

Space Program Operations Contract

SPACE SHUTTLE ORBITER OPERATIONAL LEVEL C FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS GUIDANCE, NAVIGATION AND CONTROL PART E

SUBSYSTEM OPERATING PROGRAMS FLIGHT CONTROL EFFECTOR

Prepared by The Boeing Company
Space Exploration

Under Subcontract 6000132079, PDRD P1433q

December 14, 2007

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G4.46 ELVN PFB SOP
G4.47 RUD PFB SOP
G4.48 SB PFB SOP
G4.49 BF PFB SOP
G4.50 AERO ACT SOP
G4.52 HYD SYS SOP
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G4.232 HYD THERMAL COND
G4.250 SPTI SOP

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G4.191 ORB RCS CMD SOP

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G4.120 SRB MON FCN

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G4.58 E/L RCS CMD SOP

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FOREWORD

The primary avionics software system (PASS) requirements for the computer programs that execute in the Shuttle general-purpose computers (GPC's) are specified in the Computer Program Development Specifications (CPDS's) and the Functional Subsystem Software Requirements (FSSR) documents. The requirements are specified at three levels:

- Level A CPDS – System-level constraints and capabilities
- Level B CPDS – Functional requirements
- Level C FSSR – Detailed-level requirements

The Level A CPDS specifies system-level constraints and capabilities that are not oriented toward any particular program end item. The Level B CPDS specifies system-level requirements for guidance, navigation, and control (GN&C) and detailed requirements for systems management (SM) and vehicle utility (VU). The Level C FSSR's specify the detailed requirements for GN&C and display/controls. The Level C reconfigurable requirements are specified in the systems management and payload documents. The Level A, Level B, and Level C requirements documents are listed in Section 2, Applicable Documents.

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DOCUMENT CHANGE RECORD

The following tabulation summarizes the change activity associated with this document.

DOCUMENT CHANGE RECORD			
Issue and Date	Change Summary/Effectivity		
OI-34 Release December 14, 2007	This baseline release for effectivity OI-34 and subs includes:		
	<u>SCR</u>	<u>OI</u>	<u>Title</u>
	92816D	34	Remove Software Related to FICS
	93017G	33	Baseline RSS99D0100 with Expanded Downlist
	93164A	33	Bearing Displays Documentation Clean-up

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CHANGE REQUEST SUMMARY

The following tabulation lists the paragraphs, tables (T), and figures (F) that have been changed as a result of approved change requests for this release. Changes incorporated prior to this release are listed in Appendix R. Changes from approved change requests (CRs) to this document are indicated by a change bar in the outer margin of the changed page.

CHANGE REQUEST SUMMARY			
Paragraph	CR No.	OI	CR Title
1.3-1.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.46-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.46-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.47-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.48-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.49-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.50-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.50-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.52-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.52-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.58-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.58-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.60-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
	93167A	33	Bearing Displays Documentation Clean-up
4.60-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.62-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.62-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.64-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.64-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.65-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.120-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.187-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.190-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.190-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.191	92816D	34	Remove Software Related to FICS
4.191-1.(T)	92816D	34	Remove Software Related to FICS
4.191-1.(F)	92816D	34	Remove Software Related to FICS
4.191-2.(T)	92816D	34	Remove Software Related to FICS
4.191-3.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
	92816D	34	Remove Software Related to FICS
4.193-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.250-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of the Subsystem Operating Program (SOP) Level C document is to specify the requirement details of the SOP Level B functional requirements for the Orbiter GN&C flight software.

1.2 SCOPE

This document is one of four documents which contain the requirement details for those SOP functions which are necessary during the Shuttle operations. The SOP functions are those specified in the GN&C Level B functional requirements document. This particular document addresses the Flight Control Effector SOP's.

1.3 ORGANIZATION

This document is organized into the following sections:

- 1.0 INTRODUCTION
- 2.0 APPLICABLE DOCUMENTS
- 3.0 OVERVIEW
- 4.0 DETAIL LEVEL REQUIREMENTS
- 5.0 FORMULATIONS
- 6.0 GLOSSARY

Section 1 defines the purpose, scope, and organization of this document. Section 2 lists the applicable documents. Section 3 provides an overview of the Shuttle software functions and discusses the contents of Section 4. Section 4 specifies the requirement details of the functional requirements for each Subsystem Operating Program. It also contains applicable tables (Interface Definition Document (IDD) inputs/outputs, I-Loads, K-Loads, and Constants) located at the end of each Principal Function. Section 5 shows a formulation of the detailed requirements. Lastly, Section 6 contains a list of definitions and a list of acronyms and abbreviations for the principal functions contained in this FSSR.

The automated IDD tables provided herein define signal (parameter) interface requirements either between hardware (LRU) and software elements or between software elements and other software elements. A GN&C software element is either a sequenced principal function (PF), crew generated specialist/display function, or an OPS display function. In the event of a conflict between the IDD tables and other internal text input/output tables, the SASCB data base-controlled IDD tables take precedence.

The following table defines the data elements found in the IDD input/output, I-Load, K-Load, and Constant tables for each principal function.

Table 1.3-1. Parameter Element Description		
Title	Definition	Valid Entries
CAT	Category of the I-Load (**Note)	Three alphanumeric characters: the first character must be alphabetic.
D	Dependency of the I-Load	D = Design M = Mission L = LRU
DESCRIPTION	Parameter description of the K-Load or Constant.	A string of ≤ 64 characters.
DESTINATION	Destination of the output parameter	Abbreviated functional titles. (***) Note)
DT or DATA TYPE	Data Type	* See reference (1) for valid I-Load, K-Load and Constant data types. * See reference (2) for valid IDD data types for parameters with destination TLM. * See reference (3) for valid IDD data types for all other parameters.
ENG UNITS or UNITS	Engineering Units	* See reference (1) for valid I-Load, K-Load and Constant units. * See reference (2) for valid IDD units for parameters with destination TLM. * See reference (3) for valid IDD units for all other parameters.
FSSR NAME	Requirements parameter name	A string (with no embedded blanks) of ≤ 32 characters consisting of alphanumerics, underscores, parenthesis, commas and slashes. Parenthesis are used for array elements. Commas separate the different indices of multidimensional arrays. Slashes are used to separate multiple names used for a single MSID.
LAST CR	The last CR affecting the parameter	5 digit number with an alphabetic revision letter.
MC	Memory Configuration	00=Generic 05 = SM4 Orbit P/L 01=GN1 Ascent/GN6 RTLS 06 = P/L9 MMU 02=GN2 Orbit 07 = Not Assigned 03=GN3 Entry 08 = GN8 On-Orbit C/O 04=SM2 On-Orbit 09 = GN9 Preflight
MSID or M/S ID	Measurement/Stimulus Identification	Maximum of 10 alphanumeric characters. * See reference (3) for specifications
NOMENCLATURE	Parameter description of the IDD parameter.	String of ≤ 34 characters (including underscores and blank spaces).
PR or PREC	Precision	D, DP =Double S, SP = Single
SOURCE	Origin of the input parameter	Abbreviated functional titles.

Table 1.3-1. Parameter Element Description		
Title	Definition	Valid Entries
S	Software Utilization	C = Common B = BFS Unique P = Primary X = BFS Derived A = BFS Converted
PR FCTN	Cross reference of the principal function identifiers that are applicable to this parameter.	See Level B GN&C CPDS SS-P-0002-510
VALUE	The value of the K-Load or Constant	* See reference (1) for valid value formats.
REV	Revision indicator	An Asterisk (*) indicates changes for the current OI version.
<p>* References: (1) JSC 19350 I-Load Requirements Document Volume I (2) SS-P-0002-140 Level A SS Downlist/Uplink CPDS (3) JSC 18206 Shuttle Data Integration Plan Volume III MAST II/STAR Deliverable Products.</p> <p>** Note For additional information on any I-Load, contact the I-Load owner defined in CR 98032, JSC, USA, and Boeing I-Load Owner Assignments</p> <p>*** Note IDD output (source) tables which reflect parameters going to input (destination) "TLM" shall not be interpreted as a signal actually being downlisted. The parameter is only available for downlist in COMPOOL and does not appear in a downlist format. Parameters actually on the downlist will be designated with a destination denoting the downlist Format with a Rate Code. The Rate Code legend appears at the end of each FSSR data table. To complete the downlist information, Parent MSIDs (indicated by a 'P' in the 9th character of the MSID) are now included in the software function output data tables in which a Child MSID already appears. A Parent MSID will have the same downlist destinations as its Child(ren) MSID(s).</p>		

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2.0 APPLICABLE DOCUMENTS

2.1 LEVEL A DOCUMENTS

- SS-P-0002-140 Shuttle Downlist/Uplink Software Requirements
- SS-P-0002-150 Shuttle Launch Data Bus Software Interface Requirements
- SS-P-0002-170 Shuttle System Level Requirements, Software

2.2 LEVEL B DOCUMENTS

- SS-P-0002-510 Shuttle Functional Level Requirements, GN&C
- SS-P-0002-550 Shuttle Functional Level Requirements, Vehicle Utility
- SS-P-0002-580 Shuttle Functional Level Requirements, Systems Management

2.3 LEVEL C DOCUMENTS

- STS 83-0001 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part A, Entry Through Landing Guidance
- STS 83-0002 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part A, Guidance Ascent/RTLS
- STS 83-0003 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part A, Guidance On-Orbit/Deorbit
- STS 83-0004 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part B, Entry Through Landing Navigation
- STS 83-0005 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part B, Navigation Ascent/RTLS
- STS 83-0006 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control Part B, On-Orbit Navigation
- STS 83-0007 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part C, Flight Control Entry – GRTLS
- STS 83-0008 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part C, Flight Control Volume 1, Ascent Flight Phase, Volume 2, Ascent
- STS 83-0009 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part C, Flight Control Orbit DAP
- STS 83-0010 Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part D, Redundancy Management

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STS 83-0013	Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part E, Inertial Measurement Unit Subsystem Operating Program
STS 83-0014	Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part E, Volume 1, Navigation Aids Subsystem Operating Program, Volume 2, Star Tracker Subsystem Operating Program
STS 83-0015	Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part E, Subsystem Operating Programs, FC Sensor/Controller
STS 83-0016	Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Part E, Subsystem Operating Programs, FC Effector
STS 87-0017	Operational Flight Level C, Functional Subsystem Software Requirements; Remote Manipulator System
STS 83-0020	Operational Flight Level C, Functional Subsystem Software Requirements; Displays and Controls
STS 83-0026	Operational Flight Level C, Functional Subsystem Software Requirements; Guidance, Navigation, and Control, Sequencing
JSC-19350	Shuttle Flight Software Initialization Load, <ul style="list-style-type: none">• Volume I General Requirements• Volume II Mission I-Load Requirements
JSC-19478	Payload Management, Level C Flight Software Requirements
JSC-19590	Systems Management, Level C Flight Software Requirements

2.4 INTERFACE CONTROL DOCUMENTS

ICD 3-1011-02	OFT GPC/DEU ICD
ICD 2-1S001	Orbiter Primary Flight Software System and Backup Flight System Software Interface

3.0 OVERVIEW

3.1 SHUTTLE OPERATIONAL PROGRAM

The Shuttle operational program represents the total computer program which operates in the orbiter general-purpose flight computer for the Shuttle operations. The requirements are specified at three levels:

- Level “A” – System Level Constraints and Capabilities
- Level “B” – Functional Requirements
- Level “C” – Detail Level Requirements

The Level A specifies system level constraints and capabilities which are not oriented toward any particular program end item. Levels B and C specify the functional and detailed level requirements and are program end item oriented. The Level B requirements are specified in four separate documents for Guidance, Navigation, and Control (GN&C), Systems Management (SM), Vehicle Utility (VU), and Payloads.

3.2 GN&C SOFTWARE REQUIREMENTS STRUCTURE

This section describes the top-level GN&C software requirements structure for purposes of specifying the functional requirements for operations. The structure is described below:

- A. Operational Sequence. A collection of sequentially ordered major modes and a group of specialist and display functions.
- B. Major Modes. A collection of principal functions and display formats scheduled automatically or upon crew request.
- C. Function. A task to be performed by the software. Functions are defined as:
 1. Principal function. A function that can only be initiated by the software. Principal functions may be ordered sequentially, run in parallel, enabled, or inhibited.
 2. Specialist function. A task that is scheduled upon crew command.
 3. Display function. A presentation to the crew of parameters that are already being computed.

The principal functions are only available during specific major modes. Each principal and specialist function can be classified into one of the following GN&C major functions:

- Guidance
- Navigation
- Flight Control
- Redundancy Management

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- Subsystem Operating Programs
- Displays and Controls

This document documents a portion of the SOP principal functions related to flight control effectors and includes the following:

- Elevon Position Feedback SOP
- Rudder Position Feedback SOP
- Speed Brake Position Feedback SOP
- Body Flap Position Feedback SOP
- Aerosurface Actuator Command SOP
- Hydraulic System SOP
- Entry/Landing RCS Command SOP
- MPS TVC Command SOP
- SRB TVC Command SOP
- OMS TVC Command SOP
- OMS TVC Feedback SOP
- SRB Monitor Function
- Orbiter Actuator Slew Checks
- SRB Slew Checks
- Ascent RCS Command SOP
- Orbit RCS Command SOP
- Elevon Delta Pressure Feedback SOP
- Hydraulic Thermal Conditioning
- Structural Program Test Input SOP

3.3 SOP OVERVIEW

The SOP's basically provide services and interfaces between the GN&C LRU's and other application programs. The nature of the services and interfaces provided is indicated by the general SOP functions described below:

- A. Format conversion to support input/output processing;
- B. Data compensation to convert data into engineering units by applying biases and scale factors;
- C. Data transformations and special computations as required by other application programs;
- D. Generation of appropriate data and interfaces to Display and Control (D&C);
- E. BITE and failure discrete monitoring and reporting of status to Redundancy Management (RM) for further processing; and
- F. Moding, sequencing, and control at the individual SOP level.

In some cases, such as that of the IMU, the SOP's do not include the specific input/output services provided by FCOS, nor do they include the data selection and failure management functions performed by other application programs.

3.4 SOP SUBSECTION ORGANIZATION

Section 4 of this document contains the SOP requirement details. Each subsection in Section 4 is dedicated to a particular SOP and corresponds to a subsection of the GN&C Level B CPDS to provide one-to-one traceability. To further assist in traceability, the Level B paragraph numbers are also used in the corresponding Section 4 paragraphs of this document. The contents of the paragraphs for a typical SOP subsection include:

- A. The purpose(s) of the SOP.
- B. The detailed requirements including pertinent equations, necessary logic, assumptions made, constraints, and definition of coordinate systems. The level of detail specified is sufficient to generate computer code.
- C. Initialization Parameters. The parameters which require initialization and their values are specified. This does not include initialization processing which requires execution. This information is provided in tables which consist of the following:
 1. Parameter name – A unique name is assigned to each parameter. Elements of an array are denoted by numbers in parentheses. This name is used throughout the formulation.
 2. MSID number – The number listed represents the stimuli or measurement identification number assigned for data base configuration control.
 3. Description – A brief description of the parameter is provided.
 4. Constant type – If the parameter requiring initialization is an I-load constant, this column contains the following identification:

- a. M – Mission Dependent parameters are those that change because of trajectory (orbital inclination, flight path, and glideslope), mission techniques (speed brake profile, abort sequences), mass properties.
 - b. L – LRU Dependent parameters are those that are a function of a black box (biases, scale factors, breakout switches, etc.).
 - c. D – Design Dependent parameters are those for which analyses or simulations must be completed before the final value can be determined (flight control gains, filter coefficients, L/D related parameters).
 - d. K – Fixed Constants that have specific values and all functions requiring these parameters should use same value.
 - e. R – Remove from I-load. Hard code.
5. Signal Type – The parameter types are:
- a. Fixed point – A signed binary number in which the fixed location of the binary point is assumed.
 - b. Floating point – A signed decimal number in which provisions are made for varying the location of the decimal point.
 - c. Integer – A signed whole number.
 - d. Discrete – A two-state variable generated by the GN&C subsystems.
6. Value – The initial value of the parameter.
7. Range – The limits over which the parameter is expected to vary.
8. Units – The parameter's standard of measurement.

D. Execution rates. The execution rate of each SOP subfunction is specified in Hertz.

Subparagraphs are generally used to verify the detailed requirements of subfunctions. For each SOP, the organization of the subparagraphs is tailored to individual needs and peculiarities. The major modes in which each SOP is executed are specified in GN&C Level B CPDS as well as in the individual SOP's. The detailed sequencing requirements, if any, are specified within the individual SOP's. Single precision is required for all floating point parameters and computations unless specified otherwise.

This document does not address the MDM channelization (i.e., the specific MDM address, input/output module, and channel/bit assignments) of external input/output signals. The channelization of these signals is specified in Shuttle data tape products from the MAST data base per the Data Integration Plan.

3.5 SOP IMPLEMENTATION CONSTRAINTS

The SOP's are capable of recovering from the effects of many transient type errors. Accordingly, the software design shall not preclude this capability by causing a program halt, permanent discontinuance of SOP processing, or loss of protected data as a result of program check or error interrupts.

Whenever potential transient-type errors have been identified, software requirements for limit checks, etc, and appropriate action have been defined in Section 4 detailed requirements. In addition, any other check or error interrupts shall be prevented by software safeguards; or standard fixup and error returns shall be accomplished as described in Level A CPDS Section 4.6.4.

3.6 TIMING

Timing in this document is related to error-free processing conditions.

See Level A CPDS SS-P-0002-170, paragraph 4.4-2A, for timing related to error processing conditions.

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4.0 DETAIL LEVEL REQUIREMENTS

The Subsystem Operating Programs (SOP's) specify the software required for operation of the GN&C subsystem hardware external to the Data Processing System (DPS).

The SOP's provide necessary services and interfaces between the GN&C Line Replaceable Units (LRU's) and other application programs. The major SOP functions are format conversion, data compensation, moding and sequencing, BITE monitoring, and special computations. The SOP's do not include the specific input/output services provided by FCOS, nor do they include the data selection and failure management functions performed by other application programs.

This section specifies the detailed requirements for the Flight Control Effector SOP's which are organized as follows:

Section	Title
4.46	Elevon Position Feedback SOP
4.47	Rudder Position Feedback SOP
4.48	Speed Brake Position Feedback SOP
4.49	Body Flap Position Feedback SOP
4.50	Aerosurface Actuator Command SOP
4.52	Hydraulic System SOP
4.58	Entry/Landing RCS Command SOP
4.60	MPS TVC Command SOP
4.62	SRB TVC Command SOP
4.64	OMS TVC Command SOP
4.65	OMS TVC Feedback SOP
4.120	SRB Monitor Function
4.187	Orbiter Actuator Slew Checks
4.188	SRB Slew Checks
4.190	Ascent RCS Command SOP
4.191	Orbit RCS Command SOP
4.193	Elevon Delta Pressure Feedback SOP
4.232	Hydraulic Thermal Conditioning
4.250	Structural Program Test Input SOP

Section 4.0.1 consists of Table 4.0.1-1 which provides the major mode in which a principal function is operational, and the highest processing rate of that principal function in each major mode is provided.

The continuity of actuator initialization for each functional transition has been summarized in Section 4.0.2. This initialization requires that all hydraulic pumps be off or at low pressure for all OPS transitions except OPS 1 to OPS 6. A further requirement is that the hydraulic activation in OPS 3 be constrained to remain with pumps at low pressure until elevon actuator motion stops before proceeding to high pressure on any pump.

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4.0.1 Flight Control Effector SOP's

Table 4.0.1-1 lists the major modes and rates.

Table 4.0.1-1.Effector SOP Operational Major Modes/Rates

Principal Function	101	102	103	104	105	106	201	202	301	302	303	304	305	601	602	603
4.46 ELVN PFB SOP									6.25	6.25	6.25	25.0	25.0		25.0	25.0
4.47 RUD PFB SOP									6.25	6.25	6.25	6.25	6.25		6.25	6.25
4.48 SB PFB SOP									6.25	6.25	6.25	6.25	6.25		6.25	6.25
4.49 BF PFB SOP	6.25	6.25	6.25	6.25	6.25				6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
4.50 AERO ACT SOP	25.0	25.0	6.25	6.25	6.25				25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
4.52 HYD SOP	25.0	25.0	25.0 6.25	6.25	6.25	6.25			6.25	6.25	6.25	25.0	25.0	25.0	25.0	25.0
4.58 E/L RCS CMD SOP												25.0	25.0			
4.60 MPS TVC CMD CMD SOP R/O	25.0 6.25	25.0 6.25	25.0 6.25	1.0 6.25					CYC 6.25	CYC 6.25	CYC 6.25	25.0 6.25	CYC	25.0 6.25	CYC 6.25	CYC
4.62 SRB TVC CMD SOP	25.0	25.0														
4.64 OMS TVC CMD SOP	6.25	6.25	6.25	12.5	12.5	12.5		12.5	12.5	12.5	12.5	CYC I/O	CYC I/O	6.25	12.5	CYC I/O
4.65 OMS TVC FB SOP	6.25	6.25	6.25	6.25	6.25	6.25		6.25	6.25	6.25	6.25					
4.120 SRB MON FCN		12.5														
4.187 ORB ACT SLEW	25.0															
4.188 SRB SLEW	25.0															
4.190 ACS RCS CMD SOP		25.0	25.0	25.0	25.0	25.0			25.0	25.0	25.0			25.0	25.0	25.0
4.191 ORB RCS CMD SOP							25.0	25.0								
4.193 PF/B SOP		3.12														
4.232 HYD THERM COND									25.0	25.0	25.0					
4.250 SPTI SOP	25.0	25.0														

Note: (1) INIT – indicates that outputs from the principal function are required for initialization only of another principal function.
 (2) CYC I/O – indicates that final outputs from the principal function in a major mode shall be continually outputted by cyclic I/O processing in subsequent major modes.

4.0.2 Summary of Actuator Initialization Transition

Tables 4.0.2-1, 4.0.2-2, and 4.0.2-3 summarize the actuator initialization data on transition.

Table 4.0.2-1. Primary Aero Actuator Initialization at Transition (In Degrees)							
Transition Actr	OPS 9 OPS 1	OPS 1 OPS 2	OPS 2 OPS 8	OPS 8 OPS 2	OPS 2 OPS 3	OPS 1 MM 601 (PWR)	MM 601 (PWR) MM 601 (Glide)
POSN	(1) SLEW (2) GRAVITY	STOW	FDBK	FDIR-OFF- NULL	(A) STOW (B) FDBK	(A) STOW (B) FDBK	FDBK
CMD PROC	ASC DAP	CYC I/O	VU-AI	CYC I/O	CYC I/O	(1) CYC I/O (2) GRTLS DAP	GRTLS DAP
LIB	0.0 (1)	0.0	0.0	0.0	0.0 (A)	0.0 (A)	0.0
LOB	0.0 (1)	0.0	0.0	0.0	0.0 (A)	0.0 (A)	0.0
RIB	0.0 (1)	0.0	0.0	0.0	0.0 (A)	0.0 (A)	0.0
ROB	0.0 (1)	0.0	0.0	0.0	0.0 (A)	0.0 (A)	0.0
RUD	0.0 (2)	0.0	0.0	+5.0	+5.0 (B)	0.0 (A)	0.0
SB	+5.0 (2)	-9.9	0.0	+10.0	+10.0 (B)	-9.9 (A)	-9.9
BF	0 (2)	0	0	0	0 (B)	0 (B)	0
Transition Actr	OPS 1 OPS 3	MM 303 MM 304					
POSN	FDBK	FDBK					
CMD PROC	CYC I/O	AERO-JET					
LIB	0.0	WHERE- EVER					
LOB	0.0	HYD					
RIB	0.0	THERM					
ROB	0.0	COND					
RUD	0.0	LEFT					
SB	0.0	THEM; OR					
BF	0.0	STOW					

Table 4.0.2-2 Primary MPS Actuator Initialization at Transition (In Degrees)						
TRANSITION ACTR	OPS 9 OPS 1	OPS 1 OPS 2	OPS 2* OPS 8	OPS 8* OPS 2	OPS 2** OPS 3	MM 601 MM 602
POSN CMD PROC	GRAVITY ASC DAP	STOW CYC I/O	STOW CYC I/O	STOW CYC I/O	STOW CYC I/O	STOW CYC I/O
P1	+9.5	0.0	0.0	0.0	0.0	0.0
P2	+6.15	-10.0	-10.0	-10.0	-10.0	-10.0
P3	+6.15	-10.0	-10.0	-10.0	-10.0	-10.0
Y1	+0.0	0.0	0.0	0.0	0.0	0.0
Y2	-2.15	-3.5	-3.5	-3.5	-3.5	-3.5
Y3	+2.15	+3.5	+3.5	+3.5	+3.5	+3.5
TRANSITION ACTR	OPS 1** OPS 3	MM 303 MM 304				
POSN CMD PROC	STOW CYC I/O	STOW CYC I/O				
P1	0.0	0.0				
P2	-10.0	-10.0				
P3	-10.0	-10.0				
Y1	0.0	0.0				
Y2	-3.5	-3.5				
Y3	+3.5	+3.5				
* No checkout repositioning of main engines on-orbit						
** Reposition back to stow by activating drivers and commanding by a step using CYC I/O						

Table 4.0.2-3.Primary OMS Actuator Initialization at Transition (In Degrees)							
TRANSITION ACTR	OPS 9 OPS 1	MM 103 MM 104	OPS 1*** OPS 2	OPS 2**** OPS 8	OPS 8**** OPS 2	OPS 2 OPS 3	OPS 1* MM 601
POSN CMD PROC	STOW CYC I/O	TRIM TRANS DAP	TRIM CYC I/O	TRIM CYC I/O	TRIM CYC I/O	TRIM TRANS DAP	STOW CYC I/O
LP	+5.89	+0.4	+0.4	+0.4	+0.4	-0.3	+5.89
LY	+6.44	-5.75	-5.75	-5.75	-5.75	-5.75	+6.44
RP	+5.89	+0.4	+0.4	+0.4	+0.4	-0.3	+5.89
RY	-6.44	+5.75	+5.75	+5.75	+5.75	+5.75	-6.44
TRANSITION ACTR	OPS 1** MM 301	MM 303 MM 304	MM 601 MM 602				
POSN CMD PROC	TRIM TRANS DAP	STOW CYC I/O	STOW CYC I/O				
LP	+0.4	+5.89	+5.89				
LY	-5.75	+6.44	+6.44				
RP	+0.4	+5.89	+5.89				
RY	+5.75	-6.44	-6.44				
* Transition prior to MM 104 ** Transition after OMS 1 burn *** STS-1 no dynamic commanding of OMS TVC on-orbit							

4.0.3 Documented Requirements Precedence

Requirements precedence in this document shall be as follows:

1. If there is a conflict between the data in the function subtables and the standard principal function tables, the principal function tables shall have precedence.
2. If there is a conflict between the data in the flow diagrams and the written requirements, the written requirements shall have precedence.

4.0.4 Functional/Document Traceability

Table 4.0.4-1 shows the traceability of the software sections/paragraphs in this Level C FSSR with respect to the corresponding Sections of the Level B CPDS' documentation. In addition, table 4.0.4-2 shows the traceability of the PASS GN&C principal functions located in this FSSR with respect to the applicable BFS paragraphs in the Level C PRD specifications. These tables are provided for information only.

