array Number / Item Type / Array Number / Item Type 1 / 1 / 11 / 2 2 / 2 / 12 / 2 3 / 2 / 13 / 3 4 / 2 / 14 / 4 5 / 2 / 15 / 4 6 / 2 / 16 / 6 7 / 2 / 17 / 7 8 / 3 / 18 / 8 9 / 4 / 19 / 5 10 / 4 / 20 / 5	Integer (21)
				Integer

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
41	COMMON Buffer in use. Flag for checkpoint	STM_COM_BUF_ FREE	Indicator to checkpoint of the availability of the SM Common Buffer On - common buffer is available for use. Off - common buffer is unavailable	Bit(1)
43	Pointer to next available halfword	STM_BUFR_IND	Index into Checkpoint Buffer at which to store data.	Integer
49	Time of successful checkpoint	CZIV_D_MISSION_TIME$(1:)	Current mission time obtained from UI for time of good checkpoint display	Array(3) Integer
50	Size of LIT	STM_LIT_SIZE	Number of half-words to be moved from LIT to checkpoint buffer	Integer
51	Number of words	STM_NUM_SCALARS	Number of halfwords to move from scalar portion of COT to Checkpoint buffer.	Integer
58	Total Number Entries In COT	STM_NUM_ENTRIES	Count of Number of Entries in each COT	Integer
59	Current Search Position	STM_CUR_POS	Current position of pointer into the COT	Integer
60	Double Scalar Value	STM_COT_DBL_SCAL_VALUE	Double scalar entry value	Scalar Double
61	Entered ID	STM_ITEM11	ID entered via item entry	Integer
62	COT Position Pointer	STM_COT_INCR	Length of increment into the COT	Integer
			3.3.1.3 Table Maintenance Cyclic Parameter Update (No Entries)	

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.2.1 SCM Specialist Function Control Segment	
1	Item Entry	KEY	Value set by UI based on inputs to SCM Spec.	Integer

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.2.2 SCM Process	
15	Item Table	SCM_ITEM_TABLE	Array of 6 entries to convert ITEM NUMBER to CASE INDEX for example: Item Number — ITEM TYPE (Case Index) 1 — 1 2 — 2 3 — 3 4 — 4 5 — 4 6 — 5	Array(10) Integer
16	Item Type	SCM_ITEM_TYPE	Type obtained from ITEM TABLE	Integer
17	Error Indicator	SCM_CLASS5_ERROR	Indicator used to indicate need to output Class 5 error message.	Boolean
18	Number Discrepancies	SCM_NUM_DISCREP	Counter used to count up to 10 Discrepancy Message	Integer
23	FCOS Read/Write Macro Call List		Input to FCOS indicating the following: o MM Address o Pointer to SCML Buffer o WRITE STATUS	
24	WRITE STATUS		STATUS word set by FCOS when an error occurs	
25	MM Address		Address on Mass Memory for SCM List	
26	Pointer to SCML Buffer		Address in core for SCM List to be read to or written from	
27	IFW FLAG	ICC_CSCV_ICC_MSG	Transmit SCM Data Request MSG Flag for UI in CZ2_COMMON	Bit(1)
28	ENABLE/INHIBIT FLAG	ENABLE_SCM_DATA_MSG	ENABLE Receipt of DATA FLAG INDICATES Receipt of Data for SCM in CZ2_COMMON.	Bit(1)
30	Compare_Error	SCM_COMPARE_ERROR	Flag used to indicate need to output discrepancy message	Boolean
44	Found Flag	SCM_FOUND_FLAG	Flag used to indicate PARM ID MATCH found in SCML	Boolean
48	A_FLAG	SCM_AFLAG	Used by 3 POS switch processing indicating which Parm ID of 3 POS switch pair being processed	
47	Section Indicator	SCM_SECTION	Used to indicate Section of SCM list that contains requested Parm	Integer
51	3 Pos_Error	SCM_3POS_ERROR	Used to indicate invalid 3 POS switch should be states	Boolean
55	Common Buffer In Use Flag for SCM	SCM_COM_BUF_FREE	Indicator to SCM of the availability of the SM Common Buffer. ON = buffer available. OFF = Buffer unavailable.	BIT(1)

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.2.3 SCM Initialization/Cleanup	
			(No Entries)	
			3.3.3.1 Comm/Instrumentation Control Segment	
1	Item Entry	SLS_ITEM_NO	Value obtained from U/I indicating that an item entry has been made on the CRT.	