Table 4.0.4-1. Functional/Document Traceability		
Level B PF Number	Level B PF Name (Acronym)	Level C FSSR Section No.
4.50	Aero Actuator Command SOP (AERO ACT SOP)	4.50
4.190	Ascent RCS Command SOP (ASC RCS CMD SOP)	4.190
4.49	Body Flap Position Feedback SOP (BF PFB SOP)	4.49
4.193	Elevon Delta Pressure Feedback SOP (DELTA P F/B SOP)	4.193
4.46	Elevon Position Feedback SOP (ELVN PFB SOP)	4.46
4.58	Entry/Landing RCS Command SOP (E/L RCS CMD SOP)	4.58
4.52	Hydraulic System SOP (HYD SYS SOP)	4.52
4.232	Hydraulic Thermal Conditioning (HYD THERMAL COND)	4.232
4.60	Main Propulsion System Thrust Vector Control Command SOP (MPS TVC CMD SOP)	4.60
4.191	Orbit RCS Command SOP (ORB RCS CMD SOP)	4.191
4.64	Orbital Maneuvering System Thrust Vector Control Command SOP (OMS TVC CMD SOP)	4.64
4.65	Orbital Maneuvering System Thrust Vector Control Feedback SOP (OMS TVC FB SOP)	4.65
4.187	Orbiter Actuator Slew Checks (ORB ACT SLEW)	4.187
4.47	Rudder Position Feedback SOP (RUD PFB SOP)	4.47
4.120	Solid Rocket Booster Monitor Function (SRB MON FCN)	4.120
4.62	Solid Rocket Booster Thrust Vector Control Command SOP (SRB TVC CMD SOP)	4.62
4.48	Speed Brake Position Feedback SOP (SB PFB SOP)	4.48
4.188	SRB Actuator Slew Checks (SRB ACT SLEW)	4.188
4.250	Structural Program Test Input SOP (SPTI SOP)	4.250

Table 4.0.4-2.EFFECTOR SOP FSSR/PRD CORRELATION					
Principal Function	FSSR Paragraph	FSSR Title	BFS PRD	PRD Paragraph	BFS Title
G4.46	4.46	Elevon Position Feedback SOP	MG038106	3.2.5.4.1	Elevon Position Feedback HIP (ELVN_PFB_HIP)
G4.47	4.47	Rudder Position Feedback SOP	MG038106	3.2.5.4.2	Rudder Position Feedback HIP
G4.48	4.48	Speed Brake Position Feedback SOP	MG038106	3.2.5.4.3	Speed Brake Position Feedback (SB_PFB_HIP)
G4.49	4.49	Body Flap Position Feedback SOP	MG038106	3.2.5.4.4	Body Flap Position Feedback (BF_PFB_HIP)
G4.50	4.50	Aero Actuator Command SOP	MG038106	3.2.5.5.1	Aerosurface Actuator Command HIP
G4.52	4.52	Hydraulic System SOP	MG038106	3.2.5.4.5	Hydraulic System (HYD_SYS_HIP)
G4.58	4.58	Entry/Landing RCS Command SOP	MG038106	3.2.5.5.3	RCS Command HIP
G4.60	4.60	Main Propulsion System Thrust Vector Control Command SOP	MG038106	3.2.5.5.4	Main Propulsion System Thrust Vector Control Command
G4.62	4.62	Solid Rocket Booster Thrust Vector Control Command SOP	MG038106	3.2.5.5.5	Solid Rocket Booster Thrust Vector Control Command
G4.64	4.64	Orbital Maneuvering System Thrust Vector Control Command SOP	MG038106	3.2.5.5.6	Orbital Maneuvering System Thrust Vector Control Command HIP
G4.65	4.65	Orbital Maneuvering System Thrust Vector Control Feedback SOP	MG038106	3.2.5.4.15	Orbitaler Maneuvering Thrust Vector Control Feedback HIP
G4.120	4.120	Solid Rocket Booster Monitor Function	MG038106	3.2.5.4.16	Solid Rocket Booster Monitor HIP and Initialization
G4.187	4.187	Orbiter Actuator Slew Checks	N/A	N/A	N/A
G4.188	4.188	SRB Actuator Slew Checks	N/A	N/A	N/A
G4.190	4.190	Ascent RCS Command SOP	MG038106	3.2.5.5.3	RCS Command HIP
G4.191	4.191	Orbit RCS Command SOP	N/A	N/A	N/A
G4.193	4.193	Elevon Delta Pressure Feedback SOP	MG038106	3.2.5.4.11	Elevon Delta Pressure Feedback (ELVN_DELTAP_FB_HIP)
G4.232	4.232	Hydraulic Thermal Conditioning	MG038106	3.2.5.5.2	Hydraulic Thermal Conditioning Procedure
G4.250	4.250	Structural Program Test Input SOP	N/A	N/A	N/A

4.46 ELEVON POSITION FEEDBACK SOP

The purpose of the Elevon Position Feedback (ELVN PFB) SOP principal function shall be to perform the following functions:

- A. Compensation of the selected measured elevon position feedback signals
- B. Computation of the elevator position

The ELVN PFB SOP functions shall be performed at the 25 Hz rate, during Major Modes 304, 305, 602, and 603. Major Modes 301, 302, and 303 shall be performed at the 6.25 Hz rate. The compensation function shall be performed after the Selection Filter principal function and prior to the elevator computation function. The elevator computation shall be performed prior to AERO–JET DAP, GRTLS DAP, and HYD THERM COND.

The ELVN PFB interfaces are indicated on the functional block diagram on Figure 4.46–1. The parameter initialization requirements are shown in Table 4.46–1. The IDD inputs and outputs are listed in Tables 4.46–2 and 4.46–3. Values for the I–loads are contained in the I–loads requirements document (JSC–19350); however, I–load definitions applicable to this principal function are listed in Table 4.46–4. K–loads are listed in Table 4.46–5. Constants are listed in Table 4.46–6.

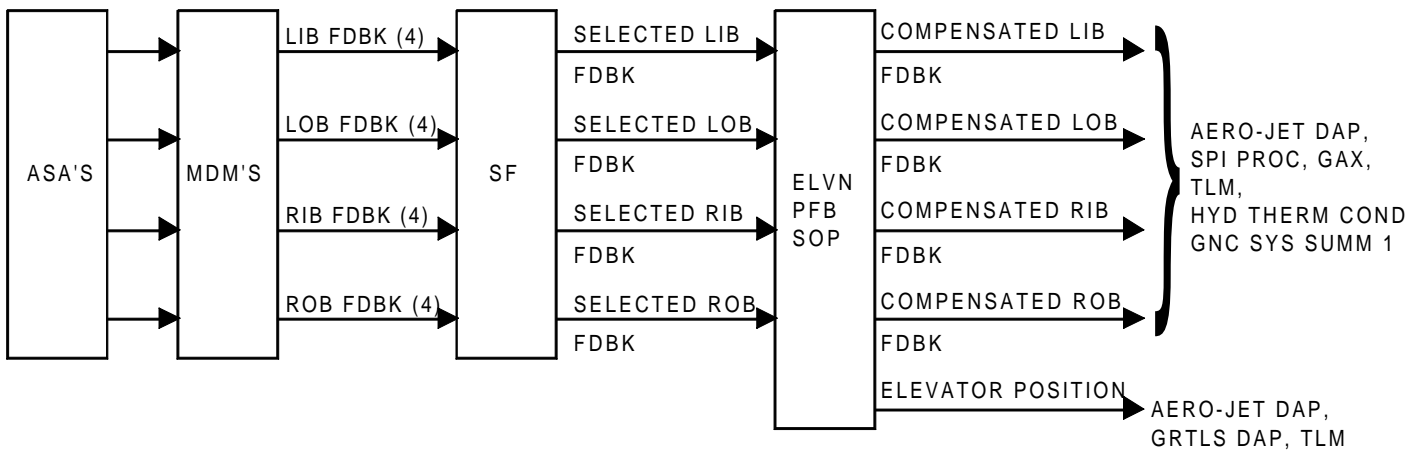


FIGURE 4.46-1. Elevon Position Feedback SOP Functional Block Diagram

Table 4.46-1. Elevon Position Feedback SOP Initialization Parameters							
Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
CLIB	V97U3942C	COMP SCALE FACTOR – LIB ELVN POSN FDBK	L	FLOAT PT			DEG/VDC
CLOB	V97U3944C	COMP SCALE FACTOR – LOB ELVN POSN FDBK	L	FLOAT PT			DEG/VDC
CRIB	V97U3983C	COMP SCALE FACTOR – RIB ELVN POSN FDBK	L	FLOAT PT			DEG/VDC
CROB	V97U3985C	COMP SCALE FACTOR – ROB ELVN POSN FDBK	L	FLOAT PT			DEG/VDC
KLIB	V97U4054C	COMP BIAS – LIB ELVN POSN FDBK	L	FLOAT PT			DEG
KLOB	V97U4056C	COMP BIAS – LOB ELVN POSN FDBK	L	FLOAT PT			DEG
KRIB	V97U4094C	COMP BIAS – RIB ELVN POSN FDBK	L	FLOAT PT			DEG
KROB	V97U4096C	COMP BIAS – ROB ELVN POSN FDBK	L	FLOAT PT			DEG
DEFB	V97H8001C	ELEVATOR POSITION	L	FLOAT PT			DEG

4.46.1 Elevon Position Feedback Compensation

The elevon position feedback compensation function shall consist of applying biases and scale factors to convert the selected feedback data into engineering units (degrees) in floating point format. Provisions shall be made for unique bias and scale factor terms for each of the four elevon panels. The general compensation equation shall be as follows:

$$DC = DEMS C + K$$

where

DC = Compensated position feedback (DEG)

DEMS = Selected measured position (VDC)

C = Compensation scale factor (DEG/VDC)

K = Compensation bias (DEG)

Specifically, the compensation equations for the four elevon panels shall be as follows:

$$DELIBOFB = LIBES CLIB + KLIB$$

$$DELOBOFB = LOBES CLOB + KLOB$$

$$\text{DERIBOFB} = \text{RIBES CRIB} + \text{KRIB}$$

$$\text{DEROBOFB} = \text{ROBES CROB} + \text{KROB}$$

The feedback positions shall be provided to the AERO-JET DAP to initialize the aerosurface priority rate limiting function.

4.46.2 Elevator Position Computation

The elevator position computation function shall generate elevator position from the compensated elevon feedback data. The elevator computation equations shall be as follows:

$$\text{DLELVN} = (\text{DELIBOFB} + \text{DELOBOFB})/2$$

$$\text{DRELVN} = (\text{DERIBOFB} + \text{DEROBOFB})/2$$

$$\text{DEFB} = (\text{DLELVN} + \text{DRELVN})/2$$

where

DELIBOFB = Compensated left inboard elevon position (DEG)

DELOBOFB = Compensated left outboard elevon position (DEG)

DERIBOFB = Compensated right inboard elevon position (DEG)

DEROBOFB = Compensated right outboard elevon position (DEG)

DLELVN = Average left elevon position (DEG)

DRELVN = Average right elevon position (DEG)

DEFB = Elevator position (DEG)

TABLE 4.46-2. INPUT FUNCTIONAL PARAMETERS FOR ELEVON POSITION FEEDBACK SOP (G4.46)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V90H7505C	SELECTED LIB ELEVON FDBK	SF	VDC	SPL		93017G	*
	V90H7525C	SELECTED LOB ELEVON FDBK	SF	VDC	SPL		93017G	*
	V90H7555C	SELECTED RIB ELEVON FDBK	SF	VDC	SPL		93017G	*
	V90H7575C	SELECTED ROB ELEVON FDBK	SF	VDC	SPL		93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.46-3. OUTPUT FUNCTIONAL PARAMETERS FROM ELEVON POSITION FEEDBACK SOP (G4.46)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DEFB	V95H8001C	ELEVATOR POSITION	AEROJET DAP DL FMT 21/2 DL FMT 23/B	DEG	SPL		93017G	*
DELIBOFB	V95H8010C	COMP LIB ELEVON POS	AEROJET DAP GAX GNC SYS SUMM1 DISP GRTLS DAP HYD THERMAL COND SPI PROC	DEG	BSS			
DELOBOFB	V95H8060C	COMP LOB ELEVON POS	AEROJET DAP GAX GNC SYS SUMM1 DISP GRTLS DAP HYD THERMAL COND SPI PROC TLM	DEG	BSS			
DERIBOFB	V95H8110C	COMP RIB ELEVON POS	AEROJET DAP GAX GNC SYS SUMM1 DISP GRTLS DAP HYD THERMAL COND SPI PROC TLM	DEG	BSS		92230F	
DEROBOFB	V95H8160C	COMP ROB ELEVON POS	AEROJET DAP GAX GNC SYS SUMM1 DISP GRTLS DAP HYD THERMAL COND SPI PROC TLM	DEG	BSS			

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec

TABLE 4.46-4. ELEVON POSITION FEEDBACK SOP (G4.46) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.46-5. ELEVON POSITION FEEDBACK SOP (G4.46) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
CLIB COMP SCALE FACTOR - LIB ELVN POSN	V97U3942C	00	+5.6240	E+00 DEG/VDC	F	S	A	G4.46 V5.1	90109D	
CLOB COMP SCALE FACTOR - LOB ELVN POSN	V97U3944C	00	+5.631	E+00 DEG/VDC	F	S	A	G4.46 V5.1	90109D	
CRIB COMP SCALE FACTOR - RIB ELVN POSN	V97U3983C	00	+5.6240	E+00 DEG/VDC	F	S	A	G4.46 V5.1	90109D	
CROB COMP SCALE FACTOR - ROB ELVN POSN	V97U3985C	00	+5.631	E+00 DEG/VDC	F	S	A	G4.46 V5.1	90109D	
KLIB COMP BIAS - LIB ELVN POSN FDBK	V97U4054C	00	-7.641	E+00 DEG	F	S	C	G4.46 V5.1	90109D	
KLOB COMP BIAS - LOB ELVN POSN FDBK	V97U4056C	00	-7.776	E+00 DEG	F	S	C	G4.46 V5.1	90109D	
KRIB COMP BIAS - RIB ELVN POSN FDBK	V97U4094C	00	-7.641	E+00 DEG	F	S	C	G4.46 V5.1	90109D	
KROB COMP BIAS - ROB ELVN POSN FDBK	V97U4096C	00	-7.776	E+00 DEG	F	S	C	G4.46 V5.1	90109D	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.46-6. ELEVON POSITION FEEDBACK SOP (G4.46) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.47 RUDDER POSITION FEEDBACK SOP

The purpose of the Rudder Position Feedback (RUD PFB) SOP principal function shall be to perform data compensation on the selected rudder position feedback signal. The compensation function shall be executed at the 6.25 Hz rate after the Selection Filter principal function. The rudder feedback position shall be provided to the AERO-JET DAP and the GRTLS DAP to initialize the aerosurface priority rate limiting, and HYD THERM COND.

The rudder position feedback compensation shall consist of applying bias and scale factor terms to convert the selected rudder feedback data into engineering units (degrees) in floating point format. The compensation equation shall be as follows:

$$DROFB = RUDS CR + KRUD$$

where

DROFB = Compensated rudder position (DEG)

RUDS = Selected measured rudder position feedback (VDC)

CR = Rudder compensation scale factor (DEG/VDC)

KRUD = Rudder compensation bias (DEG)

The RUD PFB SOP interfaces are indicated on the functional block diagram on Figure 4.47-1. The parameter initialization requirements are shown in Tables 4.47-1. The IDD inputs and outputs are listed in Tables 4.47-2 and 4.47-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.47-4. K-loads are listed in Table 4.47-5. Constants are listed in Table 4.47-6.

Table 4.47-1. Rudder Position Feedback SOP Initialization Parameters							
Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
CR	V97U3982C	COMP SCALE FACTOR – RUDDER POSN FDBK	L	FLOAT PT			DEG/ VDC
KRUD	V97U4093C	COMP BIAS – RUDDER POSN FDBK	L	FLOAT PT			DEG

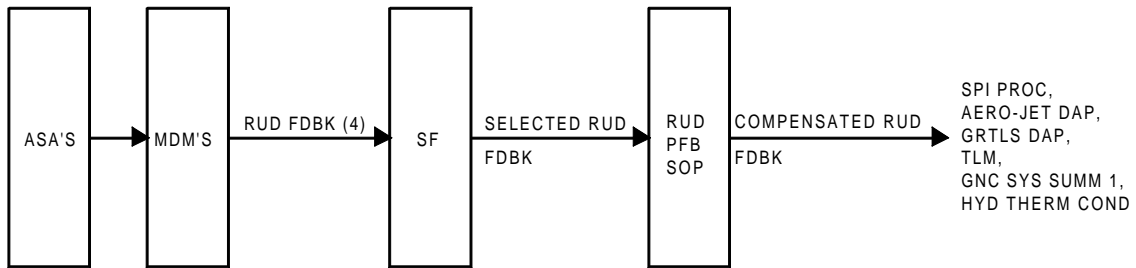


FIGURE 4.47-1. Rudder Position Feedback SOP Functional Block Diagram

TABLE 4.47-2. INPUT FUNCTIONAL PARAMETERS FOR RUDDER POSITION FEEDBACK SOP (G4.47)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V90H7010C	SELECTED RUDDER FDBK	SF	VDC	SPL		93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.47-3. OUTPUT FUNCTIONAL PARAMETERS FROM RUDDER POSITION FEEDBACK SOP (G4.47)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DROFB	V95H8210C	COMP RUDDER POS	AEROJET DAP GNC SYS SUMM1 DISP GRTLS DAP HYD THERMAL COND SPI PROC TLM	DEG	BSS			

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.47-4. RUDDER POSITION FEEDBACK SOP (G4.47) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.47-5. RUDDER POSITION FEEDBACK SOP (G4.47) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
CR COMP SCALE FACTOR - RUDDER POSN FD	V97U3982C	00	+5.5260	E+00 DEG/VDC	F	S	A	G4.47 V5.1	90109D	
KRUD COMP BIAS - RUDDER POSN FDBK	V97U4093C	00	+0.0	E+00 DEG	F	S	C	G4.47 V5.1	90109D	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.47-6. RUDDER POSITION FEEDBACK SOP (G4.47) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.48 SPEED BRAKE POSITION FEEDBACK SOP

The purpose of the Speed Brake Position Feedback (SB PFB) SOP principal function shall be to perform data compensation on the selected speed brake position feedback signal and to determine the percentage of maximum speed brake position. The SB PFB SOP shall be executed at the 6.25 Hz rate after the Selection Filter principal function and prior to AERO-JET DAP, GRTLS DAP, and HYD THERM COND.

The speed brake position feedback compensation shall consist of applying bias and scale factor terms to convert the selected speed brake position feedback data into engineering units (degrees) in floating point format. The compensation equation shall be as follows:

$$DSBOFB = SBRKS \text{ CSB} + \text{KSB}$$

where

DSBOFB = Compensated speed brake position (DEG)

SBRKS = Selected measured speed brake position feedback (VDC)

CSB = Speed brake compensation scale factor (DEG/VDC)

KSB = Speed brake compensation bias (DEG)

The final compensated value shall then be processed to determine percentage of maximum position as follows:

$$DSBFBP = (DSBOFB/SB_MAX) \times 100$$

where

DSBFBP = Percentage of maximum speed brake position

DSBOFB = Compensated speed brake position (DEG)

SB_MAX = Maximum speed brake position (DEG)

The SB PFB SOP interfaces are indicated on the functional block diagram on Figure 4.48-1. The parameter initialization requirements are shown in Table 4.48-1. The IDD inputs and outputs are listed in Tables 4.48-2 and 4.48-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.48-4. K-loads are listed in Table 4.48-5. Constants are listed in Table 4.48-6.

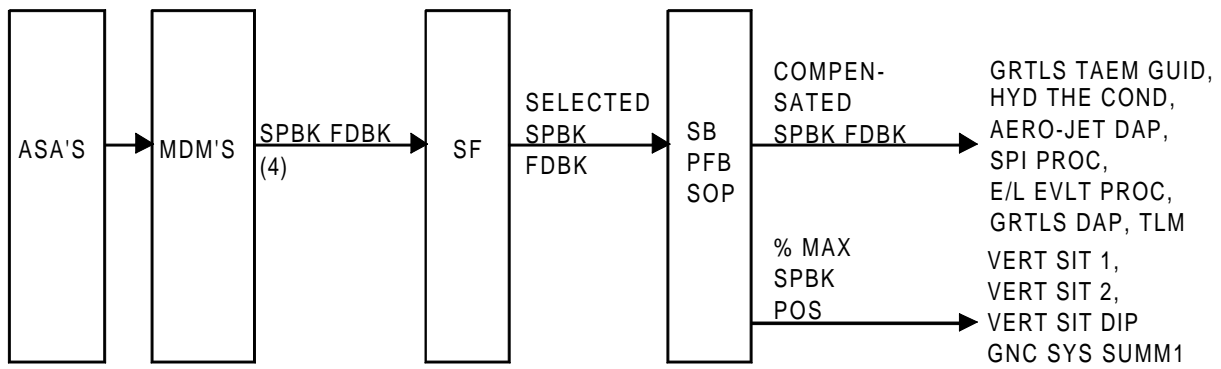


FIGURE 4.48-1. Speed Brake Position Feedback SOP Functional Block Diagram

Table 4.48-1. Speed Brake Position Feedback SOP Initialization Parameters							
Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
CSB	V97U3987C	COMP SCALE FACTOR – SP BK POSN FDBK	L	FLOAT PT			DEG/ VDC
KSB	V97U4098C	COMP BIAS – SP BK POSN FDBK	L	FLOAT PT			DEG
SB_MAX	V97U4145C	SPEED BRAKE MAX POSN	K	FLOAT PT			DEG

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TABLE 4.48-2. INPUT FUNCTIONAL PARAMETERS FOR SPEEDBRAKE POSITION FEEDBACK SOP (G4.48)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V90H6710C	SELECTED SPEEDBRAKE FDBK	SF	VDC	SPL		93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.48-3. OUTPUT FUNCTIONAL PARAMETERS FROM SPEEDBRAKE POSITION FEEDBACK SOP (G4.48)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DSBFBP	V95H8250C	PERCENTAGE OF MAX SPEEDBRAKE POS	GNC SYS SUMM1 DISP VERT SIT DIP VERT SIT1 DISP VERT SIT2 DISP	PCT	BSS			
DSBOFB	V95H8260C	COMP SPDBK POS	AEROJET DAP E/L EV AN PROC GRTLS DAP GRTLS TAEM GUID HYD THERMAL COND SPI PROC TLM	DEG			93087E	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.48-4. SPEEDBRAKE POSITION FEEDBACK SOP (G4.48) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.48-5. SPEEDBRAKE POSITION FEEDBACK SOP (G4.48) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
CSB COMP SCALE FACTOR - SP BK POSN FDB	V97U3987C	00	+1.085	E+01 DEG/VDC	F	S	A	G4.48	90109D	
KSB COMP BIAS - SP BK POSN FDBK	V97U4098C	00	+4.435	E+01 DEG	F	S	C	G4.48	90109D	
SB_MAX	V97U4145C	00	+9.86	E+01 DEG	F	S	A	G4.10 G4.234 G4.48	93015C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.48-6. SPEEDBRAKE POSITION FEEDBACK SOP (G4.48) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.49 BODY FLAP POSITION FEEDBACK SOP

The purpose of the Body Flap Position Feedback (BF PFB) SOP principal function shall be to perform data compensation on the selected body flap position feedback signal. The compensation function shall be executed at the 6.25 Hz rate after the Selection Filter outside the transport delay critical processing (i.e., in the same minor cycle) and prior to the AERO-JET DAP, BF CMD RM, ASC DAP, GRTLS DAP, and HYD THERM COND.

The body flap position feedback compensation shall consist of applying bias and scale factor terms to convert the selected body flap feedback signal into engineering units (degrees) in floating point format. The compensation equation shall be as follows:

$$DBFOFB = BFS \text{ CBF} + \text{KBF}$$

where

DBFOFB = Compensated body flap position (DEG)

BFS = Selected measured body flap position feedback (VDC)

CBF = Body flap compensation scale factor (DEG/VDC)

KBF = Body flap compensation bias (DEG)

The BF PFB SOP interfaces are indicated on the functional block diagram on Figure 4.49-1. The parameter initialization requirements are shown in Table 4.49-1. The IDD inputs and outputs are listed in Tables 4.49-2 and 4.49-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.49-4. K-loads are listed in Table 4.49-5. Constants are listed in Table 4.49-6.

Table 4.49-1. Body Flap Position Feedback SOP Initialization Parameters							
Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
CBF	V97U3901C	COMP SCALE FACTOR – BODY FLAP POSN FDBK	L	FLOAT PT			DEG/VDC
KBF	V97U4012C	COMP BIAS – BODY FLAP POSN FDBK	L	FLOAT PT			DEG

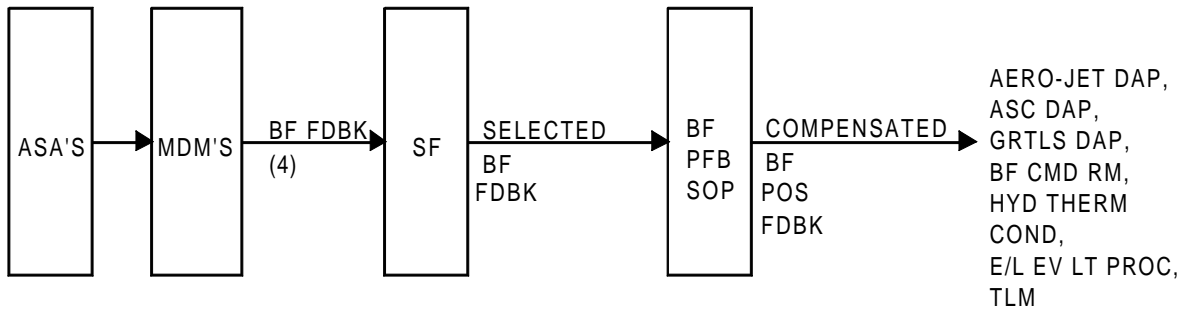


FIGURE 4.49-1. Body Flap Position Feedback SOP Functional Block Diagram

TABLE 4.49-2. INPUT FUNCTIONAL PARAMETERS FOR BODY FLAP POSITION FEEDBACK SOP (G4.49)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V90H6410C	SELECTED BODY FLAP FDBK	SF	VDC	SPL		93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.49-3. OUTPUT FUNCTIONAL PARAMETERS FROM BODY FLAP POSITION FEEDBACK SOP (G4.49)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DBFOFB	V95H8310C	COMP BODY FLAP POS	AEROJET DAP ASC DAP BF CMD RM E/L EV AN PROC GRTLS DAP HYD THERMAL COND SPI PROC TLM	DEG				

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.49-4. BODY FLAP POSITION FEEDBACK SOP (G4.49) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.49-5. BODY FLAP POSITION FEEDBACK SOP (G4.49) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
CBF COMP SCALE FACTOR - BODY FLAP POSN	V97U3901C	00	+4.4130	E+00 DEG/VDC	F	S	A	G4.49	90109D	
KBF COMP BIAS - BODY FLAP POSN FDBK	V97U4012C	00	+5.425	E+00 DEG	F	S	C	G4.49	90109D	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.49-6. BODY FLAP POSITION FEEDBACK SOP (G4.49) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.50 AERO ACTUATOR COMMAND SOP

The purpose of the Aero Actuator Command (AERO ACT) SOP principal function shall be to perform the following functions:

- A. Compensation of the control law generated elevon, speed brake, and rudder actuator position commands
- B. Compensation of the control law generated nosewheel steering commands
- C. Processing of the control law generated body flap commands and RM generated body flap hold commands
- D. Processing of the aerosurface actuator bypass/reset requests
- E. Processing of structural program test commands for the left and right outboard elevons and rudder

The elevon command compensation shall be performed during Ascent at the 25 Hz rate in Major Mode 101 and 102. The elevon command compensation shall be performed during Entry and RTLS at the 25 Hz rate. The rudder command compensation shall be performed during Ascent at the 25 Hz rate and at the 25 Hz rate during Entry and RTLS. The speed brake command compensation shall be performed during Ascent at the 25 Hz rate (CPS1 to PREP_SSME); and at the 25 Hz rate during Entry and RTLS. The body flap command processing shall be performed at the 6.25 Hz rate during Ascent (OPS1 to MPS_STOW); and at the 6.25 Hz rate within two minor cycles after the AERO-JET DAP during Entry, and within two minor cycles after the GRTLS DAP during RTLS. The nosewheel steering command compensation shall be performed at the 25 Hz rate during Entry and RTLS. (Note that in major modes in which the APU's are still powered, and no active commands are being generated, cyclic I/O processing shall maintain the last commanded position.) The reset/override processing shall be performed at the 6.25 Hz rate in the Ascent Major Modes 101, 102, 103, and 104, and in Entry Major Modes 301, 302, 303, 304, and 305. The AERO ACT SOP shall be performed after ASC DAP during Ascent; after HYD THERM COND in Major Modes 301, 302, and 303; after AERO-JET DAP during Entry; and after GRTLS DAP during RTLS.