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.4 AM Item Processor	
1	AM Item Processor Call List		Data passed to the AM Item Processor by the calling program. Consists of Display Index.	
2	Display Index	D_IND	Index to the copy of a U/I table containing keyboard entries referenced by the AM Item Processor. The AM Item Processor does not directly use the Display Index, but it is used by U/I grammar macros referenced by the AM Item Processor	Integer
3	Item Entry	ITEM_NO	The UI grammar macro used by the AM Item Processor to reference the item number input to the AM Display.	Integer
4	Item Type	SAM_ITEM_TYPE	An array in which each element indicates (via CASE number) the type of the item entry which indexes into that array element. The following table shows the values to which this array is initialized Item Entry — Item Type 1 - Radar Range Estimate Auto — 1 2 - Radar Range Estimate Min — 1 3 - Radar Self Test Initiate — 2 4 - Ku-Band Gimbal Motor Override — 3 5 - Ku-Band TDRS Select Auto — 4 6 - Ku-Band TDRS Select West — 4 7 - Ku-Band TDRS Select East — 4 8 - S-Band TDRS Select Auto — 5 9 - S-Band TDRS Select West — 5 10 - S-Band TDRS select East — 5 11 - S-Band Site Select Auto — 6 12 - S-Band Site Select Next — 6 13 - Auto S-Band Select Enabled — 7 14 - Auto S-Band Select Inhibited — 7	Array(10) Integer
5	Item Code	SAM_ITEM_CODE	An array in which each element contains the item variable value which corresponds to the item entry which indexes into that array element. The following table shows the values to which this array is initialized (see Item Type description above for item entry names). Item Entry — Item Code 1 — 1000 0000 0000 0000 2 — 0100 0000 0000 0000 3 — 0000 0000 0000 0000 4 — 0000 0000 0000 0000 5 — 1000 0000 0000 0000 6 — 0010 0000 0000 0000 7 — 0100 0000 0000 0000 8 — 1000 0000 0000 0000 9 — 0010 0000 0000 0000 10 — 0100 0000 0000 0000 11 — 1000 0000 0000 0000	Array(10) Bit(16)

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			Item Entry / Item Code 12 — 0100 0000 0000 0000 13 — 1000 0000 0000 0000 14 — 0100 0000 0000 0000	
25	Radar Self Test Initiate Item		Item entry from keyboard to initiate Radar self test	
26	Ku-Band Gimbal Motor Override Item		Item entry from keyboard to override Ku-band Gimbal Motor	

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.5 Payload Bay Door Item Processor	
1	Display Indicator	D_IND	A pointer to a copy of the Miscellaneous Applications Control Table (MACT) which is a structure with variables necessary to execute this module.	Integer
2	Item Entry Number	ITEM_NO	Value obtained from UI indicating the item number that has been made on the CRT.	Integer

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.6.1 Payload Control Specialist Function	
1	Item Entry	KEY	Value obtained from UI indicating that an item entry has been made.	Integer
2	Item No.	SP1_ITEM_NO SP2_ITEM_ND SP3_ITEM_ND SP4_ITEM_ND	Value passed to SPC_ITEM containing the displacement into the GXT for an item entry.	Integer
3	DISP	SP1_DISP SP2_DISP SP3_DISP SP4_DISP	Displacement to start of GXT for the specific Payload Control Spec. For P/L Control Spec 1, DISP=0. 2, DISP=50. 3, DISP=100. 4, DISP=150. Passed to the Payload Control Initialization/Cleanup routine.	Integer
4	Scalar Data Item	SP1_Item_S SP2_ITEM_S SP3_ITEM_S SP4_ITEM_S	Value obtained from UI containing data entered on an analog request Passed to SPC_ITEM in Call List.	Scalar Double
5	UI Scalar Value	ITEM_S	Location in UI Compool containing EU data entered on analog request.	Scalar Double
6	DEU#	SP1_DEU SP2_DEU SP3_DEU SP4_DEU	DEU from which item request was made. Passed to SPC_ITEM in Call List	Integer
7	UI DEU#	D_DEU_NUMBER	Location in UI Compool containing DEU number from which request was made.	Integer

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.6.2 Payload Control Process	
6	Offscale Indicator	SPC_OFFSCALE_IND	Indicator returned from the Backward Scaling Module to indicate an off-scale result value.	Bit(1)
11	Transaction Status Word for Bite Test 4	SPC_BT4_TSW	Status fields for I/O Statuses returned from FCOS.	Bit(32)
13	Command Word Fields	SPE_TCS_DISC_SET SPC_TCS_DISC_RESET SPC_TCS_MDM_BT4 SPC_TSC_ANA	Information passed to FCOS via parameter list to issue TCS-IO macro. Includes MIA, Module, and Channel.	Bit(24)
14	FCOS Data Words	SPC_DISC_REST.DLOC SPC_DISC_SET.DLOC SPC_ANA.DLOC	Fields containing pointers to data which FCOS is to output.	Name (ATRB)
15	TCS-IO Device ID	SPC_DISC_RESET.DDEV SPC_DISC_SET.DDEV SPC_MDM_BT4.DDEV	Part of parameter list passed to FCOS defining output device.	Integer
16	TCSPF1	TCSPF1_DEVID	Device ID defining PF1 as output device. Replace name for Bus 38.	
17	TCSPF2	TCSPF2_DEVID	Device ID defining PF2 as output device. Replace name for Bus 39.	
18	Pallet MDM 1	TCSPF1_DEVID	Device ID defining Pallet MDM 1 as output device. Replace name for Bus 38.	
19	Pallet MDM 2	TCSPF2_DEVID	Device ID defining Pallet MDM 2 as output device. Replace name for Bus 39.	
21	Data Item	SPC_EU_DATA_ITEM	Data entered via DEU keyboard when an item entry for an analog command is made. Passed in Call List.	Double Scalar
9	Item No.	SPC_ITEM_NO	Value passed from SP1, SP2, SP3, or SP4 containing the displacement into the GXT for an item entry.	Integer
23	Response Word	SPC_BT4_RESPONSE	Contains status of channel. Obtained as a result of an MDM Bite Test 4	Bit(16)
24	DEU no.	SPC_DEU	DEU on which item entry was made. Passed in Call list.	Integer
25	Set Word	SPC_SET_OUT	Output word for set mask. Located on a fullword boundary.	Bit(16)
26	Reset Word	SPC_RESET_OUT	Output word for Reset mask. Located on a fullword boundary.	Bit(16)
27	Analog Word	SPC_PCM_VAL	Output word for analog data. Located on a fullword boundary.	Integer

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.6.3 Payload Control Init/Cleanup	
2	Command Word Fields	ST1_TCS_BT4	Information passed to FCOS via FCOS parameter list to issue TCS-IO macro. Includes MIA, Module, and Channel.	Name (CWATRB)
4	TCS-IO Device ID	STI_BT4_DDEV	Part of parameter list passed to FCOS defining output device.	Integer
5	TCSPF1	TCSPF1_DEVID	Device ID defining PF1 as output device. Replace name for Bus 38.	
6	TCSPF2	TCSPF2_DEVID	Device ID defining PF2 as output device. Replace name for Bus 39.	
7	Pallet MDM 1	TCSPF1_DEVID	Device ID defining Pallet MDM 1 as output device. Replace name for Bus 38.	
8	Pallet MDM 2	TCSPF2_DEVID	Device ID defining Pallet MDM 2 as output device. Replace name for Bus 39.	
9	Transaction Status Word	SI1_TSW	Status fields for I/O Statuses returned from FCOS.	Bit(32)
11	DISP	SI1_DISP	Displacement to start of GXT for the specific Payload Control Spec. Passed in Call List. For P/L Control Spec 1, DISP=0. 2, DISP=50 3, DISP=100 4, DISP=150	Integer
12	Range	SI1_RANGE	Boolean used to indicate the end of GXT entries for a Payload Control Spec. Init = True.	
14	Response Word	SI1_BT4_RESPONSE	Contains status of channel. Obtained as a result of an MDM Bite Test 4.	Bit(16)

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.7.1 Mass Memory Read/Write Spec Control Segment	
1	Keyboard Function Type	KEY	Keyboard entry of new key	Integer
2	MM Msg Proc Event	DMP_MM_MSG_PROC	MM Msg Proc process event flag: 1 = enabled 0 = disabled	Process Event

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.2 RMS Item Processor	
3	Illegal Entry Flag	RUD_ILLEGAL_ENTRY	Indicates that UI MACRO should be enabled for 'Illegal Entry' Message	Boolean
5	Case Number	RUD_CASE_NUM	Variable used to control DO case process	Integer
6	Array Item	RUD_ARRAY_ITEM	Array 21 of total items on display - to be mapped to Item NO	Array A(21) I
19	Match	RUD_MATCH	Boolean used to terminate a loop	Boolean
27	Ident	RUD_IDENT	Boolean used to terminate a loop	Boolean
			3.3.8.3 Data Conversion Processor	
20	Null Flag	RYE_NULL_FLAG	Local flag to set HC NULL FLAG at end of process	B
21	K1	RYE_K1	Smoothing factor computed from elapsed MCIU frame change.	S
22	K2	RYE_K2	Smoothing factor computed from elapsed MCIU frame change	S
23	Motor rates last pass	RYE_MOT_RATE_PAST	Previous joint rates (smoothed) used to smooth current raw rates	A(6)