Initialization of Aerosurfaces

- AEROSURFACE COMMANDS. The elevons, rudder, speed brake, and body flap command outputs shall be initialized based on the initial command inputs from ASC DAP on OPS 1 transition. The mass memory major functions base shall be initialized to values given in Table 4.50-1. On OPS 3 transition, the rudder and speed brake commands shall be initialized to the position feedbacks; the elevon commands shall be initialized to the last commands from the previous OPS; and body flap command shall be initialized to "zero" position.
- RESET COMMANDS. The aerosurface reset command outputs shall be initialized based on the initial input commands from GN&C SW RM on transition into all applicable OPS.

The remaining initialization parameters are shown in Table 4.50-1.

The AERO ACT SOP interfaces are indicated on the functional block diagram on Figure 4.50-1. The IDD inputs and outputs are listed in Tables 4.50-2 and 4.50-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.50-4. K-loads are listed in Table 4.50-5. Constants are listed in Table 4.50-6.

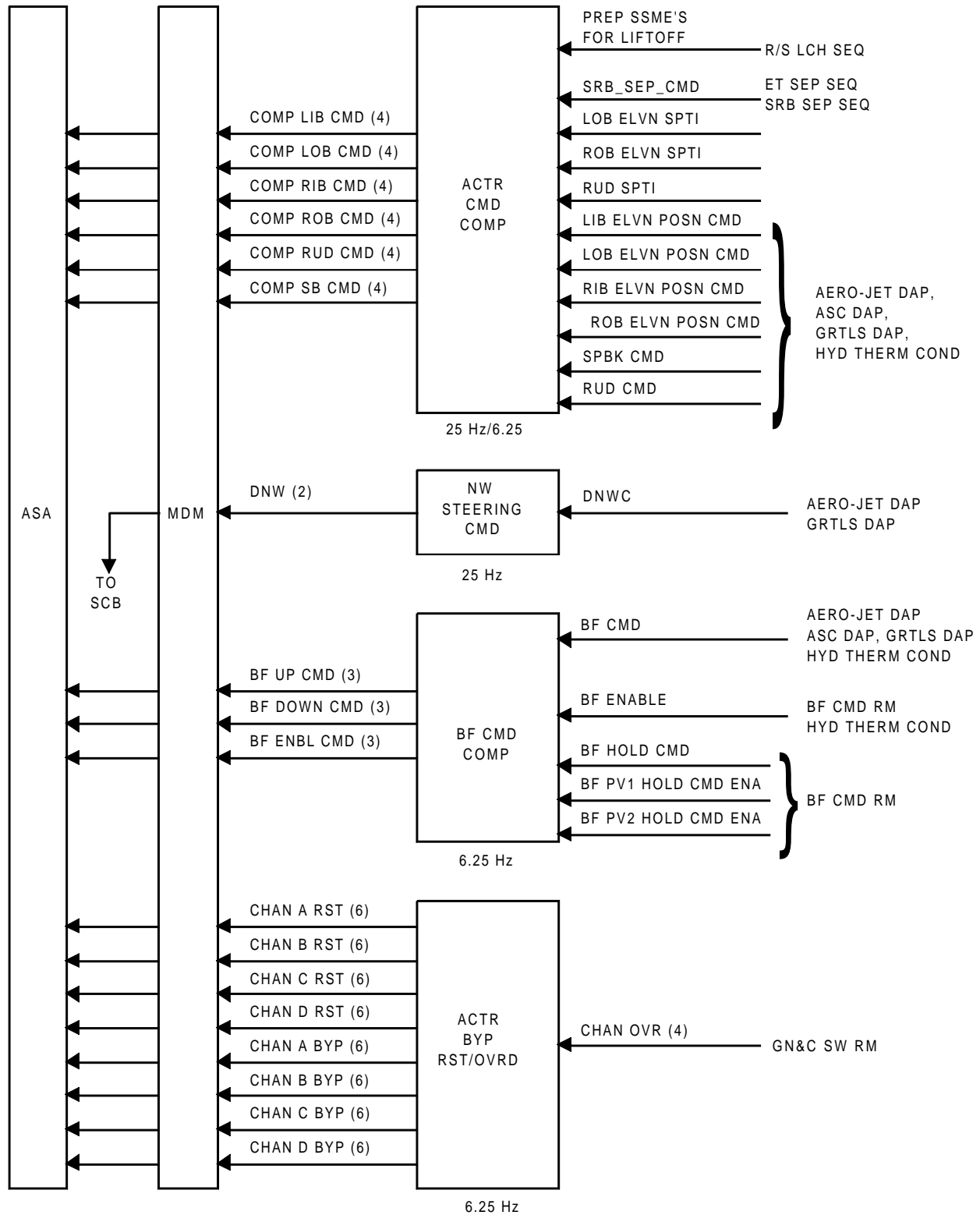


FIGURE 4.50-1. Aero Actuator SOP Functional Block Diagram

Table 4.50-1. Aero Actuator SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
CCLIB	V97U3902C	COMP SCALE FACTOR – LIB ELVN CMD	L	FLOAT PT			VDC/DEG
CCLOB	V97U3906C	COMP SCALE FACTOR – LOB ELVN CMD	L	FLOAT PT			VDC/DEG
CCRIB	V97U3914C	COMP SCALE FACTOR – RIB ELVN CMD	L	FLOAT PT			VDC/DEG
CCROB	V97U3918C	COMP SCALE FACTOR – ROB ELVN CMD	L	FLOAT PT			VDC/DEG
CNW	V97U3970C	COMP SCALE FACTOR – NOSEWHEEL CMD	L	FLOAT PT			VDC/DEG
CCR	V97U3910C	COMP SCALE FACTOR – RUDDER CMD	L	FLOAT PT			VDC/DEG
CCSB	V97U3922C	COMP SCALE FACTOR – SP BK CMD	L	FLOAT PT			VDC/DEG
KCLIB	V97U4013C	COMP BIAS – LIB ELVN CMD	L	FLOAT PT			VDC
KCLOB	V97U4017C	COMP BIAS – LOB ELVN CMD	L	FLOAT PT			VDC
KCRIB	V97U4026C	COMP BIAS – RIB ELVN CMD	L	FLOAT PT			VDC
KCROB	V97U4030C	COMP BIAS – ROB ELVN CMD	L	FLOAT PT			VDC
KCNW	V97U4150C	COMP BIAS – NOSEWHEEL CMD	L	FLOAT PT			VDC
KCR	V97U4021C	COMP BIAS – RUDDER CMD	L	FLOAT PT			VDC
KCSB	V97U4034C	COMP BIAS – SP BK CMD	L	FLOAT PT			VDC
DELIB (1)	V58K0820C	L INBD ELEVON CMD 1		FIXED PT	0.0 *		DEG
DELIB (2)	V58K0821C	L INBD ELEVON CMD 2		FIXED PT	0.0 *		DEG
DELIB (3)	V58K0822C	L INBD ELEVON CMD 3		FIXED PT	0.0 *		DEG
DELIB (4)	V58K0823C	L INBD ELEVON CMD 4		FIXED PT	0.0 *		DEG
DELOB (1)	V58K0870C	L OUTBD ELEVON CMD 1		FIXED PT	0.0 *		DEG
DELOB (2)	V58K0871C	L OUTBD ELEVON CMD 2		FIXED PT	0.0 *		DEG
DELOB (3)	V58K0872C	L OUTBD ELEVON CMD 3		FIXED PT	0.0 *		DEG
DELOB (4)	V58K0873C	L OUTBD ELEVON CMD 4		FIXED PT	0.0 *		DEG
DERIB (1)	V58K0920C	R INBD ELEVON CMD 1		FIXED PT	0.0 *		DEG
DERIB (2)	V58K0921C	R INBD ELEVON CMD 2		FIXED PT	0.0 *		DEG
DERIB (3)	V58K0922C	R INBD ELEVON CMD 3		FIXED PT	0.0 *		DEG
DERIB (4)	V58K0923C	R INBD ELEVON CMD 4		FIXED PT	0.0 *		DEG
DEROB (1)	V58K0970C	R OUTBD ELEVON CMD 1		FIXED PT	0.0 *		DEG
DEROB (2)	V58K0971C	R OUTBD ELEVON CMD 2		FIXED PT	0.0 *		DEG
DEROB (3)	V58K0972C	R OUTBD ELEVON CMD 3		FIXED PT	0.0 *		DEG
DEROB (4)	V58K0973C	R OUTBD ELEVON CMD 4		FIXED PT	0.0 *		DEG
DNW (1)	V51K0750C	NOSEWHEEL STEERING 1 CMD		FIXED PT	0.0 *		DEG
DNW (2)	V51K0751C	NOSEWHEEL STEERING 2 CMD		FIXED PT	0.0 *		DEG

Table 4.50-1. Aero Actuator SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
DR(1)	V57K0140C	RUDDER CMD 1		FIXED PT	0.0 *		DEG
DR(2)	V57K0141C	RUDDER CMD 2		FIXED PT	0.0 *		DEG
DR(3)	V57K0142C	RUDDER CMD 3		FIXED PT	0.0 *		DEG
DR(4)	V57K0143C	RUDDER CMD 4		FIXED PT	0.0 *		DEG
DSB (1)	V57K0240C	SPEED BRAKE CMD 1		FIXED PT	*(DSB_ CLOSED)		DEG
DSB (2)	V57K0241C	SPEED BRAKE CMD 2		FIXED PT	*(DSB_ CLOSED)		DEG
DSB (3)	V57K0242C	SPEED BRAKE CMD 3		FIXED PT	*(DSB_ CLOSED)		DEG
DSB (4)	V57K0243C	SPEED BRAKE CMD 4		FIXED PT	*(DSB_ CLOSED)		DEG
DBFDOWN (1)	V57K0302X	BODY FLAP DOWN CMD 1		DISCRETE			
DBFDOWN (2)	V57K0402X	BODY FLAP DOWN CMD 2		DISCRETE			
DBFDOWN (3)	V57K0502X	BODY FLAP DOWN CMD 3		DISCRETE			
DBFUP (1)	V57K0301X	BODY FLAP UP CMD 1		DISCRETE			
DBFUP (2)	V57K0401X	BODY FLAP UP CMD 2		DISCRETE			
DBFUP (3)	V57K0501X	BODY FLAP UP CMD 3		DISCRETE			
DEFENBL (1)	V57K0300X	BODY FLAP ENABLE CMD 1		DISCRETE			
DEFENBL (2)	V57K0400X	BODY FLAP ENABLE CMD 2		DISCRETE			
DEFENBL (3)	V57K0500X	BODY FLAP ENABLE CMD 3		DISCRETE			
BYPLIB (1)	V79K3221X	LEFT INBD ELEVON ACTR 1 BYPASS		DISCRETE			
BYPLIB (2)	V79K3223X	LEFT INBD ELEVON ACTR 2 BYPASS		DISCRETE			
BYPLIB (3)	V79K3225X	LEFT INBD ELEVON ACTR 3 BYPASS		DISCRETE			
BYPLIB (4)	V79K3227X	LEFT INBD ELEVON ACTR 4 BYPASS		DISCRETE			
BYPLOB (1)	V79K3231X	LEFT OUTBD ELEVON ACTR 1 BYPASS		DISCRETE			
BYPLOB (2)	V79K3233X	LEFT OUTBD ELEVON ACTR 2 BYPASS		DISCRETE			
BYPLOB (3)	V79K3235X	LEFT OUTBD ELEVON ACTR 3 BYPASS		DISCRETE			
BYPLOB (4)	V79K3237X	LEFT OUTBD ELEVON ACTR 4 BYPASS		DISCRETE			
BYPRIB (1)	V79K3241X	RIGHT INBD ELEVON ACTR 1 BYPASS		DISCRETE			
BYPRIB (2)	V79K3243X	RIGHT INBD ELEVON ACTR 2 BYPASS		DISCRETE			

Table 4.50-1. Aero Actuator SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
BYPRIB (3)	V79K3245X	RIGHT INBD ELEVON ACTR 3 BYPASS		DISCRETE			
BYPRIB (4)	V79K3247X	RIGHT INBD ELEVON ACTR 4 BYPASS		DISCRETE			
BYPROB (1)	V79K3251X	RIGHT OUTBD ELEVON ACTR 1 BYPASS		DISCRETE			
BYPROB (2)	V79K3253X	RIGHT OUTBD ELEVON ACTR 2 BYPASS		DISCRETE			
BYPROB (3)	V79K3255X	RIGHT OUTBD ELEVON ACTR 3 BYPASS		DISCRETE			
BYPROB (4)	V79K3257X	RIGHT OUTBD ELEVON ACTR 4 BYPASS		DISCRETE			
BYPRUD (1)	V79K3365X	RUDDER ACTR 1 BYPASS		DISCRETE			
BYPRUD (2)	V79K3366X	RUDDER ACTR 2 BYPASS		DISCRETE			
BYPRUD (3)	V79K3367X	RUDDER ACTR 3 BYPASS		DISCRETE			
BYPRUD (4)	V79K3368X	RUDDER ACTR 4 BYPASS		DISCRETE			
BYPSB (1)	V79K3375X	SPEED BRAKE ACTR 1 BYPASS		DISCRETE			
BYPSB (2)	V79K3376X	SPEED BRAKE ACTR 2 BYPASS		DISCRETE			
BYPSB (3)	V79K3377X	SPEED BRAKE ACTR 3 BYPASS		DISCRETE			
BYPSB (4)	V79K3378X	SPEED BRAKE ACTR 4 BYPASS		DISCRETE			
RSTLIB (1)	V79K3220X	LEFT INBD ELEVON ACTR 1 RESET		DISCRETE			
RSTLIB (2)	V79K3222X	LEFT INBD ELEVON ACTR 2 RESET		DISCRETE			
RSTLIB (3)	V79K3224X	LEFT INBD ELEVON ACTR 3 RESET		DISCRETE			
RSTLIB (4)	V79K3226X	LEFT INBD ELEVON ACTR 4 RESET		DISCRETE			
RSTLOB (1)	V79K3230X	LEFT OUTBD ELEVON ACTR 1 RESET		DISCRETE			
RSTLOB (2)	V79K3232X	LEFT OUTBD ELEVON ACTR 2 RESET		DISCRETE			
RSTLOB (3)	V79K3234X	LEFT OUTBD ELEVON ACTR 3 RESET		DISCRETE			
RSTLOB (4)	V79K3236X	LEFT OUTBD ELEVON ACTR 4 RESET		DISCRETE			
RSTRIB (1)	V79K3240X	RIGHT INBD ELEVON ACTR 1 RESET		DISCRETE			
RSTRIB (2)	V79K3242X	RIGHT INBD ELEVON ACTR 2 RESET		DISCRETE			
RSTRIB (3)	V79K3244X	RIGHT INBD ELEVON ACTR 3 RESET		DISCRETE			
RSTRIB (4)	V79K3246X	RIGHT INBD ELEVON ACTR 4 RESET		DISCRETE			
RSTROB (1)	V79K3250X	RIGHT OUTBD ELEVON ACTR 1 RESET		DISCRETE			

Table 4.50-1. Aero Actuator SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
RSTROB (2)	V79K3252X	RIGHT OUTBD ELEVON ACTR 2 RESET		DISCRETE			
RSTROB (3)	V79K3254X	RIGHT OUTBD ELEVON ACTR 3 RESET		DISCRETE			
RSTROB (4)	V79K3256X	RIGHT OUTBD ELEVON ACTR 4 RESET		DISCRETE			
RSTRUD (1)	V79K3345X	RUDDER ACTR 1 RESET		DISCRETE			
RSTRUD (2)	V79K3346X	RUDDER ACTR 2 RESET		DISCRETE			
RSTRUD (3)	V79K3347X	RUDDER ACTR 3 RESET		DISCRETE			
RSTRUD (4)	V79K3348X	RUDDER ACTR 4 RESET		DISCRETE			
RSTSB (1)	V79K3355X	SPEED BRAKE ACTR 1 RESET		DISCRETE			
RSTSB (2)	V79K3356X	SPEED BRAKE ACTR 2 RESET		DISCRETE			
RSTSB (3)	V79K3357X	SPEED BRAKE ACTR 3 RESET		DISCRETE			
RSTSB (4)	V79K3358X	SPEED BRAKE ACTR 4 RESET		DISCRETE			

* INITIALIZE TO VDC WHICH GIVE EQUIVALENT ENGINEERING UNIT COMMAND FOR MASS MEMORY MAJOR FUNCTION BASE INITIATION.

4.50.1 Elevon, Speed Brake, and Rudder Command Compensation

The actuator command compensation function shall consist of applying biases and scale factors to convert the aerosurface position commands from engineering units to VDC. The outputs shall consist of four redundant compensated commands for each of the following actuators:

- A. Left inboard elevon
- B. Left outboard elevon
- C. Right inboard elevon
- D. Right outboard elevon
- E. Speed brake
- F. Rudder

Prior to performing the compensation function, the DAP position commands for the left and right outboard elevons and the rudder shall be summed with the structural program test commands as follows:

$$DLOBPC = DLOBPC + LOB_SPTI$$

$$DROBPC = DROBPC + ROB_SPTI$$

$$DRPC = DRPC + RUD_SPTI$$

where

DLOBPC = LOB elevon position command (DEG)

DROBPC = ROB elevon position command (DEG)

DRPC = Rudder position command (DEG)

LOB_SPTI = Left outboard elevon SPTI (DEG)

ROB_SPTI = Right outboard elevon SPTI (DEG)

RUD_SPTI = Rudder SPTI (DEG)

Whenever the SPTI SOP is not processed, the structural program test commands shall be set to zero.

Provisions shall be made for unique scale factor and bias values for each aerosurface. The general compensation equation shall be as follows:

$$\text{COMPCMD} = \text{CMD CC} + \text{KC}$$

where

COMPCMD = Compensated command (VDC)

CMD = Actuator position command (DEG)

CC = Command compensation scale factor (VDC/DEG)

KC = Command compensation bias (VDC)

4.50.2 Nosewheel Steering Command Processing

The nosewheel steering command processing function shall compensate the AERO-JET DAP or GRTLS DAP command to the nosewheel steering by applying bias and scale factor terms. The output shall consist of two redundant compensated commands. The compensation equation shall be as follows:

$$\text{DNW}(1) = \text{DNWC CCNW} + \text{KCNW}$$

$$\text{DNW}(2) = \text{DNW}(1)$$

where

DNW(1) = Compensated nosewheel steering 1 command (VDC)

DNW(2) = Compensated nosewheel steering 2 command (VDC)

DNWC = AERO-JET DAP or GRTLS DAP nosewheel steering command (DEG)

CCNW = Nosewheel command compensation scale factor (VDC/DEG)

KCNW = Nosewheel command compensation bias (VDC)

4.50.3 Body Flap Command Processing

The body flap command processing function shall consist of first determining if the body flap is enabled and then generating body flap command discretes. The body flap activate signal shall be used to determine which body flap pilot valve is to be enabled and commanded up/down. For each pilot valve activated by BF CMD RM or HYD THERM COND, set to “1” only when the flight control body flap command is nonzero. The body flap up/down commands shall then be processed to generate body flap command discretes as follows:

Body Flap Input Command	Body Flap Up/Down Discrete Commands	
	Up	Down
0	0	0
-1 (up)	1	0
+1 (down)	0	1

The enable, up, and down discretes for the body flap pilot valves not activated shall be set to “0”.

The body flap hold command function shall be processed after the DAP body flap command processing function; and any existing DAP body flap commands shall be maintained in addition to the body flap hold commands generated by the body flap hold command function.

The body flap hold command function shall consist of first determining if the BF CMD RM body flap hold command (BFCH) is not equal to zero. When the body flap hold command is not equal to zero, the body flap hold pilot valve enable command (BFHLD(1) or BFHLD(2)) shall be used to determine which pilot valve is to be enabled and commanded up/down. The BF CMD RM body flap hold commands shall then be processed to generate body flap hold command discretes as follows:

BF_CMD_RM Body Flap HOLD COMMAND Input	Body Flap Up/Down Discrete Commands UP DOWN
0	DAP COMMANDED BODY FLAP
-1 (UP)	1 DAP COMMAND
+1 (DOWN)	DAP COMMAND 1

4.50.4 Aero Actuator Bypass/Reset Processing

The actuator bypass/reset processing function shall generate bypass and reset secondary channel commands to the elevons, rudder, and speed brake actuators. The FCS channel switch override requests from the GN&C SW RM principal function shall be monitored on an actuator channel basis. The requests shall be processed only when the switch position has changed. The channel switch in the “OVERRIDE” position shall result in all elevon, rudder, and speed brake actuator reset discretes for that channel being set to the “1” state. These shall remain unchanged until the “OVERRIDE” switch position is removed, at

which time all reset discrettes for that channel shall be reset to the “zero” state. Each of the reset discrettes for all aerosurfaces shall be set to the “zero” state, when terminating the Aerosurface Actuator SOP at the SSME Stow Complete Event (Event 43B) or transitioning to GN&C OPS 9. All elevon, rudder, and speed brake actuator bypass discrettes for each secondary channel shall be set to the state command during GN&C OPS 9 or OPS 8 checkpoint processing, and shall be sent to the actuators at the cyclic I/O processing rate.

4.50.5 Supplemental Information

The initialization logic assumes that the rudder and speedbrake position feedbacks are successfully read. If none of the four redundant feedbacks are available (due to commfaults, for example), the rudder and speedbrake will be initialized based on their last known major function base feedback (actively processed in OPS 8 and OPS 3). If a valid major function base value does not exist (OPS 3/8 not previously executed or no feedbacks ever available during execution, or major function base overlaid), the speedbrake will be commanded to 44.35 degrees and the rudder will be commanded to 0 degrees. These values correspond to a declared value of 0 VDC for each selected feedback.

TABLE 4.50-2. INPUT FUNCTIONAL PARAMETERS FOR AEROSURFACE ACTUATOR COMMAND SOP (G4.50)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BFCH	V90J6421C	BODY FLAP HOLD COMMAND	BF CMD RM					
BFHLD(1)	V90X6422X	BODY FLAP PILOT VLV 1 HOLD CMD ENA	BF CMD RM		BD			
BFHLD(2)	V90X6423X	BODY FLAP PILOT VLV 2 HOLD CMD ENA	BF CMD RM		BD			
BFPVE(1)	V90X6430XA	ENABLE BODY FLAP PILOT VALVE-1	BF CMD RM				92354	
BFPVE(1)	V90X6430XB	ENABLE BODY FLAP PILOT VALVE-1	HYD THERMAL COND					
BFPVE(2)	V90X6431XA	ENABLE BODY FLAP PILOT VALVE-2	BF CMD RM				92354	
BFPVE(2)	V90X6431XB	ENABLE BODY FLAP PILOT VALVE-2	HYD THERMAL COND					
BFPVE(3)	V90X6432XA	ENABLE BODY FLAP PILOT VALVE-3	BF CMD RM				92354	
BFPVE(3)	V90X6432XB	ENABLE BODY FLAP PILOT VALVE-3	HYD THERMAL COND					
DBFRC	V90H1580CA	BODY FLAP DEFLECTION CMD	GRTLS DAP				93064D	
DBFRC	V90H1580CB	BODY FLAP DEFLECTION CMD	ASC DAP				93064D	
DBFRC	V90H1580CC	BODY FLAP DEFLECTION CMD	AEROJET DAP				93017G	*
DBFRC	V90H1580CD	BODY FLAP DEFLECTION CMD	HYD THERMAL COND					
DLIBPC	V90H1734CA	LIB ELEVON POSITION CMD	ASC DAP	DEG				
DLIBPC	V90H1734CB	LIB ELEVON POSITION CMD	AEROJET DAP	DEG				
DLIBPC	V90H1734CC	LIB ELEVON POSITION CMD	HYD THERMAL COND	DEG				
DLIBPC	V90H1734CD	LIB ELEVON POSITION CMD	GRTLS DAP	DEG				
DLOBPC	V90H1735CA	LOB ELEVON POSITION CMD	ASC DAP	DEG				
DLOBPC	V90H1735CB	LOB ELEVON POSITION CMD	AEROJET DAP	DEG				
DLOBPC	V90H1735CC	LOB ELEVON POSITION CMD	HYD THERMAL COND	DEG				
DLOBPC	V90H1735CD	LOB ELEVON POSITION CMD	GRTLS DAP	DEG				
DNWC	V90H1672CA	NOSEWHEEL DEFLECTION CMD	AEROJET DAP	DEG			93017G	*
DNWC	V90H1672CB	NOSEWHEEL DEFLECTION CMD	GRTLS DAP	DEG			89889H	
DRIBPC	V90H1737CA	RIB ELEVON POSITION CMD	ASC DAP	DEG				
DRIBPC	V90H1737CB	RIB ELEVON POSITION CMD	AEROJET DAP	DEG				
DRIBPC	V90H1737CC	RIB ELEVON POSITION CMD	HYD THERMAL COND	DEG				
DRIBPC	V90H1737CD	RIB ELEVON POSITION CMD	GRTLS DAP	DEG				
DROBPC	V90H1738CA	ROB ELEVON POSITION CMD	ASC DAP	DEG				
DROBPC	V90H1738CB	ROB ELEVON POSITION CMD	AEROJET DAP	DEG				
DROBPC	V90H1738CC	ROB ELEVON POSITION CMD	HYD THERMAL COND	DEG				
DROBPC	V90H1738CD	ROB ELEVON POSITION CMD	GRTLS DAP	DEG				
DRPC	V90R1550CA	RATE LIMITED RUDDER CMD	GRTLS DAP	DEG				
DRPC	V90R1550CB	RATE LIMITED RUDDER CMD	ASC DAP	DEG				
DRPC	V90R1550CC	RATE LIMITED RUDDER CMD	AEROJET DAP	DEG			93017G	*
DRPC	V90R1550CD	RATE LIMITED RUDDER CMD	HYD THERMAL COND	DEG				
DSBPC	V90R1560CA	RATE LIMITED SPDBK CMD	GRTLS DAP	DEG				
DSBPC	V90R1560CB	RATE LIMITED SPDBK CMD	ASC DAP	DEG				
DSBPC	V90R1560CC	RATE LIMITED SPDBK CMD	AEROJET DAP	DEG			93017G	*
DSBPC	V90R1560CD	RATE LIMITED SPDBK CMD	HYD THERMAL COND	DEG				
LOB_SPTI	V90H3243C	LEFT OUTBOARD ELEVON SPTI	SPTI SOP	DEG			79994C	
MM_CODE_301/MM_301	V90X8183X	MAJOR MODE 301 FLAG	MSC				93064D	
PREP_SSMES	V90X8373X	PREP SSME'S FOR LIFTOFF FLAG	R/S LCH SEQ		BD		93017G	*
ROB_SPTI	V90H3242C	RIGHT OUTBOARD ELEVON SPTI	SPTI SOP	DEG			79994C	
RSTSW(1)	V90X5201XB	SEL FCS RESET/OVERRIDE SW CHAN 1	GN&C SW RM				93017G	*
RSTSW(2)	V90X5211XB	SEL FCS RESET/OVERRIDE SW CHAN 2	GN&C SW RM				93017G	*
RSTSW(3)	V90X5221XB	SEL FCS RESET/OVERRIDE SW CHAN 3	GN&C SW RM				93017G	*

TABLE 4.50-2. INPUT FUNCTIONAL PARAMETERS FOR AEROSURFACE ACTUATOR COMMAND SOP (G4.50)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RSTSW(4)	V90X5231XB	SEL FCS RESET/OVERRIDE SW CHAN 4	GN&C SW RM				93017G	*
RUD_SPTI	V90H3241C	RUDDER SPTI	SPTI SOP	DEG			79994C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.50-3. OUTPUT FUNCTIONAL PARAMETERS FROM AEROSURFACE ACTUATOR COMMAND SOP (G4.50)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BYPLIB(1)	V79K3221X	LEFT INBD ELEVON ACTR 1 BYPASS	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPLIB(2)	V79K3223X	LEFT INBD ELEVON ACTR 2 BYPASS	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPLIB(3)	V79K3225X	LEFT INBD ELEVON ACTR 3 BYPASS	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPLIB(4)	V79K3227X	LEFT INBD ELEVON ACTR 4 BYPASS	ASA 4 DL FMT 21/1 DL FMT 23/1		BD		93017G	*
BYPLOB(1)	V79K3231X	LEFT OTBD ELEVON ACTR 1 BYPASS	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPLOB(2)	V79K3233X	LEFT OTBD ELEVON ACTR 2 BYPASS	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPLOB(3)	V79K3235X	LEFT OTBD ELEVON ACTR 3 BYPASS	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPLOB(4)	V79K3237X	LEFT OTBD ELEVON ACTR 4 BYPASS	ASA 4 DL FMT 21/1 DL FMT 23/1		BD		93017G	*
BYPRIB(1)	V79K3241X	RIGHT INBD ELEVON ACTR 1 BYPASS	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPRIB(2)	V79K3243X	RIGHT INBD ELEVON ACTR 2 BYPASS	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPRIB(3)	V79K3245X	RIGHT INBD ELEVON ACTR 3 BYPASS	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPRIB(4)	V79K3247X	RIGHT INBD ELEVON ACTR 4 BYPASS	ASA 4 DL FMT 21/1 DL FMT 23/1		BD		93017G	*
BYPROB(1)	V79K3251X	RIGHT OTBD ELEVON ACTR 1 BYPASS	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPROB(2)	V79K3253X	RIGHT OTBD ELEVON ACTR 2 BYPASS	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
BYPROB(3)	V79K3255X	RIGHT OTBD ELEVON ACTR 3 BYPASS	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*

TABLE 4.50-3. OUTPUT FUNCTIONAL PARAMETERS FROM AEROSURFACE ACTUATOR COMMAND SOP (G4.50)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BYPROB(4)	V79K3257X	RIGHT OTBD ELEVON ACTR 4 BYPASS	ASA 4		BD		93017G	*
			DL FMT 21/1					
			DL FMT 23/1					
BYPRUD(1)	V79K3365X	RUDDER BYPASS 1	ASA 1		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
BYPRUD(2)	V79K3366X	RUDDER BYPASS 2	ASA 2		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
BYPRUD(3)	V79K3367X	RUDDER BYPASS 3	ASA 3		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
BYPRUD(4)	V79K3368X	RUDDER BYPASS 4	ASA 4		BD		93017G	*
			DL FMT 21/1					
			DL FMT 23/1					
BYPSB(1)	V79K3375X	SPEED BRAKE BYPASS 1	ASA 1		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
BYPSB(2)	V79K3376X	SPEED BRAKE BYPASS 2	ASA 2		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
BYPSB(3)	V79K3377X	SPEED BRAKE BYPASS 3	ASA 3		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
BYPSB(4)	V79K3378X	SPEED BRAKE BYPASS 4	ASA 4		BD		93017G	*
			DL FMT 21/1					
			DL FMT 23/1					
DBFDOWN(1)	V57K0302X	BODY FLAP DOWN CMD 1	ASA 1		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
DBFDOWN(2)	V57K0402X	BODY FLAP DOWN CMD 2	ASA 2		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
DBFDOWN(3)	V57K0502X	BODY FLAP DOWN CMD 3	ASA 3		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
DBFENBL(1)	V57K0300X	BODY FLAP ENABLE CMD 1	ASA 1		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
DBFENBL(2)	V57K0400X	BODY FLAP ENABLE CMD 2	ASA 2		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
DBFENBL(3)	V57K0500X	BODY FLAP ENABLE CMD 3	ASA 3		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					

TABLE 4.50-3. OUTPUT FUNCTIONAL PARAMETERS FROM AEROSURFACE ACTUATOR COMMAND SOP (G4.50)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DBFUP(1)	V57K0301X	BODY FLAP UP CMD 1	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
DBFUP(2)	V57K0401X	BODY FLAP UP CMD 2	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
DBFUP(3)	V57K0501X	BODY FLAP UP CMD 3	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
DELIB(1)	V58K0820C	L INBD ELEVON CMD 1	ASA 1 DL FMT 21/B DL FMT 23/B	VDC	AMB		93017G	*
DELIB(2)	V58K0821C	L INBD ELEVON CMD 2	ASA 2 TLM	VDC	AMB			
DELIB(3)	V58K0822C	L INBD ELEVON CMD 3	ASA 3 TLM	VDC	AMB			
DELIB(4)	V58K0823C	L INBD ELEVON CMD 4	ASA 4 TLM	VDC	AMB			
DELOB(1)	V58K0870C	L OUTBD ELEVON CMD 1	ASA 1 DL FMT 21/B DL FMT 23/B	VDC	AMB		93017G	*
DELOB(2)	V58K0871C	L OUTBD ELEVON CMD 2	ASA 2 TLM	VDC	AMB			
DELOB(3)	V58K0872C	L OUTBD ELEVON CMD 3	ASA 3 TLM	VDC	AMB			
DELOB(4)	V58K0873C	L OUTBD ELEVON CMD 4	ASA 4 TLM	VDC	AMB			
DERIB(1)	V58K0920C	R INBD ELEVON CMD 1	ASA 1 DL FMT 21/B DL FMT 23/B	VDC	AMB		93017G	*
DERIB(2)	V58K0921C	R INBD ELEVON CMD 2	ASA 2 TLM	VDC	AMB			
DERIB(3)	V58K0922C	R INBD ELEVON CMD 3	ASA 3 TLM	VDC	AMB			
DERIB(4)	V58K0923C	R INBD ELEVON CMD 4	ASA 4 TLM	VDC	AMB			
DEROB(1)	V58K0970C	R OUTBD ELEVON CMD 1	ASA 1 DL FMT 21/B DL FMT 23/B	VDC	AMB		93017G	*
DEROB(2)	V58K0971C	R OUTBD ELEVON CMD 2	ASA 2 TLM	VDC	AMB			
DEROB(3)	V58K0972C	R OUTBD ELEVON CMD 3	ASA 3 TLM	VDC	AMB			
DEROB(4)	V58K0973C	R OUTBD ELEVON CMD 4	ASA 4 TLM	VDC	AMB			

TABLE 4.50-3. OUTPUT FUNCTIONAL PARAMETERS FROM AEROSURFACE ACTUATOR COMMAND SOP (G4.50)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DNW(1)	V51K0750CA	NOSE WHEEL STEERING 1 CMD	DL FMT 21/1 FWD RCS DSC SCB	VDC	AMB		93017G	*
DNW(2)	V51K0751CA	NOSE WHEEL STEERING 2 CMD	SCB	VDC	AMB		89889H	
DR(1)	V57K0140C	RUDDER CMD 1	ASA 1 DL FMT 21/B DL FMT 23/B	VDC	AMB		93017G	*
DR(2)	V57K0141C	RUDDER CMD 2	ASA 2 TLM	VDC	AMB			
DR(3)	V57K0142C	RUDDER CMD 3	ASA 3 TLM	VDC	AMB			
DR(4)	V57K0143C	RUDDER CMD 4	ASA 4 TLM	VDC	AMB			
DSB(1)	V57K0240C	SPEED BRAKE CMD 1	ASA 1 DL FMT 21/B DL FMT 23/B	VDC	AMB		93017G	*
DSB(2)	V57K0241C	SPEEDBRAKE CMD 2	ASA 2 TLM	VDC	AMB			
DSB(3)	V57K0242C	SPEEDBRAKE CMD 3	ASA 3 TLM	VDC	AMB			
DSB(4)	V57K0243C	SPEEDBRAKE CMD 4	ASA 4 TLM	VDC	AMB			
RSTLIB(1)	V79K3220X	LEFT INBD ELEVON ACTR 1 RESET	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTLIB(2)	V79K3222X	LEFT INBD ELEVON ACTR 2 RESET	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTLIB(3)	V79K3224X	LEFT INBD ELEVON ACTR 3 RESET	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTLIB(4)	V79K3226X	LEFT INBD ELEVON ACTR 4 RESET	ASA 4 DL FMT 21/1 DL FMT 23/1		BD		93017G	*
RSTLOB(1)	V79K3230X	LEFT OTBD ELEVON ACTR 1 RESET	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTLOB(2)	V79K3232X	LEFT OTBD ELEVON ACTR 2 RESET	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTLOB(3)	V79K3234X	LEFT OTBD ELEVON ACTR 3 RESET	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTLOB(4)	V79K3236X	LEFT OTBD ELEVON ACTR 4 RESET	ASA 4 DL FMT 21/1 DL FMT 23/1		BD		93017G	*

TABLE 4.50-3. OUTPUT FUNCTIONAL PARAMETERS FROM AEROSURFACE ACTUATOR COMMAND SOP (G4.50)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RSTRIB(1)	V79K3240X	RIGHT INBD ELEVON ACTR 1 RESET	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTRIB(2)	V79K3242X	RIGHT INBD ELEVON ACTR 2 RESET	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTRIB(3)	V79K3244X	RIGHT INBD ELEVON ACTR 3 RESET	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTRIB(4)	V79K3246X	RIGHT INBD ELEVON ACTR 4 RESET	ASA 4 DL FMT 21/1 DL FMT 23/1		BD		93017G	*
RSTROB(1)	V79K3250X	RIGHT OTBD ELEVON ACTR 1 RESET	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTROB(2)	V79K3252X	RIGHT OTBD ELEVON ACTR 2 RESET	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTROB(3)	V79K3254X	RIGHT OTBD ELEVON ACTR 3 RESET	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTROB(4)	V79K3256X	RIGHT OTBD ELEVON ACTR 4 RESET	ASA 4 DL FMT 21/1 DL FMT 23/1		BD		93017G	*
RSTRUD(1)	V79K3345X	RUDDER RESET 1	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTRUD(2)	V79K3346X	RUDDER RESET 2	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTRUD(3)	V79K3347X	RUDDER RESET 3	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTRUD(4)	V79K3348X	RUDDER RESET 4	ASA 4 DL FMT 21/1 DL FMT 23/1		BD		93017G	*
RSTSB(1)	V79K3355X	SPEED BRAKE RESET 1	ASA 1 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTSB(2)	V79K3356X	SPEED BRAKE RESET 2	ASA 2 DL FMT 21/A DL FMT 23/A		BD		93017G	*
RSTSB(3)	V79K3357X	SPEED BRAKE RESET 3	ASA 3 DL FMT 21/A DL FMT 23/A		BD		93017G	*

TABLE 4.50-3. OUTPUT FUNCTIONAL PARAMETERS FROM AEROSURFACE ACTUATOR COMMAND SOP (G4.50)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RSTSB(4)	V79K3358X	SPEED BRAKE RESET 4	ASA 4		BD		93017G	*
			DL FMT 21/1					
			DL FMT 23/1					
	V72M8713P	MDM FA01 DSCR OUT SET	CD 02 CH 1				93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
	V72M8716P	MDM FA01 DSCR OUT SET	CD 10 CH 1				93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
	V72M8733P	MDM FA02 DSCR OUT SET	CD 02 CH 1				93017G	*
		DL FMT 21/A						
		DL FMT 23/A						
V72M8736P	MDM FA02 DSCR OUT SET	CD 10 CH 1				93017G	*	
		DL FMT 21/A						
		DL FMT 23/A						
V72M8753P	MDM FA03 DSCR OUT SET	CD 02 CH 1				93017G	*	
		DL FMT 21/A						
		DL FMT 23/A						
V72M8756P	MDM FA03 DSCR OUT SET	CD 10 CH 1				93017G	*	
		DL FMT 21/A						
		DL FMT 23/A						
V72M8773P	MDM FA04 DSCR OUT SET	CD 02 CH 1				93017G	*	
		DL FMT 21/1						
		DL FMT 23/1						

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
 (HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec

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TABLE 4.50-4. AEROSURFACE ACTUATOR COMMAND SOP (G4.50) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
CNW	V97U3970C	VDC/DEG	F	S	D	X	G4.50	00	ZF5	90014G	
KCNW	V97U4150C	VDC	F	S	D	X	G4.50	00	ZF5	90014G	
MODIFIED_NWS	V97U1471C	ND	D		L	C	G4.50 G4.59	00	ZF5	90014G	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.50-5. AEROSURFACE ACTUATOR COMMAND SOP (G4.50) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
CCLIB COMP SCALE FACTOR - LIB ELEV CMD	V97U3902C	00	+1.7780	E-01	VDC/DEG	F	S	X G4.50	90109D	
CCLOB COMP SCALE FACTOR - LOB ELEV CMD	V97U3906C	00	+1.7760	E-01	VDC/DEG	F	S	X G4.50	90109D	
CCR COMP SCALE FACTOR - RUDDER CMD	V97U3910C	00	+1.81	E-01	VDC/DEG	F	S	X G4.50	90109D	
CCRIB COMP SCALE FACTOR - RIB ELVN CMD	V97U3914C	00	+1.7780	E-01	VDC/DEG	F	S	X G4.50	90109D	
CCROB COMP SCALE FACTOR - ROB ELVN CMD	V97U3918C	00	+1.7760	E-01	VDC/DEG	F	S	X G4.50	90109D	
CCSB COMP SCALE FACTOR - SP BK CMD	V97U3922C	00	+9.2170	E-02	VDC/DEG	F	S	X G4.50	90109D	
DSB_CLOSED SPEEDBRAKE CLOSED CMD	V97U2425C	00	-9.9	E+00	DEG	F	S	C G4.176 G4.227 G4.36 G4.50	89674E	
KCLIB COMP BIAS - LIB ELVN CMD	V97U4013C	00	+1.3585	E+00	VDC	F	S	X G4.50	90109D	
KCLOB COMP BIAS - LOB ELVN CMD	V97U4017C	00	+1.381	E+00	VDC	F	S	X G4.50	90109D	
KCR COMP BIAS - RUDDER CMD	V97U4021C	00	+0.0	E+00	VDC	F	S	X G4.50	90109D	
KCRIB COMP BIAS - RIB ELVN CMD	V97U4026C	00	+1.3585	E+00	VDC	F	S	X G4.50	90109D	
KCROB COMP BIAS - ROB ELVN CMD	V97U4030C	00	+1.3810	E+00	VDC	F	S	X G4.50	90109D	
KCSB COMP BIAS - SP BK CMD	V97U4034C	00	-4.0876	E+00	VDC	F	S	X G4.50	90109D	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.50-6. AEROSURFACE ACTUATOR COMMAND SOP (G4.50) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.52 HYDRAULIC SYSTEM SOP

The purpose of the Hydraulic System (HYD) SOP principal function shall be to monitor the selected hydraulic system pressures and hydraulic system data good flags to determine the fail status of each hydraulic system and the total number of good hydraulic systems. The HYD SOP function shall also monitor main gear/door and nosewheel gear/door uplock discretes. The HYD SOP shall be processed after Selection Filter and prior to ASC DAP, AERO-JET DAP, GRTLS DAP, ADTA SOP, and E/L EV AN PROC. The HYD SOP shall be processed at the 25 Hz rate in MM 101, 102 and through MECO_CONFIRMED in MM 103, at which time the execution rate shall be 6.25 Hz in OPS 1 and in OPS 3. The HYD SOP shall operate at 6.25 Hz in MM 301 to 303 and at 25 Hz in MM 304 and 305. In OPS 6 the processing rate shall be 25.0 Hz.

The HYD SOP shall monitor the hydraulic system data good flags from Selection Filter. When a system data good flag indicates the "1" state (data good), the selected pressure from the system shall be used. When a data good flag indicates the "zero" state (data bad), the previous cycle pressure data shall be used.

For each hydraulic system, the HYD SOP shall determine whether the fail status is to be determined automatically or by manual input. If the automatic flag is in the "1" state (TRUE), the HYD SOP shall then compare the hydraulic system pressure (as determined above) to a lower limit (HYPLOLMT). If the pressure measures less than this limit for HSP_CYC_LMT cycles, the associated hydraulic system fail flag shall be set to the "1" state, indicating a low pressure fail condition. If the pressure measurement equals or exceeds the lower limit, the hydraulic system fail flag shall be reset to the "zero" state.

If the automatic flag is in the "zero" state, the hydraulic system fail flag shall be set on the basis of the hydraulic deselect discrete. If the deselect discrete is in the "zero" state, the hydraulic system fail flag shall be set to the "1" state to indicate a fail condition; otherwise the fail flag shall be set to the "zero" state.

The three hydraulic system fail flags shall be outputted to the ASC DAP, AERO-JET DAP, LDG GEAR VLV CNTL and GRTLS DAP. In addition, the total number of good systems shall be determined by subtracting the hydraulic systems failed from the total number of hydraulic systems. This indication shall be outputted to the AERO-JET DAP, MPS TVC CMD SOP, and the GRTLS DAP.

The HYD SOP shall monitor the uplock discretes and their associated commfaults for the main landing gear/door and nosewheel gear/door to determine a "Gear Not Up" condition. The "Gear Not Up" condition will be said to exist whenever three or more of the six gear/door discretes which are not commfaulted indicate the "Not Uplocked" state. The six discretes and the settings which indicate the "Not Uplocked" state are:

LMG UPLOCKED = 0	LMG DOOR UPLOCKED = 1
RMG UPLOCKED = 0	RMG DOOR UPLOCKED = 1
NLG UPLOCKED = 0	NLG DOOR UPLOCKED = 0

HUD_GEAR_TRANSIT flag is set to the "1" state and latched when the "Gear Not Up" condition exists.

If the total number of good hydraulic systems indicates one or more failed systems and if the "Gear Not Up" condition exists, the UPLOCK_REL flag shall be set to the "1" state and latched. Once UPLOCKED_REL has been set for DOWN_DELAY number of cycles, the DOWNLOCK discrete shall be set to the "1" state and latched.

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If $ALT_WHEELS \leq GR_DPY_ALT$ and if the “Gear Not Up” condition exists, the MLY_GEAR_NOTUP discrete shall be set to the “1” state and latched.

The HYD SOP interfaces are indicated on the functional block diagram on Figure 4.52-1. The parameter initialization requirements are shown in Table 4.52-1. The IDD inputs and outputs are listed in Tables 4.52-2 and 4.52-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.52-4. K-loads are listed in Table 4.52-5. Constants are listed in Table 4.52-6.

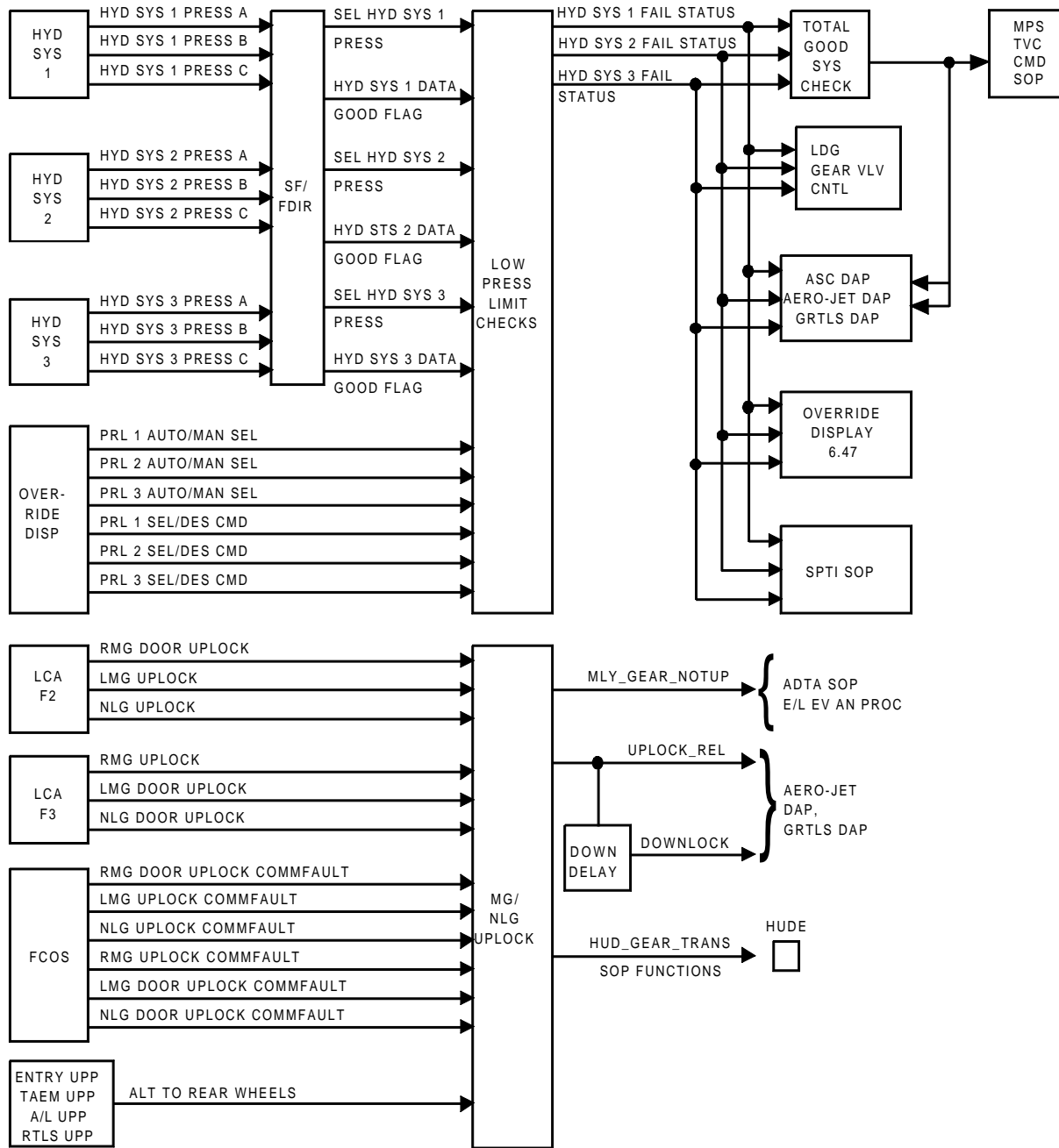


FIGURE 4.52-1. Hyd SOP Functional Block Diagram

Table 4.52-1. HYD SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
HYPLOLMT	V97U4010C	HYD SYS LOW PRESSURE LIMIT	D	FLOAT PT			VDC
HSP_CYC_LMT	V97U4009C	HYD SYS LOW PRESSURE CYCLE LIMIT	D	INTEGER			
DOWN_DELAY	V97U4248C	DOWNLOCK DELAY NUMBER CYCLES	D	INTEGER			CYCLES
GR_DPY_ALT	V96U8096C	GEAR DEPLOY ALTITUDE	D	FLOAT PT			
MPLY_GEAR_NOTUP	V90X7500X	LANDING GEAR RELEASED		DISCRETE			
UPLOCK_REL	V96X3010X	UPLOCK RELEASE FLAG		DISCRETE			
DOWNLOCK	V96X3011X	DOWNLOCK FLAG		DISCRETE			
HYDRFAIL(1)	V96X3005X	HYDR SYS 1 FAIL STATUS		DISCRETE			
HYDRFAIL(2)	V96X3006X	HYDR SYS 2 FAIL STATUS		DISCRETE			
HYDRFAIL(3)	V96X3007X	HYDR SYS 3 FAIL STATUS		DISCRETE			
N_HYDRAULIC_GOOD	V96Q3001C	HYDR SYS GOOD STATUS		INTEGER			

TABLE 4.52-2. INPUT FUNCTIONAL PARAMETERS FOR HYDRAULIC SYSTEM SUBSYSTEM OPERATING PROGRAM (G4.52)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
ALT_WHEELS	V95H0165CA	ALT TO REAR WHEELS/NAV BASE(ENTRY)	RTLS UPP	FT			93017G	*
ALT_WHEELS	V95H0165CB	ALT TO REAR WHEELS/NAV BASE(ENTRY)	ENT UPP	FT	DPL		93017G	*
ALT_WHEELS	V95H0165CC	ALT TO REAR WHEELS/NAV BASE(ENTRY)	TAEM UPP	FT	DPL		93017G	*
ALT_WHEELS	V95H0165CD	ALT TO REAR WHEELS/NAV BASE(ENTRY)	A/L UPP	FT	DPL		93017G	*
LMGDOORCF	V91X8103X	LMG DOOR UNLOCKED COMMFAULT	FCOS					
LMGUPLOCKCF	V91X8100X	LMG UNLOCKED COMMFAULT	FCOS					
LMG_UPLK	V51X0100X	LMG UNLOCKED	LCA F2		BD		93017G	*
NLGDOORCF	V91X8110X	NLG DOOR UNLOCKED COMMFAULT	FCOS					
NLGUPLOCKCF	V91X8111X	NLG UNLOCKED COMMFAULT	FCOS					
NLG_UPLK	V51X0300X	NLG UNLOCKED	LCA F2		BD		93017G	*
RMGDOORCF	V91X8102X	RMG DOOR UNLOCKED COMMFAULT	FCOS					
RMGUPLOCKCF	V91X8101X	RMG UNLOCKED COMMFAULT	FCOS					
RMG_UPLK	V51X0200X	RMG UNLOCKED	LCA F3		BD		93017G	*
	V51X0116X	LMG DOOR UNLOCKED	LCA F3		BD		93017G	*
	V51X0216X	RMG DOOR UNLOCKED	LCA F2		BD		93017G	*
	V51X0310X	NLG DOOR UNLOCKED	LCA F3		BD		93017G	*
	V90P2547C	SEL HYD SYS 1 PRESSURE	SF	VDC			89854A	
	V90P2548C	SEL HYD SYS 2 PRESSURE	SF	VDC			89854A	
	V90P2549C	SEL HYD SYS 3 PRESSURE	SF	VDC			89854A	
	V90X2532X	HYD SYS 1 PRESSURE DATA GOOD	SF				89854A	
	V90X2533X	HYD SYS 2 PRESSURE DATA GOOD	SF				89854A	
	V90X2534X	HYD SYS 3 PRESSURE DATA GOOD	SF				89854A	
	V93X5320X	PRL 1 AUTO/MAN SELECT	OVERRIDE DISP		BD			
	V93X5321X	PRL 2 AUTO/MAN SELECT	OVERRIDE DISP		BD			
	V93X5322X	PRL 3 AUTO/MAN SELECT	OVERRIDE DISP		BD			
	V93X5330X	PRL 1 SEL/DES CMD	OVERRIDE DISP		BD			
	V93X5331X	PRL 2 SEL/DES CMD	OVERRIDE DISP		BD			
	V93X5332X	PRL 3 SEL/DES CMD	OVERRIDE DISP		BD			

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.52-3. OUTPUT FUNCTIONAL PARAMETERS FROM HYDRAULIC SYSTEM SUBSYSTEM OPERATING PROGRAM
(G4.52)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DOWNLOCK	V96X3011X	DOWNLOCK FLAG	AEROJET DAP GRTLS DAP					
HUD_GEAR_TRANS	V72X4046X	HUD GEAR-IN-TRANSIT INDICATOR	HUDE1 HUDE2		BD			
HYDRFAIL(1)	V96X3005X	HYDR SYS 1 FAIL STATUS	AEROJET DAP ASC DAP DL FMT 21/1 DL FMT 23/1 GRTLS DAP LDG GEAR VLV CNTL OVERRIDE DISP SPTI SOP		BD		93017G	*
HYDRFAIL(2)	V96X3006X	HYDR SYS 2 FAIL STATUS	AEROJET DAP ASC DAP DL FMT 21/1 DL FMT 23/1 GRTLS DAP LDG GEAR VLV CNTL OVERRIDE DISP SPTI SOP		BD		93017G	*
HYDRFAIL(3)	V96X3007X	HYDR SYS 3 FAIL STATUS	AEROJET DAP ASC DAP DL FMT 21/1 DL FMT 23/1 GRTLS DAP LDG GEAR VLV CNTL OVERRIDE DISP SPTI SOP		BD		93017G	*
MLY_GEAR_NOTUP	V90X7500X	LANDING GEAR RELEASED	ADTA SOP E/L EV AN PROC					
N_HYDRAULIC_GOOD	V96Q3001C	HYDR SYS GOOD STATUS	AEROJET DAP DL FMT 21/1 DL FMT 23/1 GRTLS DAP MPS TVC CMD SOP		HXS		93017G	*
UNLOCK_REL	V96X3010X	UNLOCKED RELEASE FLAG	AEROJET DAP GRTLS DAP					
	V96M0143P	CGCB_MC163_FLAG_4	DL FMT 21/1 DL FMT 23/1				93017G	*

TABLE 4.52-3. OUTPUT FUNCTIONAL PARAMETERS FROM HYDRAULIC SYSTEM SUBSYSTEM OPERATING PROGRAM
(G4.52)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
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NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

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TABLE 4.52-4. HYDRAULIC SYSTEM SUBSYSTEM OPERATING PROGRAM (G4.52) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
DOWN_DELAY	V97U4248C	CYCLES	I	S	D	C	G4.52	00	ZSL	DC0691	
GR_DPY_ALT	V96U8096C	FT	F	S	D	P	G4.52	00	ZSL	DC0691	
HSP_CYC_LMT	V97U4009C	ND	I	S	D	C	G4.52	00	ZSL	DC0691	
HYPLOLMT	V97U4010C	VDC	F	S	D	A	G4.52	00	ZFL	DC0691	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.52-5. HYDRAULIC SYSTEM SUBSYSTEM OPERATING PROGRAM (G4.52) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.52-6. HYDRAULIC SYSTEM SUBSYSTEM OPERATING PROGRAM (G4.52) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.58 ENTRY/LANDING RCS COMMAND SOP

The purpose of the Entry/Landing RCS Command (E/L RCS CMD) SOP principal function shall be to convert AERO–JET DAP, PTI DRIVER and ABT CNTL SEQ RCS commands into dual ON signals for the reaction jet drivers. Also, an indication of which jets are being commanded shall be made available to RCS RM.