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
24	XZ1	RYE_XZ1	Number of 360 detree corrections to be added to wrist roll encoder output	I
26	TD	RYE_TD	Thermister data limited by upper limit	S
27	RT	RYE_RT	Resistence quotient	
28	LNTEMP	RYE_LNTEMP	Natural log of resistence quotient	S
29	TK	RYE_TK	Temperature in degrees Kelvin	S
49	THC	RYE_COND_THC_SIG	Translational hand controller commands	A(3)S
50	RHC	RYE_COND_RHC_SIG	Rotational hand controller commands	A(3)S
			3.3.8.5 MCIU Decoder	
86	Sensor ID Table	RCD_SENSOR_ID_TABLE	Table of Sensor ID Values corresponding to each value of Port/STBD Temp ID (I)	A(32)I
93	N	RCD_N	Temperature Data Counter	I
			3.3.8.6 Kinematic Data Generator	
32	POR Position in AM	RKG_POR_POS_ARM	Position of Active Arm Point of Resolution (POR) in the Arm Reference	V(3)S
33	Sine of Swing Out Angle	RKG_SWOUT_SIN	Sine of Arm Swing Out Angle	S
34	EE Ref to AM Ref Matrix	RKG_EE_TO_AM	Transformation matrix from EE Ref to AM Ref	M(3,3)S
37	PL Ref to EE Ref Matrix	RKG_PL_TO_EE	Transformation matrix from PL REF to EE REF	M(3,3)S

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.7 Single Joint Control	
17	Counter	RSC_COUNTER	Cycle Counter	I
18	RSC JNT Rate LIM	RSC_JNT_RATE_LIM	Maximum Joint Rates as determined by vernier/coarse state and payload status	S
19	Counter LIM	RSC-COUNTER_LIM	Maximum cycles	I
20	SINGL DIR Drive Pos/Neg Past	RSC_SING_DRV_POSNEG_PAST	Value of Pos/Neg flag on last pass	I
21	RSC Pos Hold Flag	RSC_POS_HOLD	RSC Local Position Hold Flag	B
22	Delta Joint Angle	RSC_DELTA_JA	Difference of actual joint angle minus RSC JNT angle	S
23	RSC JNT Angle	RSC_JA	RSC Local Joint Angle	S
24	RSC JNT Rate CMD	RSC_JAR_CMD	RSC Local Joint Rate Command	A(6)S
			3.3.8.8 Hand Controller	
31	Vernier Scaling Save	RJS_VERN_SCALE_SAVE	Value of vernier REQ on previous cycle	B
32	Max Trans Save	RJS_MAX_TRANS_SAVE	Maximum allowable EE trans rate on previous cycle	S
33	Max Trans	RJS_MAX_TRANS	Current maximum allowable EE trans rate	S
34	Max Rot Save	RJS_MAX_ROT_SAVE	Maximum allowable EE ROT RATE on previous cycle	S
35	Max Rot	RJS_MAX_ ROT	Current maximum allowable EE ROT RATE	S
36	THC Save	RJS_THC_SAVE	Trans HC commanded rate on previous cycle	V(3)S
37	THC Rate CMD	RJS_THC_RATE_CMD	Current Trans HC command rate	V(3)S
38	RHC Save	RJS_RHC_SAVE	ROT HC command rate on previous cycle	V(3)S
39	RHC Rate CMD	RJS_RHC_RATE_CMD	Current ROT HC commanded rate	V(3)S
40	Null Local	RJS_NULL_LOCAL	State of HC Null Flag	B
41	Min Rate Local	RJS_MIN_RATE_LOCAL	State of min rate flag (for DL purposes)	B
42	Max Trans Com	RJS_MAX_TRANS_COM	Maximum allowable EE trans rate component	S
43	Max Rot Com	RJS_MAX_ROT_COM	Maximum allowable EE rot rate component	S

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.9 Resolved Position Algorithm	
10	XYZ	RPO_XYZ	Desired point of resolution (X,Y,Z) in orbiter structural frame	V(3)
11	PYR	RPO_PYR	Desired attitude (P,Yaw,R) in orbiter structural frame	V(3)
12	AIF	RPO_AIF	Arm initialization flag	I
13	EE SEL	RPO_EE_SEL	Selected RMS end-effector identifier for initialized arm	I
14	SIN_SWOUT	RPO_SIN_SWOUT	Sine of swingout joint angle	S
16	SP	RPO_SP	Sine of desired POR pitch attitude in orbiter structural frame	S
17	CP	RPO_CP	Cosine of desired POR pitch attitude in orbiter structural frame	S
18	SY	RPO_SY	Sine of desired POR yaw attitude in orbiter structural frame	S
19	CY	RPO_CY	Cosine of desired POR yaw attitude in orbiter structural frame	S
20	L_WY_EET	RPO_L_WY_EET	Length between wrist yaw joint and selected end-effector tip	S
21	POS_SHY_WRY	RPO_POS_SHY_WRY	Position vector (X,Y,Z) from the shoulder yaw to the wrist yaw joint in the swing-out frame	V(3)S
22	FAIL FLAG	RPO_FAIL_FLAG	Flag indicating failure of the algorithm to find an acceptable solution	B
23	S1	RPO_S1	Sine of shoulder yaw joint	S
24	C1	RPO_C1	Cosine of shoulder yaw joint	S
25	POS_SHP_WRY	RPO_POS_SHP_WRY	Position vector from the shoulder pitch to the wrist yaw joint in the arm reference frame	V(3)
26	SWRY	RPO_SWRY	Sine of the wrist yaw joint angle	S
27	PASS 1 FLAG	RPO_PASS1_FLAG	Iteration control flag depending on the wrist yaw singularity condition	B
28	PASS 2 FLAG	RPO_PASS2_FLAG	Iteration control flag depending on the wrist yaw singularity condition	B
29	S234	RPO_S234	Sine of the sum of the shoulder, elbow and wrist pitch angles	S
30	C234	RPO_C234	Cosine of the sum of the shoulder, elbow, and wrist pitch angles	S
31	SUM_PITCH	RPO_SUM_PITCH	Sum of the shoulder, elbow, and wrist pitch angles	S
32	NUM 1	RPO_NUM1	Numerator of an intermediate quotient used to calculate the elbow pitch angle	S
33	DEN 1	RPO_DEN1	Denominator of an intermediate quotient used to calculate the elbow pitch angle	S