The E/L RCS CMD SOP shall be executed at the 25.0 Hz rate after the AERO–JET DAP and ABT CNTL SEQ. This function shall be operational in major modes 304 and 305.

Upon transition to MM 304, the E/L RCS Command SOP shall monitor the following:

- Major Mode (MM_CODE) from MSC
- Ground Relative Velocity Magnitude (REL_VEL_MAG) from ENT UPP
- RCS JET availability from RCS RM
- RCS + X jets (ABT_X_ON) from ABT CNTL SEQ
- 20 RCS NULL JETS ON CMD (ABT_20_NULL) from ABT CNTL SEQ
- RCS 1/2 ALL JET INHIBIT, RCS 3/4/5 ALL JET INHIBIT, AFT MANIFOLD 1/2 JET INH, AFT MANIFOLD 3/4/5 JET INH, and OMS/RCS INTERCONNECT COMPLETE flags from ABT OMS/RCS INTERCONNECT SEQ
- NEW JONLIST A from AERO–JET DAP and PTI DRIVER
- FWD_RCS_DUMP_ENABLE and FWD_RCS_DUMP_DURATION from OVERRIDE display

RCS jet locations and plume directions are shown in Figure 4.58–2.

A. Forward RCS

The Entry/Landing RCS Command SOP will monitor the forward RCS yaw jets' availability from RCS RM and FWD_RCS_DUMP_ENABLE discrete and FWD_RCS_DUMP_DURATION from OVERRIDE display in MM 304.

To maintain null burn effects, do the following:

1. For a single forward yaw jet made unavailable by RM, the lowest priority jet on the opposite side shall be commanded off.
2. For two forward jets on opposite sides of the vehicle made unavailable by RM, the two remaining jets shall be commanded on.
3. For two forward yaw jets on the same side of the vehicle made unavailable by RM, the two remaining jets shall be commanded off.

The forward yaw jet dump priorities are as follows:

DAP Jet. No.	Priority
F1L	1
F3L	2
F2R	1
F4R	2

Unavailable Jets	Corresponding Jet Commands
F1L	F4R – off
F3L	F4R – off
F2R	F3L – off
F4R	F3L – off
F1L and F3L	F2R and F4R – off
F1L and F2R	F3L and F4R – on
F1L and F4R	F3L and F2R – on
F3L and F2R	F1L and F4R – on
F3L and F4R	F1L and F2R – on
F2R and F4R	F1L and F3L – off

If the ground relative velocity magnitude is less than or equal to `FRCS_DUMP_START_VEL` and the `FWD_RCS_DUMP_ENABLE=(ON)` while in MM 304, the available forward yaw jets shall be commanded on. The `FWD_RCS_DUMP_COUNTER` shall monitor dump duration and shall be initialized to zero (0.0) and incremented by 80–msec increments if the dump is in progress with four jets and by 40–msec increments if the dump involves only two jets. The `FWD_RCS_TTG_SF` will be computed as the ratio of the counter increment (40, 80, 0 ms) to 80 msec. The forward RCS yaw jets will fire as long as the `FWD_RCS_DUMP_COUNTER` is less than or equal to the `FWD_RCS_DUMP_DURATION` and the dump initiation and enable conditions are true. Whenever the dump is stopped automatically (i.e., `FWD_RCS_DUMP_COUNTER > FWD_RCS_DUMP_DURATION` or at the transition to MM 305), `FWD_RCS_DUMP_ENABLE` shall be reset. The forward null jet dump shall be terminated when the `FWD_RCS_DUMP_ENABLE` discrete is off. This forward dump command logic shall be executed at 12.5 Hz on the RCS Command SOP cycle following AERO–JET DAP execution. The `FWD_RCS_DUMP_COUNTER` and `FWD_RCS_TTG_SF` shall be provided to `OVERRIDE` display to support display of forward RCS burn time.

B. Aft RCS

When all of the ABT CNTL SEQ abort flags indicate the “zero” state (no abort commands), the RCS output commands shall be set to the state of the DAP RCS commands (“1” state is on, “zero” state is off). The DAP input signals shall be processed to generate the discrete commands.

When any of the ABT CNTL SEQ abort flags indicate the “1” state, the RCS output commands shall be determined by processing Paragraphs C through F in the order listed. For each abort function, there exists an activation (abort flag becomes true) and deactivation (abort flag becomes false) procedure unique to its function. Each abort function can be re-executed; therefore, re-initialization of flags and counters (e.g., the RCS_CYC1 and RCS_CYC2 counters) used for each function is required at the completion of that function’s deactivation procedure.

C. The RCS_1/2_ALL_JET_INHIBIT_FLAG and the RCS_3/4/5_ALL_JET_INHIBIT_FLAG shall be processed as follows:

- When the RCS_1/2_ALL_JET_INHIBIT_FLAG and/or the RCS_3/4/5_ALL_JET_INHIBIT_FLAG indicates the “0” state, all RCS jets on the corresponding manifolds (see Table 4.58–1a) will be made available for ABT_20NULL and ABT_X_ON dump commands and DAP commands, subject to availability determined by the AFT_MANIFOLD_JET_INH_FLAGS in Paragraph D.
- When the RCS_1/2_ALL_JET_INHIBIT_FLAG and/or the RCS_3/4/5_ALL_JET_INHIBIT_FLAG indicates the “1” state, availability of RCS jets on the corresponding manifolds (see Table 4.58–1a) for ABT_20NULL and ABT_X_ON dump commands and DAP commands will be determined according to Table 4.58–1c. The rationale for the design of the table is as follows:

When an ALL_JET_INHIBIT_FLAG becomes true (“1” state), i.e., the availability of propellant to the jets is unknown, jets should not be fired either for dumps or for DAP commands. A delay of RCS_CYC2 cycles is necessary in the event that a dump was in progress when the ALL_JET_INHIBIT_FLAG becomes true. The one exception to this rule is the case in which the OMS/RCS_INTERCONNECT_COMPLETE_FLAG becomes true and the ALL_JET_INHIBIT_FLAG is true: in that case, no dump could have been in progress and the jets can be made unavailable immediately.

- If RCS jets were made unavailable to dump commands and DAP commands as a result of the processing of Table 4.58–1c, all RCS jet commands to the corresponding manifold jets will be set to the “0” state (see Table 4.58–1a), the ABT_20NULL and ABT_X_ON commands and DAP commands will not be processed for those manifold jets, and, if both ALL_JET_INHIBIT_FLAGS are true, the processing of the AFT_MANIFOLD_JET_INH_FLAGS (Paragraph D) will not be performed for those jets.

D. The AFT_MANIFOLD_1/2_JET_INH_FLAG and/or the AFT_MANIFOLD_3/4/5_JET_INH_FLAG shall be processed as follows:

- When the AFT_MANIFOLD_1/2_JET_INH_FLAG and/or the AFT_MANIFOLD_3/4/5_JET_INH_FLAG indicates the “0” state, all RCS jets on the corresponding manifolds (see Table 4.58–1b) will be made available for ABT_20NULL and ABT_X_ON dump commands.

- When the AFT_MANIFOLD_1/2_JET_INH_FLAG and/or the AFT_MANIFOLD_3/4/5_JET_INH_FLAG indicates the “1” state, availability of X jets on the corresponding manifolds (see Table 4.58–1b) for ABT_X_ON dump commands, and availability of Y and Z jets on the corresponding manifolds (see Table 4.58–1b) for ABT_20NULL dump commands will be determined according to Table 4.58–1d and 4.58–1e, respectively. The rationale for the design of the tables is as follows:

When an AFT_MANIFOLD_JET_INH_FLAG becomes true (“1” state), i.e. a valve failure has been detected indicating that the RCS jets on the corresponding manifolds are not correctly connected to the OMS propellant tanks, jets should not be fired for the dumps that are intended to assist in dumping OMS propellant. They may, however, be used for DAP commands. Delays of RCS_CYC1 cycles for the Y jets and RCS_CYC2 cycles for the X jets are necessary in the event that a dump was in progress when the AFT_MANIFOLD_JET_INHIBIT_FLAG became true. The one exception to this rule is the case in which the ABT_20NULL or ABT_X_ON flag becomes true and the AFT_MANIFOLD_INHIBIT_FLAG is true: in that case no dumps could have been in progress and the jets can be made unavailable immediately. No delays of unavailability are necessary for the Z jets, because the Z jets will not be requested to fire for the ABT_20NULL dump after the ABT_20NULL flag is set false.

E. When the ABT_X_ON flag indicates the “1” state (4 + X jets on), the RCS output commands to each of the available 4 + X thrusters, as determined by RCS RM, the ALL JET INHIBIT FLAGS and AFT MANIFOLD INHIBIT FLAGS, shall be set to the “1” state. If the ABT_20NULL is indicating the “0” state, the AFT_RCS_TTG_SF (initialized to 1.0) will be set to a value to adjust the aft RCS dump duration when a jet failure exists and the aft jet availability for the + X dump will also be updated to balance the propellant usage (see following AFT RCS JET FAILURES table below). Subsequently, when the ABT_X_ON flag changes from the “1” state to the “zero” state and the ABT_20NULL flag has not changed state, the 4 + X thrusters shall be set to the “zero” state. If the ABT_X_ON flag and the ABT_20NULL flag change from the “1” state to the “zero” state, the available 4 + X thrusters as determined by the RCS RM, the ALL JET INHIBIT FLAGS, and AFT MANIFOLD INHIBIT FLAGS, shall be commanded to the “1” state for RCS_CYC2 cycles and then shall be set to the “zero” state.

Upon transition into MM305, the RCS 4 + X dump shall be terminated.

AFT RCS JET FAILURES								
JET FAILURES				RCS OUTPUT DURING ABT_X_ON				AFT_RCS_TTG_SF
L3A	L1A	R1A	R3A	L3A	L1A	R1A	R3A	
A	A	A	A	ON	ON	ON	ON	1.0
UNA	A	A	A	OFF	ON	ON	OFF	0.5
A	UNA	A	A	ON	OFF	OFF	ON	0.5
A	A	UNA	A	ON	OFF	OFF	ON	0.5
A	A	A	UNA	OFF	ON	ON	OFF	0.5
UNA	UNA	A	A	OFF	OFF	ON	ON	1.0
UNA	A	UNA	A	OFF	ON	OFF	ON	0.5
UNA	A	A	UNA	OFF	ON	ON	OFF	0.5
A	UNA	UNA	A	ON	OFF	OFF	ON	0.5
A	UNA	A	UNA	ON	OFF	ON	OFF	0.5
A	A	UNA	UNA	ON	ON	OFF	OFF	1.0
UNA	UNA	UNA	A	OFF	OFF	OFF	ON	1.0
UNA	UNA	A	UNA	OFF	OFF	ON	OFF	1.0
UNA	A	UNA	UNA	OFF	ON	OFF	OFF	1.0
A	UNA	UNA	UNA	ON	OFF	OFF	OFF	1.0
UNA	UNA	UNA	UNA	OFF	OFF	OFF	OFF	1.0

UNA = Unavailable
A = Available
Note: The ABT_X_ON flag will never be in the "zero" state when the ABT_20NULL flag is in the "1" state.

F. The ABT_20NULL flag shall be processed as follows:

- When the ABT_20NULL flag indicates the "1" state (20 null jets on), the available, as indicated by the all jet inhibit flags, 8 aft Y and 12 aft Z jets shall be set to the DAP RCS commands for the RCS_CYC1 cycles and RCS_CYC2 cycles, respectively.
- Once RCS_CYC1 cycles have occurred, the available eight aft Y jets, as determined by RCS RM, the all jet inhibit flags, and the aft manifold inhibit flags, shall be set to the "1" state. If any of the Y jets is unavailable by RCS RM, its opposing jet shall be set to the "0" state. Any subsequent DAP commands to the Y jets in the "1" state will result in the setting of the opposing jets to the "0" state (see following list of the opposing jets).

If the DAP commands a jet that is turned off during a dump because its opposing jet is unavailable, then the DAP commanded jet shall be allowed to fire.

- Once RCS_CYC2 cycles have occurred, the available twelve aft Z jets, as determined by RCS RM, the all jet inhibit flags, and the aft manifold inhibit flags, shall be set to the “1” state. If any of the Z jets are unavailable by RCS RM, its opposing jet shall be set to the “0” state. Any subsequent DAP commands to the Z jets in the “1” state will result in the setting of the opposing jets to the “0” state (see the following list of the opposing jets). If the DAP commands a jet that is turned off during a dump because its opposing jet is unavailable, then the DAP commanded jet shall be allowed to fire.
- Once ABT_20NULL flag subsequently indicates the “zero” state (20 null jets off), the available, as determined by the ALL JET INHIBIT FLAGS, 12 aft Z jets and shall be set to the DAP RCS commands for RCS_CYC1 cycles.
- Once RCS_CYC1 has occurred, the available, as determined by the ALL JET INHIBIT FLAGS, 12 aft Z jets and the available, as determined by the ALL JET INHIBIT FLAGS, 8 aft Y jets shall be set to the DAP RCS commands.

NEW_JONLIST_A

<u>DAP Jet No.</u>	<u>Opposing Jet No. Output</u>
L4L_ON	RCS_ON A(23)
L2L_ON	RCS_ON A(24)
L3L_ON	RCS_ON A(25)
L1L_ON	RCS_ON A(26)
R4R_ON	RCS_ON A(19)
R2R_ON	RCS_ON A(20)
R3R_ON	RCS_ON A(21)
R1R_ON	RCS_ON A(22)
L4U_ON	RCS_ON A(33)
L2U_ON	RCS_ON A(34)
L1U_ON	RCS_ON A(35)
R4U_ON	RCS_ON A(36)
R2U_ON	RCS_ON A(37)
R1U_ON	RCS_ON A(38)
L4D_ON	RCS_ON A(27)
L2D_ON	RCS_ON A(28)
L3D_ON	RCS_ON A(29)
R4D_ON	RCS_ON A(30)
R2D_ON	RCS_ON A(31)
R3D_ON	RCS_ON A(32)

G. After completion of processing in any one or all of the previous steps, A, B, C, D, E, and/or F, the RCS commands (determined in the previous steps) shall be processed to generate dual output commands to the RCS thrusters. For each RCS thruster, there shall be two commands to the RJDs (the RJD AND’s the dual commands prior to firing a jet). The CMD “A” word shall be initially set to the logic “1” state, while the CMD “B” word shall be initially set to the logic “zero” state. At the first “ON” command, the CMD “A” word will go to “zero” for 40 ms and the CMD “B” word will go to and maintain a steady state “1”. The CMD “A” word will toggle at 40 ms intervals (40 ms “LOW” and 40 ms “HIGH”) as long as the jet is commanded “ON”. For a jet firing, the CMD “B” shall be maintained in the logic “1” state for a minimum

of 80 ms until commanded “OFF”; between firings CMD “B” shall be maintained at the logic “zero” state for a minimum of 80 ms.

The E/L RCS CMD SOP interfaces are indicated by the functional block diagram (Figure 4.58–1). The parameter initialization requirements are shown in Table 4.58–1. The IDD inputs and outputs are listed in Tables 4.58–2 and 4.58-3. Values for the I–loads are contained in the I–loads requirements document (JSC–19350); however, I–load definitions applicable to this principal function are listed in Table 4.58–4. K–loads are listed in Table 4.58-5. Constants are listed in Table 4.58–6.

The NEW_JONLIST signal name referenced in both the input table and in the Section 5 flow charts has the following equivalent names in the AERO–JET DAP, GRTLS DAP and PTI DRIVER, respectively:

<u>SOP</u>	<u>PTI DRIVER</u>	<u>AERO–JET DAP</u>	<u>GRTLS DAP</u>
NEW_JONLIST (19)		L4L_ON	L4L_ON
NEW_JONLIST (20)		L2L_ON	L2L_ON
NEW_JONLIST (21)		L3L_ON	L3L_ON
NEW_JONLIST (22)		L1L_ON	L1L_ON
NEW_JONLIST (23)		R4R_ON	R4R_ON
NEW_JONLIST (24)		R2R_ON	R2R_ON
NEW_JONLIST (25)		R3R_ON	R3R_ON
NEW_JONLIST (26)		R1R_ON	R1R_ON
NEW_JONLIST (27)		L4U_ON	L4U_ON
NEW_JONLIST (28)		L2U_ON	L2U_ON
NEW_JONLIST (29)		L1U_ON	L1U_ON
NEW_JONLIST (30)		R4U_ON	R4U_ON
NEW_JONLIST (31)		R2U_ON	R2U_ON
NEW_JONLIST (32)		R1U_ON	R1U_ON
NEW_JONLIST (33)		L4D_ON	L4D_ON
NEW_JONLIST (34)		L2D_ON	L2D_ON
NEW_JONLIST (35)		L3D_ON	L3D_ON
NEW_JONLIST (36)		R4D_ON	R4D_ON
NEW_JONLIST (37)		R2D_ON	R2D_ON
NEW_JONLIST (38)		R3D_ON	R3D_ON
NEW_JONLIST (4)	F1L_ON		
NEW_JONLIST (5)	F3L_ON		
NEW_JONLIST (6)	F2R_ON		
NEW_JONLIST (7)	F4R_ON		

Table 4.58-1a. All Jet Inhibit Table	
Manifold 1/2 JET INH	Manifold 3/4/5 JET INH
R1R	R3R
R2R	R4R
R2U	R4U
R1U	R3D
R2D	R4D
R1A	R3A
L2U	L4U
L1U	L3D
L2D	L4D
L1L	L3L
L2L	L4L
L1A	L3A

NOTE: If only one of the ALL_JET_INHIBIT_FLAGS is true, the corresponding AFT_MANIFOLD_JET_INH_FLAG will be true. Therefore, it is not necessary to include jets R3D and L3D in the 1/2 All Jet Inhibit Table, nor to include jets R1U and L1U in the 3/4/5 All Jet Inhibit Table.

Table 4.58-1b. Aft Manifold Jet Inhibit Table	
Manifold 1/2 JET INH	Manifold 3/4/5 JET INH
R1R	R3R
R2R	R4R
R2U	R4U
R1U	R1U*
R3D*	R3D
R2D	R4D
R1A	R3A
L2U	L4U
L1U	L1U*
L3D*	L3D
L2D	L4D
L1L	L3L
L2L	L4L
L1A	L3A

* These jets are included in order to maintain a balanced dump.

Table 4.58-1c. All Jet Inhibit Availability Table				
Inputs				Outputs
IC_CPLT_LAST	IC_CPLT	ALL_JET_INH_LAST	ALL_JET_INH	DUMP COMMANDS AND DAP COMMAND AVAILABILITY
ANY	ANY	ANY	0	AVAILABLE
1	ANY	0	1	A
1	ANY	1	1	B
0	1	ANY	1	UNAVAILABLE
0	0	0	1	A
0	0	1	1	B

LEGEND:

- IC_CPT_LAST – OMS/RCS_INTERCONNECT_COMPLETE_FLAG_LAST_PASS
- IC_CPLT – OMS/RCS_INTERCONNECT_COMPLETE_FLAG
- ALL_JET_INH_LAST – RCS_ALL_JET_INHIBIT_FLAG_LAST_PASS (1/2 or 3/4/5)
- ALL_JET_INH – RCS_ALL_JET_INHIBIT_FLAG (1/2 or 3/4/5)
- A – Available. Begin counter for condition B.
- B – If RCS_CYC2 cycles have occurred since condition A, jets will be made unavailable. Otherwise, maintain previous cycle's availability.

Table 4.58-1d. ABT_X_ON Availability Table				
Inputs				Outputs
ABT_X_ON_LAST_PASS	ABT_X_ON	MANF_INH_LAST	MANF_INH	DUMP COMMAND AVAILABILITY FOR X JETS
ANY	ANY	ANY	0	AVAILABLE
1	ANY	0	1	A
1	ANY	1	1	B
0	1	ANY	1	UNAVAILABLE
0	0	0	1	A
0	0	1	1	B

LEGEND:

- MANF_INH_LAST – AFT_MANIFOLD_JET_INH_FLAG_LAST_PASS (1/2 or 3/4/5)
- MANF_INH – AFT_MANIFOLD_JET_INH_FLAG (1/2 or 3/4/5)
- A – Available. Begin counter for condition B.
- B – If RCS_CYC2 cycles have occurred since condition A, jets will be made unavailable. Otherwise, maintain previous cycle's availability.

Table 4.58-1e. ABT_20NULL Availability Table					
Inputs				Outputs	
ABT_20NULL_LAST_PASS	ABT_20NULL	MANF_INH_LAST	MANF_INH	DUMP COMMAND AVAILABILITY	
				FOR Y JETS	FOR Z JETS
ANY	ANY	ANY	0	AVAILABLE	AVAILABLE
1	ANY	0	1	A	UNAVAILABLE
1	ANY	1	1	B	UNAVAILABLE
0	1	ANY	1	UNAVAILABLE	UNAVAILABLE
0	0	0	1	A	X
0	0	1	1	B	X

LEGEND:

- MANF_INH_LAST – AFT_MANIFOLD_JET_INH_FLAG_LAST_PASS (1/2 or 3/4/5)
- MANF_INH – AFT_MANIFOLD_JET_INH_FLAG (1/2 or 3/4/5)
- A – Available. Begin counter for condition B.
- B – If RCS_CYC1 cycles have occurred since condition A, jets will be made unavailable. Otherwise, maintain previous cycle's availability.
- X – Not applicable.

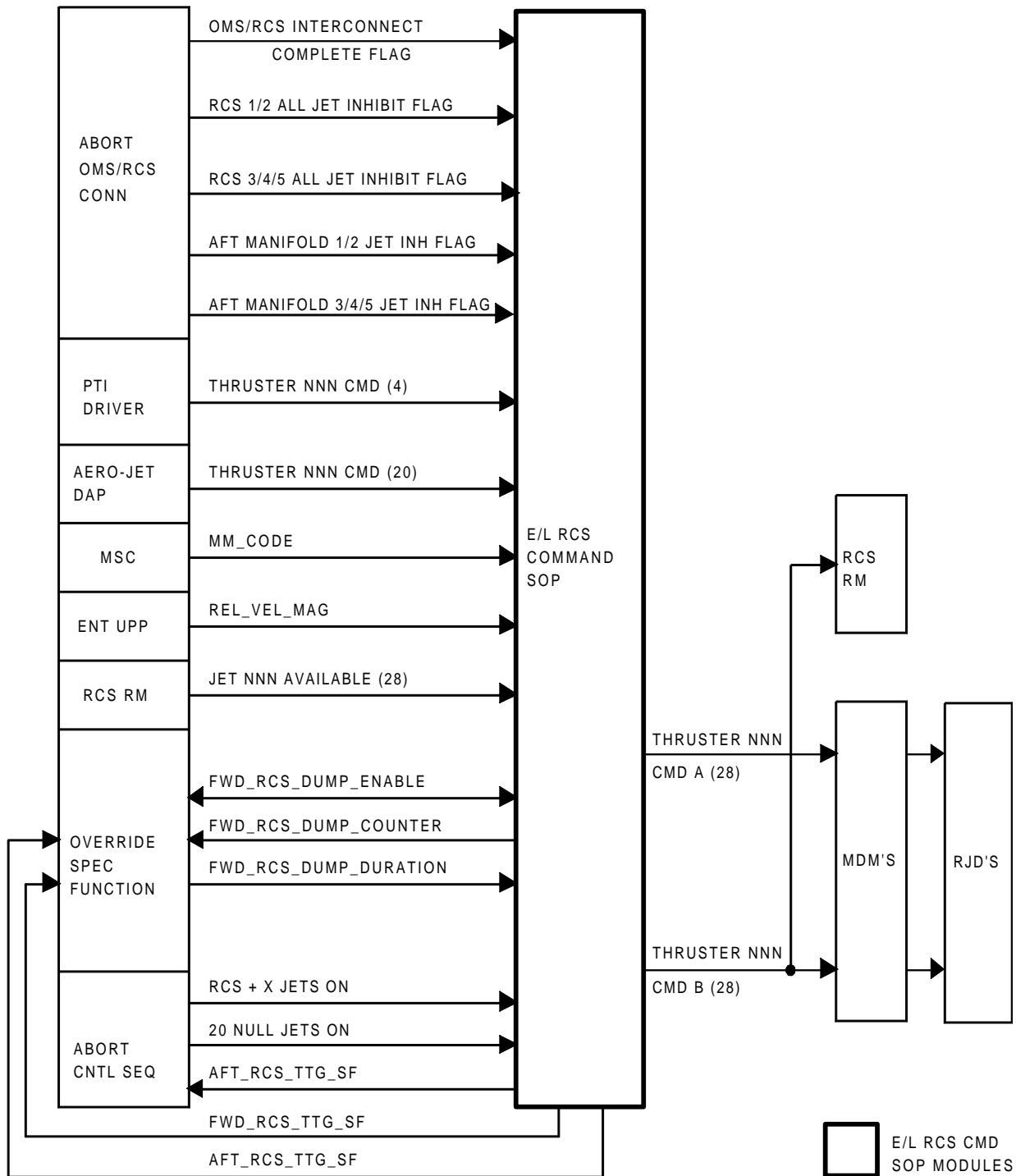


FIGURE 4.58-1. E/L RCS CMD SOP Functional Block Diagram

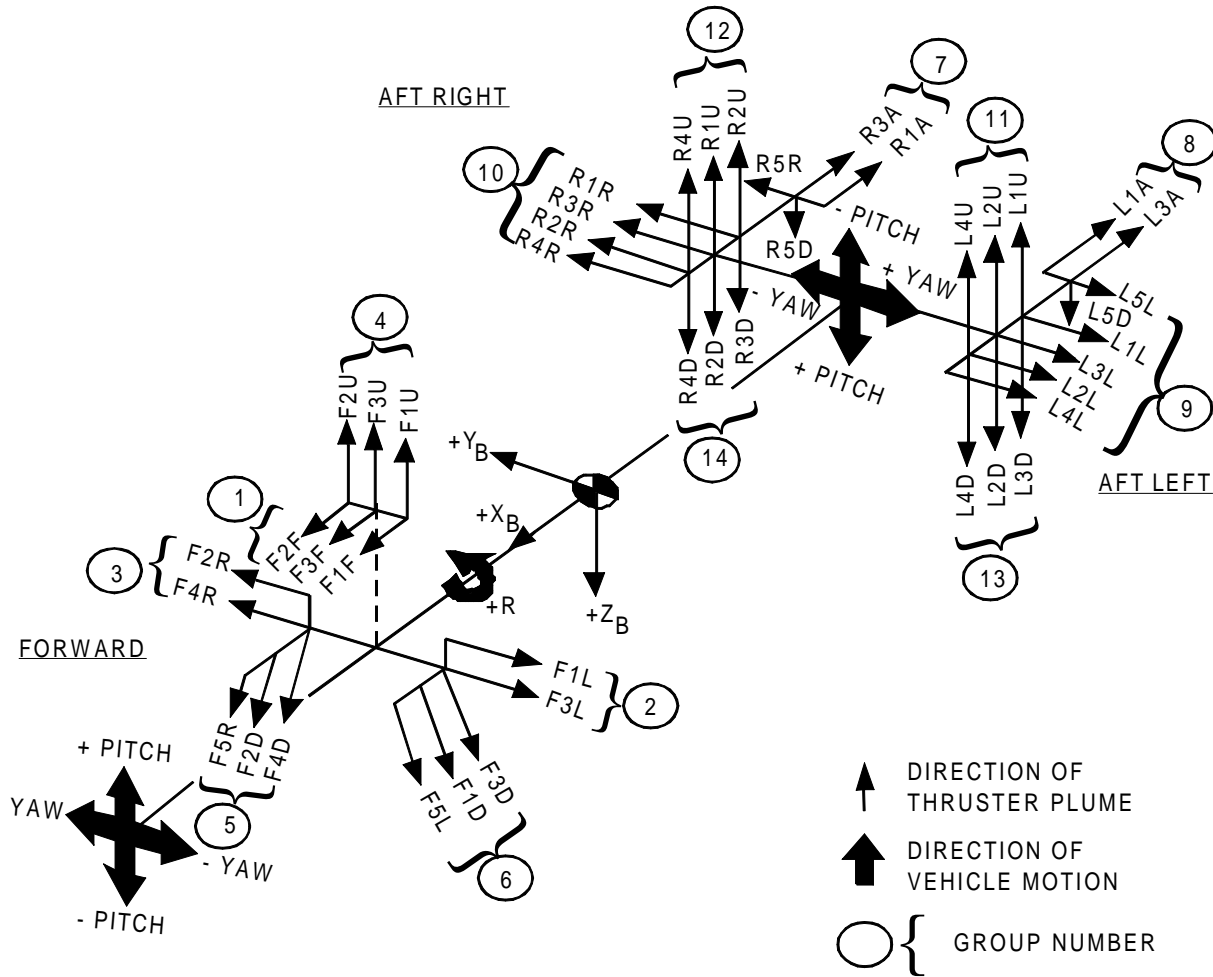


FIGURE 4.58-2. RCS Jet Locations and Plume Directions

Table 4.58-1. E/L RCS Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
RCS_ON_A(4)	V79K2402XA	RJDF 1 JET F1L CMD A		DISCRETE			
RCS_ON_A(6)	V79K2406XA	RJDF 1 JET F2R CMD A		DISCRETE			
RCS_ON_A(5)	V79K2410XA	RJDF 2 JET F3L CMD A		DISCRETE			
RCS_ON_A(7)	V79K2413XA	RJDF 2 JET F4R CMD A		DISCRETE			
RCS_ON_A(18)	V79K2417XC	RJDA 1 JET L1A CMD A		DISCRETE			
RCS_ON_A(22)	V79K2418XA	RJDA 1 JET L1L CMD A		DISCRETE			
RCS_ON_A(29)	V79K2419XA	RJDA 1 JET LIU CMD A		DISCRETE			
RCS_ON_A(20)	V79K2420XA	RJDA 1 JET L2L CMD A		DISCRETE			
RCS_ON_A(28)	V79K2421XA	RJDA 1 JET L2U CMD A		DISCRETE			
RCS_ON_A(34)	V79K2422XA	RJDA 1 JET L2D CMD A		DISCRETE			
RCS_ON_A(17)	V79K2423XC	RJDA 2 JET L3A CMD A		DISCRETE			
RCS_ON_A(21)	V79K2424XA	RJDA 2 JET L3L CMD A		DISCRETE			
RCS_ON_A(35)	V79K2425XA	RJDA 2 JET L3D CMD A		DISCRETE			
RCS_ON_A(19)	V79K2426XA	RJDA 2 JET L4L CMD A		DISCRETE			
RCS_ON_A(27)	V79K2427XA	RJDA 2 JET L4U CMD A		DISCRETE			
RCS_ON_A(33)	V79K2428XA	RJDA 2 JET L4D CMD A		DISCRETE			
RCS_ON_A(16)	V79K2431XC	RJDA 1 JET R1A CMD A		DISCRETE			
RCS_ON_A(26)	V79K2432XA	RJDA 1 JET R1R CMD A		DISCRETE			
RCS_ON_A(32)	V79K2433XA	RJDA 1 JET R1U CMD A		DISCRETE			
RCS_ON_A(24)	V79K2434XA	RJDA 1 JET R2R CMD A		DISCRETE			
RCS_ON_A(31)	V79K2435XA	RJDA 1 JET R2U CMD A		DISCRETE			
RCS_ON_A(37)	V79K2436XA	RJDA 1 JET R2D CMD A		DISCRETE			
RCS_ON_A(15)	V79K2437XC	RJDA 2 JET R3A CMD A		DISCRETE			
RCS_ON_A(25)	V79K2438XA	RJDA 2 JET R3R CMD A		DISCRETE			
RCS_ON_A(38)	V79K2439XA	RJDA 2 JET R3D CMD A		DISCRETE			
RCS_ON_A(23)	V79K2440XA	RJDA 2 JET R4R CMD A		DISCRETE			
RCS_ON_A(30)	V79K2441XA	RJDA 2 JET R4U CMD A		DISCRETE			
RCS_ON_A(36)	V79K2442XA	RJDA 2 JET R4D CMD A		DISCRETE			
RCS_ON_B(26)	V79K2532XA	RJDA 1 JET R1R CMD B		DISCRETE			
RCS_ON_B(32)	V79K2533XA	RJDA 1 JET R1U CMD B		DISCRETE			
RCS_ON_B(24)	V79K2534XA	RJDA 1 JET R2R CMD B		DISCRETE			
RCS_ON_B(31)	V79K2535XA	RJDA 1 JET R2U CMD B		DISCRETE			
RCS_ON_B(37)	V79K2536XA	RJDA 1 JET R2D CMD B		DISCRETE			
RCS_ON_B(25)	V79K2538XA	RJDA 2 JET R3R CMD B		DISCRETE			
RCS_ON_B(38)	V79K2539XA	RJDA 2 JET R3D CMD B		DISCRETE			
RCS_ON_B(23)	V79K2540XA	RJDA 2 JET R4R CMD B		DISCRETE			
RCS_ON_B(30)	V79K2541XA	RJDA 2 JET R4U CMD B		DISCRETE			

Table 4.58-1. E/L RCS Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
RCS_ON_B(36)	V79K2542XA	RJDA 2 JET R4D CMD B		DISCRETE			
RCS_ON_B(15)	V79K2537XC	RJDA 2 JET R3A CMD B		DISCRETE			
RCS_ON_B(16)	V79K2531XC	RJDA 1 JET R1A CMD B		DISCRETE			
RCS_OH_B(22)	V79K2518XA	RJDA 1 JET L1L CMD B		DISCRETE			
RCS_ON_B(29)	V79K2519XA	RJDA 1 JET L1U CMD B		DISCRETE			
RCS_ON_B(20)	V79K2520XA	RJDA 1 JET L2L CMD B		DISCRETE			
RCS_ON_B(28)	V79K2521XA	RJDA 1 JET L2U CMD B		DISCRETE			
RCS_ON_B(34)	V79K2522XA	RJDA 1 JET L2D CMD B		DISCRETE			
RCS_ON_B(21)	V79K2524XA	RJDA 2 JET L3L CMD B		DISCRETE			
RCS_ON_B(35)	V79K2525XA	RJDA 2 JET L3D CMD B		DISCRETE			
RCS_ON_B(19)	V79K2526XA	RJDA 2 JET L4L CMD B		DISCRETE			
RCS_ON_B(27)	V79K2527XA	RJDA 2 JET L4U CMD B		DISCRETE			
RCS_ON_B(33)	V79K2528XA	RJDA 2 JET L4D CMD B		DISCRETE			
RCS_ON_B(17)	V79K2523XC	RJDA 2 JET L3A CMD B		DISCRETE			
RCS_ON_B(18)	V79K2517XC	RJDA 1 JET L1A CMD B		DISCRETE			
RCS_ON_B(4)	V79X2502XA	RJDF 1 JET F1L CMD B		DISCRETE			
RCS_ON_B(5)	V79X2510XA	RJDF 2 JET F3L CMD B		DISCRETE			
RCS_ON_B(6)	V79X2506XA	RJDF 1 JET F2R CMD B		DISCRETE			
RCS_ON_B(7)	V79X2513XA	RJDF 2 JET F4R CMD B		DISCRETE			
FWD_RCS_DUMP_COUNTER	V90W8228C	FWD RCS DUMP COUNTER		SCALAR	0.0	0-150	sec
FWD_RCS_TTG_SF	V94J3756C	FWD RCS TIME SCALE FACTOR		SCALAR	1.0	0-1	
AFT_RCS_TTG_SF	V94J3757C	AFT RCS TIME SCALE FACTOR		SCALAR	1.0	0-1	
RCS_CYC1	V97U6214C	RCS DELAY 1 CYCLE CTE	R	INTEGER	4		
RCS_CYC2	V97U6215C	RCS DELAY 2 CYCLE CTE	R	INTEGER	6		
ABT_X_ON_LAST_PASS		PREVIOUS STATE + X RCS DUMP COMMAND		DISCRETE	0		
ABT_20_NULL_LAST_PASS		PREVIOUS STATE 20 NULL DUMP COMMAND		DISCRETE	0		
AFT_MANIFOLD_1/2_JET_INH_FLAG_LAST_PASS		PREVIOUS STATE - AFT MANIFOLD 1/2 JET INHIBIT FLAG		DISCRETE	0		
AFT_MANIFOLD_3/4/5_JET_INH_FLAG_LAST_PASS		PREVIOUS STATE - AFT MANIFOLD 3/4/5 JET INHIBIT FLAG		DISCRETE	0		

Table 4.58-1. E/L RCS Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
OMS/RCS_INTERCONNECT_COMPLETE_FLAG_LAST_PASS		PREVIOUS STATE – OMS/RCS INTERCONNECT COMPLETE FLAG		DISCRETE	0		
RCS_1/2_ALL_JET_INHIBIT_FLAG_LAST_PASS		PREVIOUS STATE – RCS 1/2 ALL JET INHIBIT FLAG		DISCRETE	0		
RCS_3/4/5_ALL_JET_INHIBIT_FLAG_LAST_PASS		PREVIOUS STATE – RCS 3/4/5 ALL JET INHIBIT FLAG		DISCRETE	0		

TABLE 4.58-2. INPUT FUNCTIONAL PARAMETERS FOR ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP
(G4.58)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AVAILABLE_JET_AFT(01)	V90X4520X	JET L1A AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(02)	V90X4521X	JET L1L AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(03)	V90X4522X	JET L1U AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(04)	V90X4534X	JET R1A AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(05)	V90X4535X	JET R1R AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(06)	V90X4536X	JET R1U AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(09)	V90X4526X	JET L3A AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(10)	V90X4527X	JET L3L AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(11)	V90X4528X	JET L3D AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(12)	V90X4540X	JET R3A AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(13)	V90X4541X	JET R3R AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(14)	V90X4542X	JET R3D AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(17)	V90X4523X	JET L2L AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(18)	V90X4524X	JET L2U AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(19)	V90X4525X	JET L2D AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(20)	V90X4537X	JET R2R AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(21)	V90X4538X	JET R2U AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(22)	V90X4539X	JET R2D AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(23)	V90X4529X	JET L4L AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(24)	V90X4530X	JET L4U AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(25)	V90X4531X	JET L4D AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(26)	V90X4543X	JET R4R AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(27)	V90X4544X	JET R4U AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_AFT(28)	V90X4545X	JET R4D AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(02)	V90X4549X	JET F1L AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(06)	V90X4553X	JET F2R AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(09)	V90X4560X	JET F4R AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(14)	V90X4557X	JET F3L AVAILABLE	RCS RM		BD		93017G	*
FWD_RCS_DUMP_ENABLE	V93X6948XA	FWD RCS DUMP ENABLE	VERRIDE DISP		BD		89149B	
MM_CODE	V90Q8001C	MAJOR MODE CODE	UI		HXS		93017G	*
NEW_JONLST_AFT(02)/L1L_ON	V90X1673XC	RCS JET L1L ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(03)/L1U_ON	V90X1674XC	RCS JET L1U ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(05)/R1R_ON	V90X1683XC	RCS JET R1R ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(06)/R1U_ON	V90X1684XC	RCS JET R1U ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(10)/L3L_ON	V90X1678XC	RCS JET L3L ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(11)/L3D_ON	V90X1679XC	RCS JET L3D ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(13)/R3R_ON	V90X1688XC	RCS JET R3R ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(14)/R3D_ON	V90X1689XC	RCS JET R3D ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(17)/L2L_ON	V90X1675XC	RCS JET L2L ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(18)/L2U_ON	V90X1676XC	RCS JET L2U ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(19)/L2D_ON	V90X1677XC	RCS JET L2D ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(20)/R2R_ON	V90X1685XC	RCS JET R2R ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(21)/R2U_ON	V90X1686XC	RCS JET R2U ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(22)/R2D_ON	V90X1687XC	RCS JET R2D ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(23)/L4L_ON	V90X1680XC	RCS JET L4L ON CMD	AEROJET DAP				89463	

TABLE 4.58-2. INPUT FUNCTIONAL PARAMETERS FOR ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP (G4.58)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
NEW_JONLST_AFT(24)/L4U_ON	V90X1681XC	RCS JET L4U ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(25)/L4D_ON	V90X1682XC	RCS JET L4D ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(26)/R4R_ON	V90X1690XC	RCS JET R4R ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(27)/R4U_ON	V90X1691XC	RCS JET R4U ON CMD	AEROJET DAP				89463	
NEW_JONLST_AFT(28)/R4D_ON	V90X1692XC	RCS JET R4D ON CMD	AEROJET DAP				89463	
NEW_JONLST_FWD(02)/F1L_ON	V90X1442XE	RCS JET F1L ON CMD	PTI				89463	
NEW_JONLST_FWD(06)/F2R_ON	V90X1446XE	RCS JET F2R ON CMD	PTI				89463	
NEW_JONLST_FWD(09)/F4R_ON	V90X1453XE	RCS JET F4R ON CMD	PTI				89463	
NEW_JONLST_FWD(14)/F3L_ON	V90X1450XE	RCS JET F3L ON CMD	PTI				89463	
REL_VEL_MAG/V	V95L0151CC	GND REL VEL MAGNITUDE IN M50 SYS	ENT UPP	FT/S	SPL		93017G	*
S_RCS_IGN	V90X8314X	ABORT RCS +X ON CMD	ABT CNTL SEQ		BD		93017G	*
S_RCS_NULL20	V90X8317X	20 RCS NULL JETS ON CMD	ABT CNTL SEQ		BD		93017G	*
	V90X8282X	OMS TO RCS INTERCONNECT COMP FLAG	ABT OMS/RCS CONN		BD		93017G	*
	V90X8285X	AFT MANIFOLD 1/2 JET INH FLAG	ABT OMS/RCS CONN		BD		93017G	*
	V90X8286X	AFT MANIFOLD 3/4/5 JET INH FLAG	ABT OMS/RCS CONN		BD		93017G	*
	V90X8290X	RCS 1/2 ALL JET INHIBIT FLAG	ABT OMS/RCS CONN		BD		90705H	
	V90X8291X	RCS 3/4/5 ALL JET INHIBIT FLAG	ABT OMS/RCS CONN		BD		90705H	
	V93W6957C	FWD RCS DUMP DURATION	OVERRIDE DISP	S			92392C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.58-3. OUTPUT FUNCTIONAL PARAMETERS FROM ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP
(G4.58)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AFT_RCS_TTG_SF	V94J3757CA	AFT RCS TIME SCALE FACTOR	ABT CNTL SEQ OVERRIDE SPEC				90114B	
FWD_RCS_DUMP_CNTR	V90W8228CA	FWD RCS DUMP COUNTER	OVERRIDE SPEC	S				
FWD_RCS_DUMP_ENABLE	V93X6948XC	FWD RCS DUMP ENABLE	OVERRIDE DISP		BD		89149B	
FWD_RCS_TTG_SF	V94J3756CA	FWD RCS TIME SCALE FACTOR	OVERRIDE SPEC					
RCS_ON_A(15)	V79K2437XC	RJDA 2 JET R3A CMD A	RJDA 2 TLM					
RCS_ON_A(16)	V79K2431XC	RJDA 1 JET R1A CMD A	RJDA 1 TLM					
RCS_ON_A(17)	V79K2423XC	RJDA 2 JET L3A CMD A	RJDA 2 TLM					
RCS_ON_A(18)	V79K2417XC	RJDA 1 JET L1A CMD A	RJDA 1 TLM					
RCS_ON_A(19)	V79K2426XA	RJDA 2 JET L4L CMD A	RJDA 2 TLM					
RCS_ON_A(20)	V79K2420XA	RJDA 1 JET L2L CMD A	RJDA 1 TLM					
RCS_ON_A(21)	V79K2424XA	RJDA 2 JET L3L CMD A	RJDA 2 TLM					
RCS_ON_A(22)	V79K2418XA	RJDA 1 JET L1L CMD A	RJDA 1 TLM					
RCS_ON_A(23)	V79K2440XA	RJDA 2 JET R4R CMD A	RJDA 2 TLM					
RCS_ON_A(24)	V79K2434XA	RJDA 1 JET R2R CMD A	RJDA 1 TLM					
RCS_ON_A(25)	V79K2438XA	RJDA 2 JET R3R CMD A	RJDA 2 TLM					
RCS_ON_A(26)	V79K2432XA	RJDA 1 JET R1R CMD A	RJDA 1 TLM					
RCS_ON_A(27)	V79K2427XA	RJDA 2 JET L4U CMD A	RJDA 2 TLM					
RCS_ON_A(28)	V79K2421XA	RJDA 1 JET L2U CMD A	RJDA 1 TLM					
RCS_ON_A(29)	V79K2419XA	RJDA 1 JET L1U CMD A	RJDA 1 TLM					
RCS_ON_A(30)	V79K2441XA	RJDA 2 JET R4U CMD A	RJDA 2 TLM					
RCS_ON_A(31)	V79K2435XA	RJDA 1 JET R2U CMD A	RJDA 1 TLM					
RCS_ON_A(32)	V79K2433XA	RJDA 1 JET R1U CMD A	RJDA 1 TLM					
RCS_ON_A(33)	V79K2428XA	RJDA 2 JET L4D CMD A	RJDA 2 TLM					
RCS_ON_A(34)	V79K2422XA	RJDA 1 JET L2D CMD A	RJDA 1 TLM					

TABLE 4.58-3. OUTPUT FUNCTIONAL PARAMETERS FROM ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP (G4.58)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_A(35)	V79K2425XA	RJDA 2 JET L3D CMD A	RJDA 2					
RCS_ON_A(36)	V79K2442XA	RJDA 2 JET R4D CMD A	TLM RJDA 2					
RCS_ON_A(37)	V79K2436XA	RJDA 1 JET R2D CMD A	TLM RJDA 1					
RCS_ON_A(38)	V79K2439XA	RJDA 2 JET R3D CMD A	TLM RJDA 2					
RCS_ON_A(4)	V79K2402XC	RJDF 1 JET F1L CMD A	TLM RJDF 1					
RCS_ON_A(5)	V79K2410XC	RJDF 2 JET F3L CMD A	TLM RJDF 2					
RCS_ON_A(6)	V79K2406XC	RJDF 1 JET F2R CMD A	TLM RJDF 1					
RCS_ON_A(7)	V79K2413XC	RJDF 2 JET F4R CMD A	TLM RJDF 2					
RCS_ON_B(15)	V79K2537XC	RJDA 2 JET R3A CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(16)	V79K2531XC	RJDA 1 JET R1A CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(17)	V79K2523XC	RJDA 2 JET L3A CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(18)	V79K2517XC	RJDA 1 JET L1A CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(19)	V79K2526XA	RJDA 2 JET L4L CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(20)	V79K2520XA	RJDA 1 JET L2L CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(21)	V79K2524XA	RJDA 2 JET L3L CMD B	DL FMT 23/A RJDA 2				93017G	*
RCS_ON_B(22)	V79K2518XA	RJDA 1 JET L1L CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(23)	V79K2540XA	RJDA 2 JET R4R CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(24)	V79K2534XA	RJDA 1 JET R2R CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*

TABLE 4.58-3. OUTPUT FUNCTIONAL PARAMETERS FROM ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP
(G4.58)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(25)	V79K2538XA	RJDA 2 JET R3R CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(26)	V79K2532XA	RJDA 1 JET R1R CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(27)	V79K2527XA	RJDA 2 JET L4U CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(28)	V79K2521XA	RJDA 1 JET L2U CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(29)	V79K2519XA	RJDA 1 JET L1U CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(30)	V79K2541XA	RJDA 2 JET R4U CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(31)	V79K2535XA	RJDA 1 JET R2U CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(32)	V79K2533XA	RJDA 1 JET R1U CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(33)	V79K2528XA	RJDA 2 JET L4D CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(34)	V79K2522XA	RJDA 1 JET L2D CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(35)	V79K2525XA	RJDA 2 JET L3D CMD B	DL FMT 23/A RJDA 2				93017G	*
RCS_ON_B(36)	V79K2542XA	RJDA 2 JET R4D CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(37)	V79K2536XA	RJDA 1 JET R2D CMD B	DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(38)	V79K2539XA	RJDA 2 JET R3D CMD B	DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(4)	V79K2502XC	RJDF 1 JET F1L CMD B	DL FMT 23/A RCS RM RJDF 1				93017G	*

TABLE 4.58-3. OUTPUT FUNCTIONAL PARAMETERS FROM ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP (G4.58)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(5)	V79K2510XC	RJDF 2 JET F3L CMD B	DL FMT 23/A RCS RM RJDF 2				93017G	*
RCS_ON_B(6)	V79K2506XC	RJDF 1 JET F2R CMD B	DL FMT 23/A RCS RM RJDF 1				93017G	*
RCS_ON_B(7)	V79K2513XC	RJDF 2 JET F4R CMD B	DL FMT 23/A RCS RM RJDF 2				93017G	*
	V72M6633P	MDM FF01 DSCR OUT SET	CD 13 CH 0	DL FMT 23/A			93017G	*
	V72M6683P	MDM FF02 DSCR OUT SET	CD 13 CH 0	DL FMT 23/A			93017G	*
	V72M6733P	MDM FF03 DSCR OUT SET	CD 13 CH 0	DL FMT 23/A			93017G	*
	V72M6783P	MDM FF04 DSCR OUT SET	CD 13 CH 0	DL FMT 23/A			93017G	*
	V72M8715P	MDM FA01 DSCR OUT SET	CD 10 CH 0	DL FMT 23/A			93017G	*
	V72M8735P	MDM FA02 DSCR OUT SET	CD 10 CH 0	DL FMT 23/A			93017G	*
	V72M8755P	MDM FA03 DSCR OUT SET	CD 10 CH 0	DL FMT 23/A			93017G	*
	V72M8774P	MDM FA04 DSCR OUT SET	CD 10 CH 0	DL FMT 23/A			93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

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TABLE 4.58-4. ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP (G4.58) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
FRCS_DUMP_START_VEL	V99U9599C	FT/SEC	F	S	M	C	G4.58	00	QFR	DC0599	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.58-5. ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP (G4.58) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.58-6. ENTRY/LANDING REACTION CONTROL SYSTEM COMMAND SOP (G4.58) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
RCS_CYC1 RCS DELAY 1 CYCLE COUNTER	V97U6214C	00	+4	CYCLES	I	S	P	G4.190 G4.58	90374C	
RCS_CYC2 RCS DELAY 2 CYCLE COUNTER	V97U6215C	00	+6	CYCLES	I	S	P	G4.190 G4.58	90374C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.60 MAIN PROPULSION SYSTEM THRUST VECTOR CONTROL COMMAND SOP

The purpose of the Main Propulsion System Thrust Vector Control Command (MPS TVC CMD) SOP shall be to perform the following functions:

- A. Processing of the MPS pitch and yaw actuator position commands
- B. Processing of the MPS actuator bypass/override requests

The actuator command processing function shall be performed at a 25 Hz rate during Major Modes 101, 102, 103, 304, and 601. In Major Mode 103 or 601, once ME_ZERO flag indicates the “1” state, the actuator command processing shall be performed at the 12.5 Hz rate. Upon entry into Major Mode 602, the engines shall be stowed and the MPS TVC CMD SOP shall be terminated. The reset/override processing shall be performed at the 6.25 Hz rate in Major Modes 101, 102, 103, 104, 301, 302, 303, 304, 601, and 602. The MPS TVC CMD SOP shall terminate after engines are stowed in OPS 1 or OPS 6. The MPS TVC CMD SOP shall be processed after ASC DAP, SSME SOP, and R/S LCH SEQ.