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TABLE ENTRY CONTENTS

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
34	K	RPO_K	Quotient of NUM1/DEN1 equivalent to COS (DTR(ELP-DELTA_EPSILON))	S
35	ELP	RPO_ELP	Elbow pitch joint angle	S
36	SHP	RPO_SHP	Shoulder pitch joint angle	S
37	WRP	RP_WRP	Wrist pitch joint angle	S
65	PID	RPO_PID	Payload index	I
66	SR	RPO_SR	Sine of desired POR roll attitude	S
67	CR	RPO_CR	Cosine of desired POR roll attitude	S
68	POR TO OS	RPO_POR_TO_OS	Transformation matrix from POR frame to orbiter structural frame	M(3,3)S
69	V_EE_POR	RPO_V_EE_POR	Vector from end effector tip to point of resolution.	V(3)S
71	PL_TO_EE	RPO_PL_TO_EE	Vector from the payload POR to the end effector tip in the end effector frame	V(3)S
73	EE TO OS	RPO_EE_TO_OS	Transformation matrix from end effector to orbiter structural frame	M(3,3)S
74	OS TO SWOUT	RPO_OS_TO_SWOUT	Transformation matrix from the orbiter structural to swing-out frame	M(3,3)S
75	POS_WRY_EET	RPO_POS_WRY_EET	Position vector from wrist yaw joint to end effector tip	V(3)S
76	POS_MPM_SWOUT	RPO_POS_MPM_SWOUT	Position vector from manipulator positioning mechanism to swing-out joint	V(3)S
77	POS_SWOUT_SHY	RPO_POS_SWOUT_SHY	Position vector from swing-out joint to shoulder yaw joint	V(3)S
78	SHY	RPO_SHY	Shoulder yaw joint angle	S
79	SWOUT TO AM	RPO_SWOUT_TO_AM	Transformation matrix from the swing-out to arm reference frame	M(3,3)S
80	EE TO AM	RPO_EE_TO_AM	Transformation matrix from end effector to arm reference frame	M(3,3(S
81	POS_SHY_SHP	RPO_POS_SHY_SHP	Position vector from shoulder yaw to shoulder pitch joint	V(3)S
82	POS_SHP_WRP	RPO_POS_SHP_WRP	Position vector from shoulder pitch to wrist pitch joint	V(3)S
83	NUM 2	RPO_NUM2	Numerator of tan $(\alpha+\beta)$ identity used to calculate shoulder pitch angle	S
84	NUM 3	RPO_NUM3	Denominator of tan $(\alpha+\beta)$ identity used to calculate shoulder pitch angle	S
85	S3DE	RPO_S3DE	Sin (elbow pitch - (Delta_Epsilon))	S
87	Good XYZ	RPO_GOOD_XYZ	Copy of XYZ used to save a validated desired position	V(3)S

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.10 Automatic Sequence Processor	
46	XYZ	RAS_XYZ	Desired POR position	V(3) S
47	PYR	RAS_PYR	Desired POR attitude	V(3) S
48	Pause Flag	RAS_PAUSE_FLAG	0= no pause 1= pause } - for desired point	B
49	SP	RAS_SP	Sine of PYR_1	S
50	CP	RAS_CP	Cosine of PYR_1	S
51	SY	RAS_SY	Sine of PYR_2	S
52	CY	RAS_CY	Cosine of PYR_2	S
53	SR	RAS_SR	Sine of PYR_3	S
54	CR	RAS_CR	Cosine of PYR_3	S
55	STR TO DES	RAS_STR_TO_DES	Transformation matrix from orbiter structural frame to desired POR orientation	M(3,3) S
56	POINTER	RAS_POINTER	Index to the next pre-stored POR point to be used	I
57	Dist	RAS_DIST	Distance between current POR position and desired POR position	S
58	Phi	RAS_PHI	Angle through which present POR frame must be rotated to be coincident with desired POR frame	S
59	ERR_MAT	RAS_ERR_MAT	Transformation from present POR ref. frame to desired POR ref. frame	M(3,3)
60	KFPS	RAS_KFPS	POR translation rate in feet/sec.	S
61	KDPS	RAS_KDPS	POR rotation rate in degrees/sec.	S
62	XYZ dot	RAS_XYZ_DOT	POR translation rate command with respect to the orbiter structural frame	V(3)
63	PYR dot	RAS_PYR_DOT	POR rotation rate command with respect to the POR frame	V(3)
64	Dist Min	RAS_DIST_MIN }	Distance and attitude errors used to determine if POR has passed the desired point while in time mode	S
65	Phi Min	RAS_PHI_MIN }		S
66	Gain	RAS_GAIN	Gain used to set commanded EE rotation rates	S
67	X	RAS_X	X	S
68	Y	RAS_Y	Y	S
69	Z	RAS_Z	Z	S

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
70	Next Point Flag	RAS_NEXT_POINT_FLAG	Flag to determine if the next point in a pre-stored auto sequence is to be used when the Progressing mode is entered	B
73	Max Trans	RAS_MAX_TRANS	Maximum allowable POR trans rate	S
76	Progressing Flag	RAS_PROGRESSING_FLAG	Flag to enter Progressing mode	B
77	Waiting Flag	RAS_WAITING_FLAG	Flag to enter Waiting mode	B
78	Distance Flag	RAS_DISTANCE_FLAG	Flag to enter Distance mode	B
79	Time Flag	RAS_TIME_FLAG	Flag to enter Time mode	B
80	Arm ID	RAS_ARM_ID	Integer converted pre-stored auto sequence arm ID	I
81	EE ID	RAS_EE_ID	Integer converted pre-stored auto sequence EE ID	I
82	PL ID	RAS_PL_ID	Integer converted pre-stored auto sequence payload ID	I
83	Pos Tol	RAS_POS_TOL	Integer converted pre-stored auto sequence position tolerance	I
84	Att Tol	RAS_ATT_TOL	Integer converted pre-stored auto sequence attitude tolerance	I
85	Seq Length	RAS_SEQ_LENGTH	Integer converted pre-stored auto sequence length	I
86	Seq Init Fail	RAS_SEQ_INIT_FAIL	Flag for validation failure of pre-stored auto sequence initialization	B
96	Trans Time	RAS_TRANS_TIME	Translation time	S
97	Rot Time	RAS_ROT_TIME	Rotation time	S

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.11 Resolved Rate Processor	
28	Y-Component of WRY velocity	RRP_V_WY_Y	Y-Component of wrist yaw joint	S
29	EE Rotation Rate about Y-Axis of AM	RRP_OMEGA_Y	End effector angular velocity for rotation about Y-axis of AM	S
30	EE Translation Rate in X-Axis of AM	RRP_V234_X	End effector linear velocity for translation in the X-axis direction of AM	S
31	EE Translation Rate in Z-Axis of AM	RRP_V234_Z	End effector linear velocity for translation in the Z-axis direction of AM	S
32	In-Plane Linear Velocity of Arm Segment from WRP to EE Tip	RRP_IP_WP_EE	Linear velocity in the arm plane colinear with the straight line segment from the wrist pitch joint to the end effector tip	S
33	Normal Linear Velocity of Arm Segment from WRP to EE Tip	RRP_IP_NORM	Linear velocity in the arm plane normal to the straight line segment from the wrist pitch joint to the end effector tip	S

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
34	Sine of Sum of WRP Angle and EPSILON	RRP_SE4	Sine of (Wrist pitch angle +EPSILON)	S
35	Cosine of Sum of WRP Angle and EPSILON	RRP_CE4	Cosine of (Wrist pitch angle +EPSILON)	S
36	Linear Velocity of Arm Segment from ELP to WRP	RRP_V_ELP_WP	Linear velocity along the arm segment from the elbow pitch joint to the wrist pitch joint	S
37	Cosine of Difference of ELP Angle and DELTA_ EPSILON	RRP_CDE3	Cosine of (Elbow pitch angle - DELTA_ EPSILON)	S
38	Ratio of absolute value of commanded rate to maximum allowable joint rate	RRP_KDOT	Ratio of the absolute value of commanded rate to maximum allowable joint rate	A(6)S
39	Inverse maximum of RRP_KDOT array	RRP_MAX_KDOT	Inverse of MAX (RRP_KDOT)	S
40	Sine of Difference of ELP Angle and DELTA_ EPSILON	RRP_SDE3	Sine of (Elbow pitch angle-DELTA_EPSILON)	S