The MPS TVC CMD SOP interfaces are indicated on the functional block diagram on Figure 4.60–1. The parameter initialization requirements shall be as follows:

- A. MPS Actuator Commands. The main engine pitch and yaw command outputs shall be initialized based on the initial command inputs from ASC DAP on OPS 1 transition and on cyclic I/O commands to the stow position on OPS 3 transition.
- B. Reset Commands. The main engine reset commands outputs shall be initialized based on the initial input commands from GN&C SW RM on transition into all applicable OPS.

The remaining parameter initialization and the I-load parameters are shown in Table 4.60–1. The IDD inputs and outputs are listed in Tables 4.60–2 and 4.60–3. Values for the I-loads are contained in the I-loads requirements document (JSC–19350); however, I-load definitions applicable to this principal function are listed in Table 4.60–4. K-loads are listed in Table 4.60–5. Constants are listed in Table 4.60–6.

4.60.1 MPS TVC Command Processing

The MPS TVC command processing function shall generate compensated commands to the main engines’ pitch and yaw actuators. The MPS TVC CMD SOP shall issue the main engine control commands after monitoring the dump, stow, and drag chute repositioning flags and determining which positions shall be compensated to convert from engineering units to VDC. The outputs shall consist of four redundant commands to each of the three main engines’ pitch and yaw actuators.

The MPS TVC CMD SOP shall compensate position commands from the ASC DAP. Once the ASC DAP is descheduled, the MPS TVC CMD SOP shall monitor dump position flags from ET SEP SEQ, stow position flags from MPS DUMP SEQ and ET SEP SEQ, and the SSME drag chute gimbal position flag from LDG GEAR VLV CNTL SEQ.

MPS TVC CMD SOP shall monitor the dump flag from ET SEP SEQ. When the dump flag indicates a “1” state (command the dump position), the MPS TVC CMD SOP shall cyclically increment the last commanded pitch positions by MPS_P degrees and cyclically increment the last commanded yaw positions

by MPS_Y degrees until each actuator is in the designated dump position. The dump position commands shall take precedence over the ASC DAP position commands.

The MPS TVC CMD SOP shall monitor the stow flag from MPS DUMP or ET SEP SEQ. When the stow flag indicates a “1” state (i.e., MPS dump is complete, MM602 is indicated, or prevalves are commanded closed and RTLS or TAL abort has been declared), the MPS TVC CMD SOP shall cyclically increment the last commanded pitch positions by MPS_P degrees and cyclically increment the last commanded yaw positions by MPS_Y degrees. For a TAL abort, the pitch and yaw positions shall be incremented until each actuator is in the designated stow position. When the actuators have reached the stow position, the SSME STOW COMPLETE flag shall be set to the “1” state. For an RTLS abort, the pitch and yaw positions shall be incremented until each actuator is in the RTLS stow position (CHUTESTOW drag chute deploy position for pitch actuators and MPSYSTOW for yaw actuators) at which time the SSME STOW COMPLETE flag shall be set in the “1” state. The stow position and drag chute deploy position commands shall take precedence over the dump position commands. During Entry (MM 301), the MPS TVC CMD SOP shall cyclically increment the last commanded pitch positions by MPS_P degrees and cyclically increment the last commanded yaw positions by MPS_Y degrees until each actuator is in the designated stow position. When the actuators have reached the stow position, the SSME STOW COMPLETE flag shall be set to the “1” state. The MPS TVC CMD SOP, during entry (MM304), shall monitor the drag chute gimbal position flag from LDG GEAR VLV CNTL SEQ and the hydraulic systems good flag from the HYD SYS SOP. When the drag chute gimbal position flag (SSME_GMBL_POS) is set true and the number of good hydraulic systems is greater than one, then the three main engine pitch actuators shall be cyclically incremented by MPS_PC degrees until the designated drag chute deploy position (CHUTESTOW) is reached. The SSME REPOS CMPLT flag shall be set to the “1” state after reaching the drag chute deploy position. The values to which the main engine actuators shall be set for dump, stow, and drag chute positions and the command increments are presented in Table 4.60-1, Initialization Parameters.

The selected position commands for the main engines shall be compensated by applying bias and scale factor terms to convert from engineering units to VDC. Provisions shall be made for unique bias and scale factor values for each engine actuator. The general compensation equation shall be as follows:

$$\text{COMPCMD} = \text{CMD CC} + \text{KC}$$

where

COMPCMD =Compensated actuator command (VDC)

CMD =Selected actuator position command (DEG)

CC =Command compensation scale factor (VDC/DEG)

KC =Command compensation bias (VDC)

4.60.2 MPS TVC Actuator Bypass/Override Processing

The MPS TVC actuator bypass/override processing function shall generate bypass and reset secondary channel command discrettes to the three main engines by pitch and yaw actuators. The processing shall be performed as follows:

A. The bypass discrettes (24 total) shall always be set to the “zero” state and shall be output at the cyclic processing rate.

B. The reset command discrettes (24 total) shall be generated by monitoring the following override requests:

- FCS channel override requests from GN&C SW RM shall be monitored on a channel basis. A channel switch in the “OVERRIDE” position shall result in all the pitch and yaw actuator reset discrettes for that channel (6 total) being set to the “1” state. A channel switch in a position other than “OVERRIDE” shall result in all pitch and yaw reset discrettes for that channel being set to the “zero” state.
- Forced override command from R/S LCH SEQ or from ORB ACT SLEW for all three main engines shall be monitored. The forced override command in the “1” state shall result in all pitch and yaw actuator reset discrettes for all three main engines (24 total) being set to the “1” state. The forced override command in the “zero” state shall result in all reset discrettes being set to the “zero” state.
- ME-X TVC SERVO OVRD flags shall be monitored on an engine basis. A flag in the “1” state shall result in all pitch and yaw actuators reset discrettes for that engine being set to the “1” state for RSTCYC number of cycles. Once RSTCYC cycles have occurred, the pitch and yaw actuators shall be set to the “zero” state.

The override requests shall only be processed when an override request has changed state. However, all reset output discrettes shall be transmitted at the 6.25 Hz rate to preclude communication errors. When an override request changes state, all related override requests shall be logical “OR’d” together, and the appropriate reset command discrettes shall be set as indicated above. All reset discrettes for all main engine actuators shall be set to the “zero” state, the processing cycle prior to termination of the reset/ override processing of the MPS TVC CMD SOP.

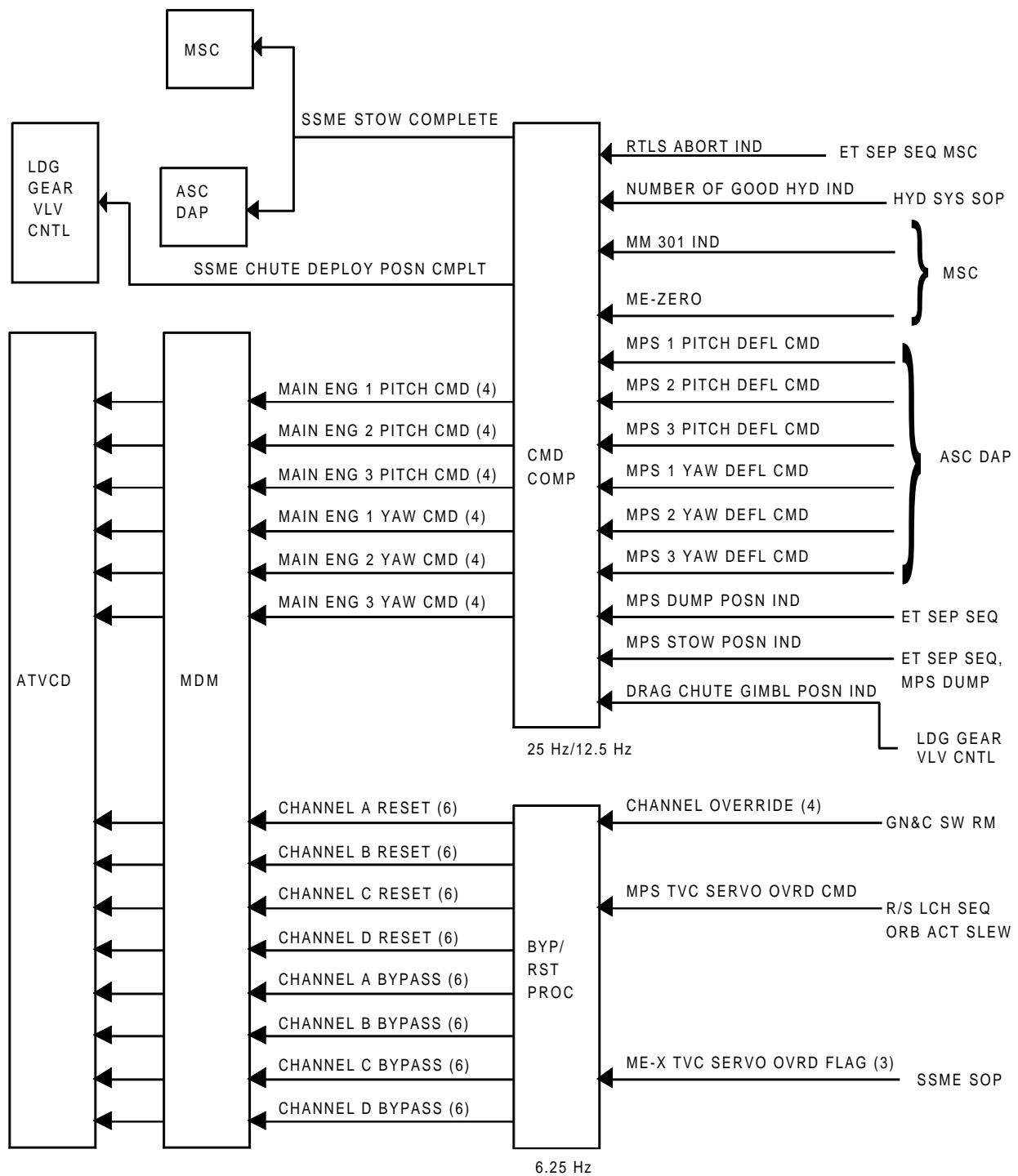


FIGURE 4.60-1. MPS TVC CMD SOP Functional Block Diagram

Table 4.60-1. MPS TVC Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
CHUTESTOW1	V97U4271C	MAIN ENG 1 PITCH REPOS	D	FLOAT PT			DEG
CHUTESTOW2	V97U4272C	MAIN ENG 2 PITCH REPOS	D	FLOAT PT			DEG
CHUTESTOW3	V97U4273C	MAIN ENG 3 PITCH REPOS	D	FLOAT PT			DEG
CME1P	V97U3946C	COMP SCALE FACTOR – ME1 PITCH CMD	K	FLOAT PT	-0.4337		VDC/DEG
CME2P	V97U3954C	COMP SCALE FACTOR – ME2 PITCH CMD	K	FLOAT PT	+0.4337		VDC/DEG
CME3P	V97U3962C	COMP SCALE FACTOR – ME3 PITCH CMD	K	FLOAT PT	-0.4337		VDC/DEG
CME1Y	V97U3950C	COMP SCALE FACTOR – ME1 YAW CMD	K	FLOAT PT	+0.5353		VDC/DEG
CME2Y	V97U3958C	COMP SCALE FACTOR – ME2 YAW CMD	K	FLOAT PT	+0.5444		VDC/DEG
CME3Y	V97U3966C	COMP SCALE FACTOR – ME3 YAW CMD	K	FLOAT PT	+0.5254		VDC/DEG
KME1P	V97U4058C	COMP BIAS – ME1 PITCH CMD	K	FLOAT PT	+0.1453		VDC
KME2P	V97U4066C	COMP BIAS – ME2 PITCH CMD	K	FLOAT PT	+0.1453		VDC
KME3P	V97U4074C	COMP BIAS – ME3 PITCH CMD	K	FLOAT PT	+0.1453		VDC
KME1Y	V97U4062C	COMP BIAS – ME1 YAW CMD	K	FLOAT PT	+0.098		VDC
KME2Y	V97U4070C	COMP BIAS – ME2 YAW CMD	K	FLOAT PT	+0.1127		VDC
KME3Y	V97U4078C	COMP BIAS – ME3 YAW CMD	K	FLOAT PT	+0.1151		VDC
MPS_P	V97U4113C	MAIN ENG PITCH POSN INCREMENT	K	FLOAT PT	+0.08		DEG
MPS_PC	V97U4276C	MAIN ENG PITCH POSN INCREMENT	D	FLOAT PT			DEG
MPS_Y	V97U4114C	MAIN ENG YAW POSN INCREMENT	K	FLOAT PT	+0.08		DEG
MPSPDUMP1	V97U4115C	MAIN ENG 1 PITCH DUMP POSN	K	FLOAT PT	0.0	+1.5, -1.5	DEG
MPSPDUMP2	V97U4116C	MAIN ENG 2 PITCH DUMP POSN	K	FLOAT PT	-10.0	-8.5, -11.5	DEG
MPSPDUMP3	V97U4117C	MAIN ENG 3 PITCH DUMP POSN	K	FLOAT PT	-10.0	-8.5, 11.5	DEG
MPSYDUMP1	V97U4121C	MAIN ENG 1 YAW DUMP POSN	K	FLOAT PT	0.0	+1.5, -1.5	DEG
MPSYDUMP2	V97U4122C	MAIN ENG 2 YAW DUMP POSN	K	FLOAT PT	-3.5	-3.0, -4.0	DEG
MPSYDUMP3	V97U4123C	MAIN ENG 3 YAW DUMP POSN	K	FLOAT PT	+3.5	+4.0, +3.0	DEG
MPSPSTOW1	V97U4118C	MAIN ENG 1 PITCH STOW POSN	K	FLOAT PT	0.0	+1.5, -1.5	DEG

Table 4.60-1. MPS TVC Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
MPSSTOW2	V97U4119C	MAIN ENG 2 PITCH STOW POSN	K	FLOAT PT	-10.0	-8.5 -11.5	DEG
MPSSTOW3	V97U4120C	MAIN ENG 3 PITCH STOW POSN	K	FLOAT PT	-10.0	-8.5, -11.5	DEG
MPSYSTOW1	V97U4124C	MAIN ENG 1 YAW STOW POSN	K	FLOAT PT	0.0	+0.5, -0.5	DEG
MPSYSTOW2	V97U4125C	MAIN ENG 2 YAW STOW POSN	K	FLOAT PT	-3.5	-3.0, -4.0	DEG
MPSYSTOW3	V97U4126C	MAIN ENG 3 YAW STOW POSN	K	FLOAT PT	+3.5	+4.0, -3.0	DEG
RSTCYC	V97U4144C	MAIN ENG SHUTDOWN/ OVERRIDE CYCLE COUNTER	K	INTEGER	0		CYCLES
BYPME1P(1)	V79K1180X	MPS ENG 1 P ACTR A BYPASS		DISCRETE	0		
BYPME1P(2)	V79K1183X	MPS ENG 1 P ACTR B BYPASS		DISCRETE	0		
BYPME1P(3)	V79K1186X	MPS ENG 1 P ACTR C BYPASS		DISCRETE	0		
BYPME1P(4)	V79K1188X	MPS ENG 1 P ACTR D BYPASS		DISCRETE	0		
BYPME1Y(1)	V79K1181X	MPS ENG 1 Y ACTR A BYPASS		DISCRETE	0		
BYPME1Y(2)	V79K1184X	MPS ENG 1 Y ACTR B BYPASS		DISCRETE	0		
BYPME1Y(3)	V79K1187X	MPS ENG 1 Y ACTR C BYPASS		DISCRETE	0		
BYPME1Y(4)	V79K1189X	MPS ENG 1 Y ACTR D BYPASS		DISCRETE	0		
BYPME2P(1)	V79K1280X	MPS ENG 2 P ACTR A BYPASS		DISCRETE	0		
BYPME2P(2)	V79K1283X	MPS ENG 2 P ACTR B BYPASS		DISCRETE	0		
BYPME2P(3)	V79K1286X	MPS ENG 2 P ACTR C BYPASS		DISCRETE	0		
BYPME2P(4)	V79K1288X	MPS ENG 2 P ACTR D BYPASS		DISCRETE	0		
BYPME2Y(1)	V79K1281X	MPS ENG 2 Y ACTR A BYPASS		DISCRETE	0		
BYPME2Y(2)	V79K1284X	MPS ENG 2 Y ACTR B BYPASS		DISCRETE	0		
BYPME2Y(3)	V79K1287X	MPS ENG 2 Y ACTR C BYPASS		DISCRETE	0		
BYPME2Y(4)	V79K1289X	MPS ENG 2 Y ACTR D BYPASS		DISCRETE	0		
BYPME3P(1)	V79K1380X	MPS ENG 3 P ACTR A BYPASS		DISCRETE	0		
BYPME3P(2)	V79K1383X	MPS ENG 3 P ACTR B BYPASS		DISCRETE	0		
BYPME3P(3)	V79K1386X	MPS ENG 3 P ACTR C BYPASS		DISCRETE	0		
BYPME3P(4)	V79K1388X	MPS ENG 3 P ACTR D BYPASS		DISCRETE	0		
BYPME3Y(1)	V79K1381X	MPS ENG 3 Y ACTR A BYPASS		DISCRETE	0		
BYPME3Y(2)	V79K1384X	MPS ENG 3 Y ACTR B BYPASS		DISCRETE	0		
BYPME3Y(3)	V79K1387X	MPS ENG 3 Y ACTR C BYPASS		DISCRETE	0		
BYPME3Y(4)	V79K1389X	MPS ENG 3 Y ACTR D BYPASS		DISCRETE	0		

TABLE 4.60-2. INPUT FUNCTIONAL PARAMETERS FOR MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DYC1	V90H1718C	MPS 1 PITCH ACTR DEFLECTION CMD	ASC DAP	DEG				
DYC2	V90H1719C	MPS 2 PITCH ACTR DEFLECTION CMD	ASC DAP	DEG			91042A	
DYC3	V90H1720C	MPS 3 PITCH ACTR DEFLECTION CMD	ASC DAP	DEG			91042A	
DZC1	V90H1724C	MPS 1 YAW ACTR DEFLECTION CMD	ASC DAP	DEG				
DZC2	V90H1725C	MPS 2 YAW ACTR DEFLECTION CMD	ASC DAP	DEG				
DZC3	V90H1726C	MPS 3 YAW ACTR DEFLECTION CMD	ASC DAP	DEG				
ENT_STOW_GIM_POSN	V90X8254XA	ENTRY STOW GIMBAL POS FLAG	MPS DUMP		BD			
ENT_STOW_GIM_POSN	V90X8254XB	ENTRY STOW GIMBAL POS FLAG	ET SEP SEQ		BD			
ME_ZERO	V90X8638X	ZERO THRUST	MSC				92522D	
MM_CODE_301/MM_301	V90X8183X	MAJOR MODE 301 FLAG	MSC				93064D	
MPS_OVRD_CMD	V90X8374XA	MPS TVC SERVO OVRD CMD	R/S LCH SEQ					
MPS_OVRD_CMD	V90X8374XB	MPS TVC SERVO OVRD CMD	ORB ACT SLEW					
N_HYDRAULIC_GOOD	V96Q3001C	HYDR SYS GOOD STATUS	HYD SYS SOP		HXS		93017G	*
RSTSW(1)	V90X5201XB	SEL FCS RESET/OVERRIDE SW CHAN 1	GN&C SW RM				93017G	*
RSTSW(2)	V90X5211XB	SEL FCS RESET/OVERRIDE SW CHAN 2	GN&C SW RM				93017G	*
RSTSW(3)	V90X5221XB	SEL FCS RESET/OVERRIDE SW CHAN 3	GN&C SW RM				93017G	*
RSTSW(4)	V90X5231XB	SEL FCS RESET/OVERRIDE SW CHAN 4	GN&C SW RM				93017G	*
RTLS_ABORT_DECLARED	V90X8637XA	RTLS ABORT DECLARED	MSC		BD		93167A	*
RTLS_ABORT_DECLARED	V90X8637XB	RTLS ABORT DECLARED	ET SEP SEQ		BD		93167A	*
RTLS_ABORT_DECLARED	V90X8637XC	RTLS ABORT DECLARED	CONT 3E/O GUID		BD		93167A	*
SSME_GMBL_POS	V90X5521X	DRAG CHUTE GIMBAL POSITION FLAG	LDG GEAR VLV CNTL				89991E	
	V90X8253X	MPS DUMP GIMBAL POS FLAG	ET SEP SEQ					
	V95X1240X	ME-1 TVC SERVO OVRD	SSME SOP					
	V95X1241X	ME-2 TVC SERVO OVRD	SSME SOP					
	V95X1242X	ME-3 TVC SERVO OVRD	SSME SOP					

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.60-3. OUTPUT FUNCTIONAL PARAMETERS FROM MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
MPS_1P_BYP_A	V79K1180X	MPS ENG 1 P ACTR A BYPASS	ATVC 1		BD			
MPS_1P_BYP_B	V79K1183X	MPS ENG 1 P ACTR B BYPASS	ATVC 2		BD			
MPS_1P_BYP_C	V79K1186X	MPS ENG 1 P ACTR C BYPASS	ATVC 3		BD			
MPS_1P_BYP_D	V79K1188X	MPS ENG 1 P ACTR D BYPASS	ATVC 4		BD			
MPS_1P_CMD_A	V58K1164C	MPS ENG 1 P ACTR A CMD	ATVC 1	VDC	AMB		93017G	*
			DL FMT 21/B					
MPS_1P_CMD_B	V58K1165C	MPS ENG 1 P ACTR B CMD	ATVC 2	VDC	AMB			
MPS_1P_CMD_C	V58K1166C	MPS ENG 1 P ACTR C CMD	ATVC 3	VDC	AMB			
MPS_1P_CMD_D	V58K1167C	MPS ENG 1 P ACTR D CMD	ATVC 4	VDC	AMB			
MPS_1P_RST_A	V79K1190X	MPS ENG 1 P ACTR A RESET	ATVC 1		BD		93017G	*
			DL FMT 21/1					
			DL FMT 32/1					
MPS_1P_RST_B	V79K1193X	MPS ENG 1 P ACTR B RESET	ATVC 2		BD		93017G	*
			DL FMT 21/1					
			DL FMT 32/1					
MPS_1P_RST_C	V79K1196X	MPS ENG 1 P ACTR C RESET	ATVC 3		BD		93017G	*
			DL FMT 21/1					
			DL FMT 32/1					
MPS_1P_RST_D	V79K1198X	MPS ENG 1 P ACTR D RESET	ATVC 4		BD		93017G	*
			DL FMT 21/1					
			DL FMT 32/1					
MPS_1Y_BYP_A	V79K1181X	MPS ENG 1 Y ACTR A BYPASS	ATVC 1		BD			
MPS_1Y_BYP_B	V79K1184X	MPS ENG 1 Y ACTR B BYPASS	ATVC 2		BD			
MPS_1Y_BYP_C	V79K1187X	MPS ENG 1 Y ACTR C BYPASS	ATVC 3		BD			
MPS_1Y_BYP_D	V79K1189X	MPS ENG 1 Y ACTR D BYPASS	ATVC 4		BD			
MPS_1Y_CMD_A	V58K1168C	MPS ENG 1 Y ACTR A CMD	ATVC 1	VDC	AMB		93017G	*
			DL FMT 21/B					
MPS_1Y_CMD_B	V58K1169C	MPS ENG 1 Y ACTR B CMD	ATVC 2	VDC	AMB			
MPS_1Y_CMD_C	V58K1170C	MPS ENG 1 Y ACTR C CMD	ATVC 3	VDC	AMB			
MPS_1Y_CMD_D	V58K1171C	MPS ENG 1 Y ACTR D CMD	ATVC 4	VDC	AMB			
MPS_1Y_RST_A	V79K1191X	MPS ENG 1 Y ACTR A RESET	ATVC 1		BD		93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					
MPS_1Y_RST_B	V79K1194X	MPS ENG 1 Y ACTR B RESET	ATVC 2		BD		93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					
MPS_1Y_RST_C	V79K1197X	MPS ENG 1 Y ACTR C RESET	ATVC 3		BD		93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					

TABLE 4.60-3. OUTPUT FUNCTIONAL PARAMETERS FROM MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
MPS_1Y_RST_D	V79K1199X	MPS ENG 1 Y ACTR D RESET	ATVC 4 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A		BD		93017G	*
MPS_2P_BYP_A	V79K1280X	MPS ENG 2 P ACTR A BYPASS	ATVC 1		BD			
MPS_2P_BYP_B	V79K1283X	MPS ENG 2 P ACTR B BYPASS	ATVC 2		BD			
MPS_2P_BYP_C	V79K1286X	MPS ENG 2 P ACTR C BYPASS	ATVC 3		BD			
MPS_2P_BYP_D	V79K1288X	MPS ENG 2 P ACTR D BYPASS	ATVC 4		BD			
MPS_2P_CMD_A	V58K1264C	MPS ENG 2 P ACTR A CMD	ATVC 1 DL FMT 21/B	VDC	AMB		93017G	*
MPS_2P_CMD_B	V58K1265C	MPS ENG 2 P ACTR B CMD	ATVC 2	VDC	AMB			
MPS_2P_CMD_C	V58K1266C	MPS ENG 2 P ACTR C CMD	ATVC 3	VDC	AMB			
MPS_2P_CMD_D	V58K1267C	MPS ENG 2 P ACTR D CMD	ATVC 4	VDC	AMB			
MPS_2P_RST_A	V79K1290X	MPS ENG 2 P ACTR A RESET	ATVC 1 DL FMT 21/1 DL FMT 32/1		BD		93017G	*
MPS_2P_RST_B	V79K1293X	MPS ENG 2 P ACTR B RESET	ATVC 2 DL FMT 21/1 DL FMT 32/1		BD		93017G	*
MPS_2P_RST_C	V79K1296X	MPS ENG 2 P ACTR C RESET	ATVC 3 DL FMT 21/1 DL FMT 32/1		BD		93017G	*
MPS_2P_RST_D	V79K1298X	MPS ENG 2 P ACTR D RESET	ATVC 4 DL FMT 21/1 DL FMT 32/1		BD		93017G	*
MPS_2Y_BYP_A	V79K1281X	MPS ENG 2 Y ACTR A BYPASS	ATVC 1		BD			
MPS_2Y_BYP_B	V79K1284X	MPS ENG 2 Y ACTR B BYPASS	ATVC 2		BD			
MPS_2Y_BYP_C	V79K1287X	MPS ENG 2 Y ACTR C BYPASS	ATVC 3		BD			
MPS_2Y_BYP_D	V79K1289X	MPS ENG 2 Y ACTR D BYPASS	ATVC 4		BD			
MPS_2Y_CMD_A	V58K1268C	MPS ENG 2 Y ACTR A CMD	ATVC 1 DL FMT 21/B	VDC	AMB		93017G	*
MPS_2Y_CMD_B	V58K1269C	MPS ENG 2 Y ACTR B CMD	ATVC 2	VDC	AMB			
MPS_2Y_CMD_C	V58K1270C	MPS ENG 2 Y ACTR C CMD	ATVC 3	VDC	AMB			
MPS_2Y_CMD_D	V58K1271C	MPS ENG 2 Y ACTR D CMD	ATVC 4	VDC	AMB			
MPS_2Y_RST_A	V79K1291X	MPS ENG 2 Y ACTR A RESET	ATVC 1 DL FMT 21/1 DL FMT 32/1		BD		93017G	*
MPS_2Y_RST_B	V79K1294X	MPS ENG 2 Y ACTR B RESET	ATVC 2 DL FMT 21/1 DL FMT 32/1		BD		93017G	*
MPS_2Y_RST_C	V79K1297X	MPS ENG 2 Y ACTR C RESET	ATVC 3 DL FMT 21/1 DL FMT 32/1		BD		93017G	*