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.12 Total Velocity	
23	RATE	RTV_RATE	Alternately holds actual and commanded joint angle rates	A(6)
24	V	RTV_V	Stores translation rate data (X,Y,Z) before and after display transformation occurs	V(3)
25	W	RTV_W	Stores rotation rate data (Roll, Pitch, Yaw) before and after display transformation occurs	V(3)
26	Resultant	RTV_POR_XLT_RSLT	Translation velocity vector magnitude	S
			3.3.8.13 Position Hold	
6	Joint Angle Error	RFP_DELTA_JA	The difference of commanded joint angle and actual joint angle	S
			3.3.8.14 Health Monitor	
32	EE rigidized Past	RHM_EE_RIG_PAST	EE RIG/DERIG last pass	B
33	Derigidize CMD Flag	RHM_EE_DERIG_CMD_FLAG	First time flag for derigidize CMD	B
34	Release CMD Flag	RHM_REL_CMD_FLAG	First time flag for release CMD	B
35	SHY Sing Ctr	RHM_SING_SHY_CTR	Shoulder yaw singularity filtering counter	S
36	WRY Sing Ctr	RHM_SING_WRY_CTR	Wrist yaw singularity filtering counter	S
37	ELP Sing Ctr	RHM_SING_ELP_CTR	Elbow pitch singularity filtering counter	S
38	Reach Lim Pos Ctr	RHM_REACH_LIM_POS_CTR	Positive reach limit filtering counter	A(6)S
39	Reach Lim Neg Ctr	RHM_REACH_LIM_NEG_CTR	Negative reach limit filtering counter	A(6)S
40	Released Past	RHM_RELD_FLAG_PAST	Released flag last pass	B
41	Derigidized Past	RHM_DERIG_PAST	Derigidized flag last pass	B
42	EE Count	RHM_EE_COUNT	MCIU bite failure filtering counter	S
43	MCIU EE FLAG	RHM_MCIU_EE_FLAG	MCIU failure flag	B
44	Reach Lim P Flag	RHM_REACH_LIM_P_FLAG	Reach limit plus flag	A(6)B
45	Reach Lim M Flag	RHM_REACH_LIM_M_FLAG	Reach limit minus flag	A(6)B

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.15 Temperature Processor	
1	Worst Case Delta Temperature	RIT_WORST_CASE_DELT_TEMP	The worst case delta (out of limits) temperature condition for each arm available	A(2)S
3	HI Limit	RIT_HI_LIM	The high temperature limit (ABE or LED) for the temperature value being processed	S
4	LO Limit	RIT_LO_LIM	The low temperature limit (ABE or LED) for the temperature value being processed	S
5	Delta TEMP	RIT_DELTA_TEMP	The out of limits condition for the temperature value being processed. It is used to determine the worst case delta temperature.	S
6	ARM_INDEX	RIT_ARM_INDEX	This item contains a one if a port temperature data value is being processed and a 2 if a starboard temperature data value is being processed.	I
14	Therm Counter	RIT_THERM_COUNTER	Counter that keeps track of number of temps processed in current cycle of 24	I
15	J	RIT_J	Subscribe into the 24-element arrays	I
16	Annun Therm Counter	RIT_ANNUN_THERM_COUNTER	Two cycle counter trigger	A(24)I
18	TEMP INDEX	RIT_TEMP_INDEX	This item is a (2) for port temp and a (1) for STBD temp.	B
			3.3.8.16 MCIU Encoder	
35	Old Motor Speed	RNC_OLD_MTR_SPD	Old motor speed	A(6)S
44	ASI	RNC_ASK	Array subscript set by the arm select index	I
45	Joint Current	RNC_JNT_CRNT	Floating proint value for setting motor current	A(6)S

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
46	Motor Speed	RNC_MTR_SPD	Temporary variable to convert joint movement, gear ratios, and scaling factors into a fixed point joint rate command.	A(6)S
55	A	RNC_A	Contains the four rounded digits of the Input Data Fields.	I
56	D1	RNC_D1	Contains the first digit of Input Data Fields.	I
57	D2	RNC_D2	Contains the second digit of Input Data Fields	I
58	D3	RNC_D3	Contains the third digit of Input Data Fields	I
59	D4	RNC_D4	Contains the fourth digit of Input Data Fields	I
60	Z	RNC_Z	Counter to seperate digits	I
61	Integer Motor Speed	RNC_INT_MTR_SPD	Contains the rounded integer value of Motor Speed	I

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.17 Dedicated Display	
20	FMPT Index Table	RDD_FMPT_INDEX	The indices used in the issuing of the UI annunciation macro	A(11)I
21	Max Value	RDD_MAX_VALUE	The value of the actual POR resultant translation rate or the CMDED POR resultant translation rate, whichever is greater	S
22	Scale Factor	RDD_SCALE_FACTOR	The current scale factor (X1 or X10) to be applied to the actual and CMDED POR resultant translation rates	S
23	Annunciation Flags	RDD_ANNUN_FLAGS	A Boolean array mapping used in order to be able to index through all the annunciation flags	A(11)B
24	Index Bias	RDD_INDEX_BIAS	A value (0 for PORT, 12 for STBD) used to index into the correct portion of the thermistor temperature data array depending on whether a PORT or STBD temperature is being requested	I
25	Arm ID	RDD_ARM_ID	An index (1 for PORT, 2 for STBD) used to reference arm dependent data during temperature processing	I
26	Last Pass Annunciation Flags	RDD_ANNUN_FLAGS_LP	Annunciation flags saved from the last pass	A(11)B
27	ABE ID Array	RDD_ABE_TEMP_ID	A table used to correlate one of the seven LED temperatures with each of the five ABE temperatures	A(7)I

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DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
28	Temperature ID Base (PORT/STBD)	RDD_ARM_TEMP_ID_BASE	The base number (100 for PORT, 200 for STBD) to be incremented and used as a temperature ID	A(2)S
29	LED ID Array	RDD_LED_TEMP_ID	A table used to correlate one of the five ABE temperatures with each of the seven LED temperatures	A(5)I

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#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			3.3.8.18 Input Processing and Configuration Determination	
18	OK To Enter Flag	RQC_OK_TO_ENTER	Ok to Enter Flag-ON means arm is at rest and operator request for new mode will be services.	B
22	Mode Case Index	RQC_MODE_CASE_INDEX	Points to the correct do case	I
23	Mode Case Array	RQC_MODE_CASE_ARRAY	Contains values used by the Mode Case Index to point to the correct do case	A(6)I
31	MCIU Frame ID	RQC_MCIU_FRAME_ID	Contains the integer form of the MCIU frame ID which is input from the MCIU	I

TABLE NAME:

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
			<u>3.3.8.20 Position Hold Checks</u>	
1	Freeze Flag	RWP_FREEZE	Flag to determine whether or not to save current JA for RPF	B
4	Saved Position Hold Flag	RWP_POSITION_HOLD_SAVE	Status of Position Hold Flag on last cycle	B
			<u>3.3.8.21 Consistency and Encoder Check</u>	
41	Encoder First Chk	RVM_ENCOD_FIRST_CHK	First pass flag for encoder check	A(6)B
42	TACHO Integral	RVM_TACHO_INTEGRAL	Encoder check calculation	A(6)S
43	Integral Run Time	RVM_INTEGRAL_RUN_TIME	Encoder check calculation	A(6)S
44	Jnt Rate Match	RVM_JNT_RATE_MATCH	Loop control	B
45	Jnt Disp	RVM_JNT_DISP	Joint displacement	A(6)S
46	Mot Speed Cmd Unfilt	RVM_MOT_SPEED_RAW	Commanded unfiltered motor speeds	A(6)S
47	Mot Speed Cmd LP	RVM_MOT_SPEED_CMD_LP	Last pass value for motor speed command	A(6)S
48	F12	RVM_F12	Consistency check motor speed factor	S
49	F11	RVM_F11	Consistency check motor speed factor	S
50	F22	RVM_F22	Consistency check control error factor	S
51	F21	RVM_F21	Consistency check control error factor	S
52	F32	RVM_F32	Consistency check rate increment factor	S
53	F31	RVM_F31	Consistency check rate increment factor	S
54	Mot Speed Cmd	RVM_MOT_SPEED_CMD	Filtered motor speed commands	A(6)S
55	Cntl Err Unfilt	RVM_CNTL_ERR_RAW	Unfiltered control error	A(6)S
56	Cntl Err	RVM_CNTL_ERR	Filtered control error	A(6)S
57	Cntl Err LP	RVM_CNTL_ERR_LP	Last pass value for control error	A(6)S
58	Rate Inc	RVM_RATE_INC	Filtered rate increment	A(6)S
59	Rate Inc LP	RVM_RATE_INC_LP	Last pass value of rate increment	A(6)S
60	Rate Inc Unfilt	RVM_RATE_INC_RAW	Unfiltered rate increment	A(6)S
61	Ang Inc	RVM_ANG_INC	Joint angle increment	A(6)S

TABLE NAME:

DATA ITEM DESCRIPTOR

#	ITEM	HAL/S NAME	DESCRIPTION	ATTRIBUTES
62	Jnt Angles LP	RVM_JA_ATL_LP	Last pass value of joint angles	A(6)S
63	Consis Flag LP	RVM_CONSIS_LP	Last pass value of consistency flag	A(6)B
64	All Brakes On LP	RVM_BRAKES_LP	Last pass value of all brakes on flags	A(6)B
65	TACH Fail Flag LP	RVM_TACH_FAIL_LP	Last pass value of tach fail flag	A(6)B
66	Encoder Chk Flag LP	RVM_ENCOD_CK_LP	Last pass value of encoder check flags	A(6)B
67	Disp Elaps	RVM_DISP_ELAPS	Elapsed displacement	A(6)S
68	Jnt Consis	RVM_JNT_CONSIS	Runaway joint consistency flags	A(6)B
69	Z	RVM_J	Loop control	I

TABLE NAME:

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