TABLE 4.60-3. OUTPUT FUNCTIONAL PARAMETERS FROM MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
MPS_2Y_RST_D	V79K1299X	MPS ENG 2 Y ACTR D RESET	ATVC 4 DL FMT 21/1 DL FMT 32/1		BD		93017G	*
MPS_3P_BYP_A	V79K1380X	MPS ENG 3 P ACTR A BYPASS	ATVC 1		BD			
MPS_3P_BYP_B	V79K1383X	MPS ENG 3 P ACTR B BYPASS	ATVC 2		BD			
MPS_3P_BYP_C	V79K1386X	MPS ENG 3 P ACTR C BYPASS	ATVC 3		BD			
MPS_3P_BYP_D	V79K1388X	MPS ENG 3 P ACTR D BYPASS	ATVC 4		BD			
MPS_3P_CMD_A	V58K1364C	MPS ENG 3 P ACTR A CMD	ATVC 1 DL FMT 21/B	VDC	AMB		93017G	*
MPS_3P_CMD_B	V58K1365C	MPS ENG 3 P ACTR B CMD	ATVC 2	VDC	AMB			
MPS_3P_CMD_C	V58K1366C	MPS ENG 3 P ACTR C CMD	ATVC 3	VDC	AMB			
MPS_3P_CMD_D	V58K1367C	MPS ENG 3 P ACTR D CMD	ATVC 4	VDC	AMB			
MPS_3P_RST_A	V79K1390X	MPS ENG 3 P ACTR A RESET	ATVC 1 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A		BD		93017G	*
MPS_3P_RST_B	V79K1393X	MPS ENG 3 P ACTR B RESET	ATVC 2 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A		BD		93017G	*
MPS_3P_RST_C	V79K1396X	MPS ENG 3 P ACTR C RESET	ATVC 3 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A		BD		93017G	*
MPS_3P_RST_D	V79K1398X	MPS ENG 3 P ACTR D RESET	ATVC 4 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A		BD		93017G	*
MPS_3Y_BYP_A	V79K1381X	MPS ENG 3 Y ACTR A BYPASS	ATVC 1		BD			
MPS_3Y_BYP_B	V79K1384X	MPS ENG 3 Y ACTR B BYPASS	ATVC 2		BD			
MPS_3Y_BYP_C	V79K1387X	MPS ENG 3 Y ACTR C BYPASS	ATVC 3		BD			
MPS_3Y_BYP_D	V79K1389X	MPS ENG 3 Y ACTR D BYPASS	ATVC 4		BD			
MPS_3Y_CMD_A	V58K1368C	MPS ENG 3 Y ACTR A CMD	ATVC 1 DL FMT 21/B	VDC	AMB		93017G	*
MPS_3Y_CMD_B	V58K1369C	MPS ENG 3 Y ACTR B CMD	ATVC 2	VDC	AMB			
MPS_3Y_CMD_C	V58K1370C	MPS ENG 3 Y ACTR C CMD	ATVC 3	VDC	AMB			
MPS_3Y_CMD_D	V58K1371C	MPS ENG 3 Y ACTR D CMD	ATVC 4	VDC	AMB			
MPS_3Y_RST_A	V79K1391X	MPS ENG 3 Y ACTR A RESET	ATVC 1 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A		BD		93017G	*

TABLE 4.60-3. OUTPUT FUNCTIONAL PARAMETERS FROM MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
MPS_3Y_RST_B	V79K1394X	MPS ENG 3 Y ACTR B RESET	ATVC 2		BD		93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					
MPS_3Y_RST_C	V79K1397X	MPS ENG 3 Y ACTR C RESET	ATVC 3		BD		93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					
MPS_3Y_RST_D	V79K1399X	MPS ENG 3 Y ACTR D RESET	ATVC 4		BD		93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					
SSME_REPOS_CMPLT	V95X1624X	SSME CHUTE DEPLOY POSITION CMPLT	LDG GEAR VLV CNTL		BD		89991E	
SSME_STOW_COMPLETE	V95X1622X	SSME STOW COMPLETE FLAG	ASC DAP					
			MSC					
	V72M8712P	MDM FA01 DSCR OUT SET	CD 02 CH 0				93017G	*
			DL FMT 21/1					
			DL FMT 32/1					
	V72M8715PA	MDM FA01 DSCR OUT SET	CD 10 CH 0				93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					
	V72M8732P	MDM FA02 DSCR OUT SET	CD 02 CH 0				93017G	*
			DL FMT 21/1					
			DL FMT 32/1					
	V72M8735PA	MDM FA02 DSCR OUT SET	CD 10 CH 0				93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					
	V72M8752P	MDM FA03 DSCR OUT SET	CD 02 CH 0				93017G	*
			DL FMT 21/1					
			DL FMT 32/1					
	V72M8755PA	MDM FA03 DSCR OUT SET	CD 10 CH 0				93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					
	V72M8772P	MDM FA04 DSCR OUT SET	CD 02 CH 0				93017G	*
			DL FMT 21/1					
			DL FMT 32/1					
	V72M8774PA	MDM FA04 DSCR OUT SET	CD 10 CH 0				93017G	*
			DL FMT 21/A					
			DL FMT 22/A					
			DL FMT 23/A					
			DL FMT 32/A					

TABLE 4.60-3. OUTPUT FUNCTIONAL PARAMETERS FROM MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
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NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.60-4. MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
CHUTESTOW1	V97U4271C	DEG	F	S	D	C	G4.60	00	ZF5	90014G	
CHUTESTOW2	V97U4272C	DEG	F	S	D	C	G4.60	00	ZF5	90014G	
CHUTESTOW3	V97U4273C	DEG	F	S	D	C	G4.60	00	ZF5	90014G	
MPS_PC	V97U4276C	DEG	F	S	D	C	G4.60	00	ZF5	90014G	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.60-5. MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
CME1P COMP SCALE FACTOR - ME1 PITCH CMD	V97U3946C	00	-4.3370	E-01	VDC/DEG	F	S	X G4.60 V4.1	90109D	
CME1Y COMP SCALE FACTOR - ME1 YAW CMD	V97U3950C	00	+5.3529998	E-01	VDC/DEG	F	S	X G4.60	90508B	
CME2P COMP SCALE FACTOR - ME2 PITCH CMD	V97U3954C	00	+4.3370	E-01	VDC/DEG	F	S	X G4.60 V4.1	90109D	
CME2Y COMP SCALE FACTOR - ME2 YAW CMD	V97U3958C	00	+5.4440	E-01	VDC/DEG	F	S	X G4.60 V4.1	90109D	
CME3P COMP SCALE FACTOR - ME3 PITCH CMD	V97U3962C	00	-4.3370	E-01	VDC/DEG	F	S	X G4.60 V4.1	90109D	
CME3Y COMP SCALE FACTOR - ME3 YAW CMD	V97U3966C	00	+5.2540	E-01	VDC/DEG	F	S	X G4.60 V4.1	90109D	
KME1P COMP BIAS - ME1 PITCH CMD	V97U4058C	00	+1.453	E-01	VDC	F	S	X G4.60 V4.1	90109D	
KME1Y COMP BIAS - ME1 YAW CMD	V97U4062C	00	+9.80	E-02	VDC	F	S	X G4.60	90109D	
KME2P COMP BIAS - ME2 PITCH CMD	V97U4066C	00	+1.453	E-01	VDC	F	S	X G4.60 V4.1	90109D	
KME2Y COMP BIAS - ME2 YAW CMD	V97U4070C	00	+1.127	E-01	VDC	F	S	X G4.60 V4.1	90109D	
KME3P COMP BIAS - ME3 PITCH CMD	V97U4074C	00	+1.4530	E-01	VDC	F	S	X G4.60 V4.1	90109D	
KME3Y COMP BIAS - ME3 YAW CMD	V97U4078C	00	+1.151	E-01	VDC	F	S	X G4.60 V4.1	90109D	
MPSPDUMP1	V97U4115C	00	+0.0	E+00	DEG	F	S	C G4.60	90244B	
MPSPDUMP2	V97U4116C	00	-1.0	E+01	DEG	F	S	C G4.60	90244B	
MPSPDUMP3	V97U4117C	00	-1.0	E+01	DEG	F	S	C G4.60	90244B	
MPSPSTOW1	V97U4118C	00	+0.0	E+00	DEG	F	S	C G4.60	90244B	
MPSPSTOW2	V97U4119C	00	-1.0	E+01	DEG	F	S	C G4.60	90244B	
MPSPSTOW3	V97U4120C	00	-1.0	E+01	DEG	F	S	C G4.60	90244B	
MPSYDUMP1	V97U4121C	00	+0.0	E+00	DEG	F	S	C G4.60	90244B	
MPSYDUMP2	V97U4122C	00	-3.5	E+00	DEG	F	S	C G4.60	90244B	
MPSYDUMP3	V97U4123C	00	+3.5	E+00	DEG	F	S	C G4.60	90244B	
MPSYSTOW1	V97U4124C	00	+0.0	E+00	DEG	F	S	C G4.60	90244B	
MPSYSTOW2	V97U4125C	00	-3.5	E+00	DEG	F	S	C G4.60	90244B	

TABLE 4.60-5. MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
MPSYSTOW3	V97U4126C	00	+3.5	E+00 DEG	F	S	C	G4.60	90244B	
MPS_P MAIN ENG PITCH POSN INCREMENT	V97U4113C	00	+8.0	E-02 DEG	F	S	A	G4.60	90109D	
MPS_Y MAIN ENG YAW POSN INCREMENT	V97U4114C	00	+8.0	E-02 DEG	F	S	A	G4.60	90109D	
RSTCYC	V97U4144C	00	+0	CYCLES	I	S	C	G4.60	90857	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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TABLE 4.60-6. MPS THRUST VECTOR CONTROL COMMAND SOP (G4.60) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.62 SOLID ROCKET BOOSTER THRUST VECTOR CONTROL COMMAND SOP

The purpose of the Solid Rocket Booster Thrust Vector Control Command (SRB TVC CMD) SOP principal function shall be to perform the following functions:

- A. Data compensation of the rock and tilt deflection commands
- B. Processing of the SRB actuator bypass/override requests

The compensation function shall be performed at the 25 Hz rate; the bypass/override processing shall be performed at the 6.25 Hz rate. The SRB TVC CMD SOP shall be processed after the ASC DAP, SRB SEP SEQ, and GN&C RM.

The TVC CMD SOP interfaces are indicated on the functional block diagram on Figure 4.62-1. The parameter initialization requirements shall be as follows:

- A. SRB Actuator Commands. The SRB rock and tilt command outputs shall be initialized based on the initial command inputs from ASC DAP on OPS 1 transition.
- B. Reset Commands. The SRB reset command outputs shall be initialized based on the initial input commands from GN&C SW RM on OPS 1 transition.

The remaining parameter initialization and I-load parameters are shown in Table 4.62-1. The IDD inputs and outputs are listed in Tables 4.62-2 and 4.62-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.62-4. K-loads are listed in Table 4.62-5. Constants are listed in Table 4.62-6.

The override requests shall only be processed when an override request has changed state. However, all reset disretes shall be transmitted at the 6.25 Hz rate to preclude communication errors. When an override request changes state, all related override requests shall be logical "OR'd" together, and the appropriate reset command disretes shall be set as indicated above.

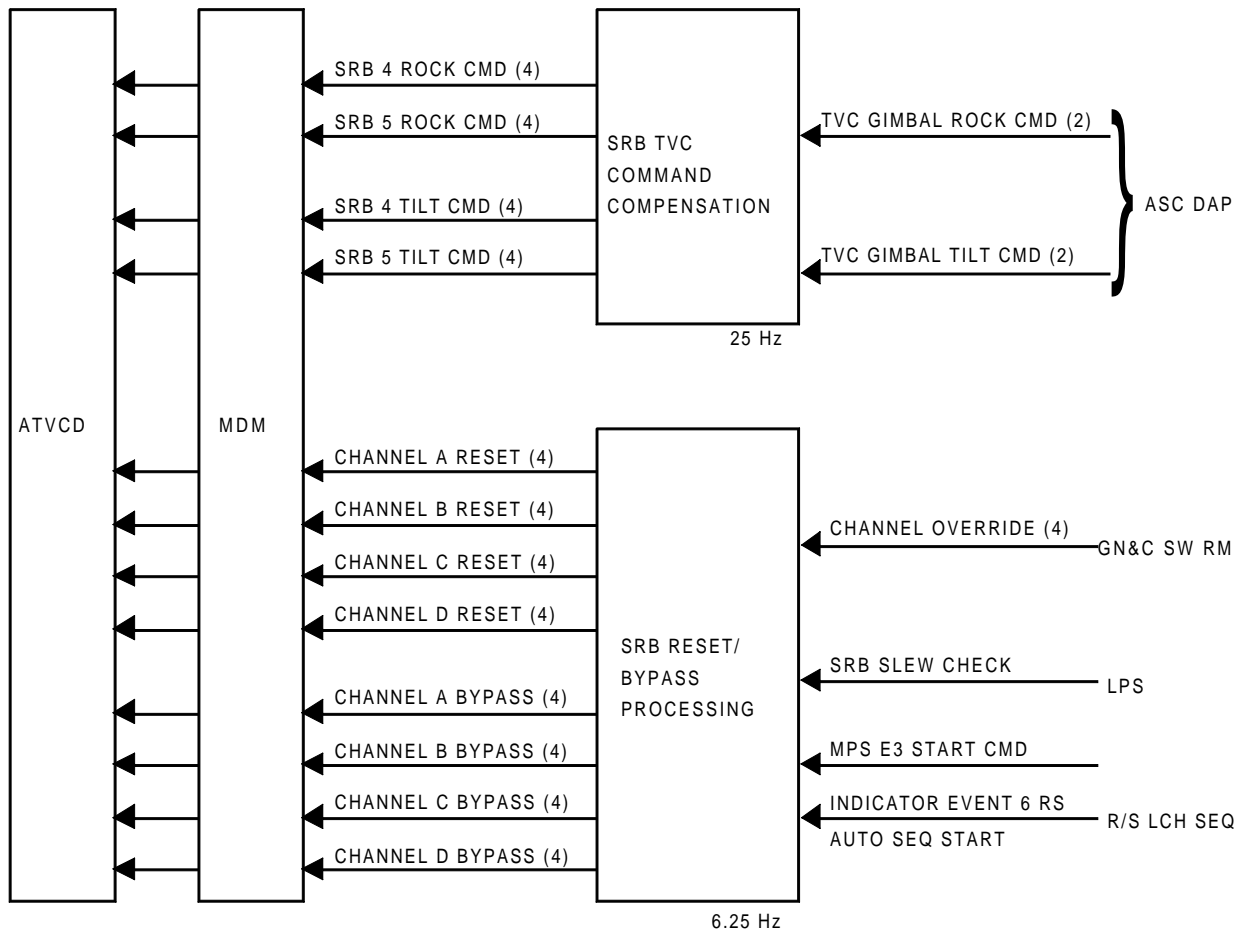


FIGURE 4.62-1. SRB TVC CMD SOP Functional Block Diagram

Table 4.62-1. SRB TVC Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
CC4ROCK	V97U3926C	COMP SCALE FACTOR – SRB 4 ROCK	K	FLOAT PT	+0.6438		VDC/ DEG
CC5ROCK	V97U3934C	COMP SCALE FACTOR – SRB 5 ROCK	K	FLOAT PT	+0.6438		VDC/ DEG
CC4TILT	V97U3930C	COMP SCALE FACTOR – SRB 4 TILT	K	FLOAT PT	+0.6438		VDC/ DEG
CC5TILT	V97U3938C	COMP SCALE FACTOR – SRB 5 TILT	K	FLOAT PT	+0.6438		VDC/ DEG
KC4ROCK	V97U4038C	COMP BIAS – SRB 4 ROCK	K	FLOAT PT	+0.0		VDC
KC5ROCK	V97U4046C	COMP BIAS – SRB 5 ROCK	K	FLOAT PT	+0.0		VDC
KC4TILT	V97U4042C	COMP BIAS – SRB 4 TILT	K	FLOAT PT	+0.0		VDC
KC5TILT	V97U4050C	COMP BIAS – SRB 5 TILT	K	FLOAT PT	+0.0		VDC
BYP4ROCK(1)	V79K5500X	LH SRB ROCK ACTR A BYPASS		DISCRETE	0		
BYP4ROCK(2)	V79K5505X	LH SRB ROCK ACTR B BYPASS		DISCRETE	0		
BYP4ROCK(3)	V79K5510X	LH SRB ROCK ACTR C BYPASS		DISCRETE	0		
BYP4ROCK(4)	V79K5515X	LH SRB ROCK ACTR D BYPASS		DISCRETE	0		
BYP5ROCK(1)	V79K5550X	RH SRB ROCK ACTR A BYPASS		DISCRETE	0		
BYP5ROCK(2)	V79K5555X	RH SRB ROCK ACTR B BYPASS		DISCRETE	0		
BYP5ROCK(3)	V79K5560X	RH SRB ROCK ACTR C BYPASS		DISCRETE	0		
BYP5ROCK(4)	V79K5565X	RH SRB ROCK ACTR D BYPASS		DISCRETE	0		
BYP4TILT(1)	V79K5501X	LH SRB TILT ACTR A BYPASS		DISCRETE	0		
BYP4TILT(2)	V79K5506X	LH SRB TILT ACTR B BYPASS		DISCRETE	0		
BYP4TILT(3)	V79K5511X	LH SRB TILT ACTR C BYPASS		DISCRETE	0		
BYP4TILT(4)	V79K5516X	LH SRB TILT ACTR D BYPASS		DISCRETE	0		
BYP5TILT(1)	V79K5551X	RH SRB TILT ACTR A BYPASS		DISCRETE	0		
BYP5TILT(2)	V79K5556X	RH SRB TILT ACTR B BYPASS		DISCRETE	0		
BYP5TILT(3)	V79K5561X	RH SRB TILT ACTR C BYPASS		DISCRETE	0		
BYP5TILT(4)	V79K5566X	RH SRB TILT ACTR D BYPASS		DISCRETE	0		

4.62.1 SRB TVC Command Compensation

The SRB TVC command compensation function shall generate compensated commands to the SRB rock and tilt actuators. The commanded positions shall be compensated by applying bias and scale factor terms to convert from engineering units to VDC. The outputs shall consist of four redundant commands to each of the two SRB's rock and tilt actuators. Provisions shall be made for unique bias and scale factor values for each SRB actuator command. The general compensation equation shall be as follows:

$$\text{COMPCMD} = \text{CMD CC} + \text{KC}$$

where

COMPCMD =Compensated actuator command (VDC)

CMD =Commanded actuator position (DEG)

CC =Commanded compensation scale factor (VDC/DEG) and

KC =Commanded compensation bias (VDC)

4.62.2 SRB TVC Actuator Bypass/Override Processing

The SRB TVC actuator bypass/override processing function shall generate bypass and reset secondary channel command discretes to the two SRB engines rock and tilt actuators. The processing shall be performed as follows:

- A. Bypass function. This function shall generate bypass discretes to both SRB engines rock and tilt actuators. The bypass discretes (16 total) shall always be set to the “zero” state and shall be output at the cyclic processing rate.
- B. Reset function. This function shall generate reset discretes to both SRB engines rock and tilt actuators by monitoring the following override requests:
 - FCS channel override requests from GN&C SW RM shall be monitored on a channel basis. A channel switch in the “OVERRIDE” position shall result in all the rock and tilt actuator reset discretes for that channel (4 total) being set to the “1” state. A channel switch in a position other than “OVERRIDE” shall result in all rock and tilt actuator reset discretes for that channel being set to the “zero” state.
 - The EVENT_6 indication from R/S LCH SEQ shall be monitored during HPU start-up. When the flag indicates a “1” state, all the rock and tilt actuator reset discretes (16 total) shall be set to the “1” state. Once set, the SRB actuator reset discretes shall remain unchanged until either the MPS E3 start command flag from R/S LCH SEQ or the SRB_SLEW indicator from LPS indicates a “1” state; at which time, the SRB reset discretes shall be set to the “zero” state.

TABLE 4.62-2. INPUT FUNCTIONAL PARAMETERS FOR SRB THRUST VECTOR CONTROL COMMAND SOP (G4.62)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AUTO_SEQ_IND	V90X8683X	INDICATOR EVENT 6 AUTO SEQ START	R/S LCH SEQ				89599C	
DR4CL	V90H1728C	SRB 4 ROCK ACTR DEFLECTION CMD	ASC DAP	DEG				
DR5CL	V90H1729C	SRB 5 ROCK ACTR DEFLECTION CMD	ASC DAP	DEG				
DT4CL	V90H1731C	SRB 4 TILT ACTR DEFLECTION CMD	ASC DAP	DEG				
DT5CL	V90H1732C	SRB 5 TILT ACTR DEFLECTION CMD	ASC DAP	DEG				
MESTRTCMD(3)	V90X8360X	MPS E3 START CMD FLAG	R/S LCH SEQ					
RSTSW(1)	V90X5201XB	SEL FCS RESET/OVERRIDE SW CHAN 1	GN&C SW RM				93017G	*
RSTSW(2)	V90X5211XB	SEL FCS RESET/OVERRIDE SW CHAN 2	GN&C SW RM				93017G	*
RSTSW(3)	V90X5221XB	SEL FCS RESET/OVERRIDE SW CHAN 3	GN&C SW RM				93017G	*
RSTSW(4)	V90X5231XB	SEL FCS RESET/OVERRIDE SW CHAN 4	GN&C SW RM				93017G	*
SRB_SLEW	V99X8820X	SLEW CHECK INDICATOR ACTIVATED	LPS				89599C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.62-3. OUTPUT FUNCTIONAL PARAMETERS FROM SRB THRUST VECTOR CONTROL COMMAND SOP (G4.62)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
LH_ROCK_BYP_A	V79K5500X	LH SRB ROCK ACTR A BYPASS	ATVC 1		BD			
LH_ROCK_BYP_B	V79K5505X	LH SRB ROCK ACTR B BYPASS	ATVC 2		BD			
LH_ROCK_BYP_C	V79K5510X	LH SRB ROCK ACTR C BYPASS	ATVC 3		BD			
LH_ROCK_BYP_D	V79K5515X	LH SRB ROCK ACTR D BYPASS	ATVC 4		BD			
LH_ROCK_CMD_A	B58K3750C	LH TVC ROCK ACTR CONTROL A CMD	ATVC 1	VDC	AMB		93017G	*
			DL FMT 21/1					
LH_ROCK_CMD_B	B58K3751C	LH TVC ROCK ACTR CONTROL B CMD	ATVC 2	VDC	AMB			
LH_ROCK_CMD_C	B58K3752C	LH TVC ROCK ACTR CONTROL C CMD	ATVC 3	VDC	AMB			
LH_ROCK_CMD_D	B58K3753C	LH TVC ROCK ACTR CONTROL D CMD	ATVC 4	VDC	AMB			
LH_ROCK_RST_A	V79K5300X	LH SRB ROCK ACTR A RESET	ATVC 1		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
			DL FMT 32/B					
LH_ROCK_RST_B	V79K5305X	LH SRB ROCK ACTR B RESET	ATVC 2		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
			DL FMT 32/B					
LH_ROCK_RST_C	V79K5310X	LH SRB ROCK ACTR C RESET	ATVC 3		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
			DL FMT 32/B					
LH_ROCK_RST_D	V79K5315X	LH SRB ROCK ACTR D RESET	ATVC 4		BD		93017G	*
			DL FMT 21/1					
			DL FMT 32/B					
			DL FMT 32/B					
LH_TILT_BYP_A	V79K5501X	LH SRB TILT ACTR A BYPASS	ATVC 1		BD			
LH_TILT_BYP_B	V79K5506X	LH SRB TILT ACTR B BYPASS	ATVC 2		BD			
LH_TILT_BYP_C	V79K5511X	LH SRB TILT ACTR C BYPASS	ATVC 3		BD			
LH_TILT_BYP_D	V79K5516X	LH SRB TILT ACTR D BYPASS	ATVC 4		BD			
LH_TILT_CMD_A	B58K3754C	LH TVC TILT ACTR CONTROL A CMD	ATVC 1	VDC	AMB		93017G	*
			DL FMT 21/1					
LH_TILT_CMD_B	B58K3755C	LH TVC TILT ACTR CONTROL B CMD	ATVC 2	VDC	AMB			
LH_TILT_CMD_C	B58K3756C	LH TVC TILT ACTR CONTROL C CMD	ATVC 3	VDC	AMB			
LH_TILT_CMD_D	B58K3757C	LH TVC TILT ACTR CONTROL D CMD	ATVC 4	VDC	AMB			
LH_TILT_RST_A	V79K5301X	LH SRB TILT ACTR A RESET	ATVC 1		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
			DL FMT 32/B					
LH_TILT_RST_B	V79K5306X	LH SRB TILT ACTR B RESET	ATVC 2		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
			DL FMT 32/B					
LH_TILT_RST_C	V79K5311X	LH SRB TILT ACTR C RESET	ATVC 3		BD		93017G	*
			DL FMT 21/A					
			DL FMT 23/A					
			DL FMT 32/B					

TABLE 4.62-3. OUTPUT FUNCTIONAL PARAMETERS FROM SRB THRUST VECTOR CONTROL COMMAND SOP (G4.62)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
LH_TILT_RST_D	V79K5316X	LH SRB TILT ACTR D RESET	ATVC 4 DL FMT 21/1 DL FMT 23/1 DL FMT 32/A		BD		93017G	*
RH_ROCK_BYP_A	V79K5550X	RH SRB ROCK ACTR A BYPASS	ATVC 1		BD			
RH_ROCK_BYP_B	V79K5555X	RH SRB ROCK ACTR B BYPASS	ATVC 2		BD			
RH_ROCK_BYP_C	V79K5560X	RH SRB ROCK ACTR C BYPASS	ATVC 3		BD			
RH_ROCK_BYP_D	V79K5565X	RH SRB ROCK ACTR D BYPASS	ATVC 4		BD			
RH_ROCK_CMD_A	B58K4750C	RH TVC ROCK ACTR CONTROL A CMD	ATVC 1 DL FMT 21/1	VDC	AMB		93017G	*
RH_ROCK_CMD_B	B58K4751C	RH TVC ROCK ACTR CONTROL B CMD	ATVC 2	VDC	AMB			
RH_ROCK_CMD_C	B58K4752C	RH TVC ROCK ACTR CONTROL C CMD	ATVC 3	VDC	AMB			
RH_ROCK_CMD_D	B58K4753C	RH TVC ROCK ACTR CONTROL D CMD	ATVC 4	VDC	AMB			
RH_ROCK_RST_A	V79K5350X	RH SRB ROCK ACTR A RESET	ATVC 1 DL FMT 21/A DL FMT 23/A DL FMT 32/B		BD		93017G	*
RH_ROCK_RST_B	V79K5355X	RH SRB ROCK ACTR B RESET	ATVC 2 DL FMT 21/A DL FMT 23/A DL FMT 32/B		BD		93017G	*
RH_ROCK_RST_C	V79K5360X	RH SRB ROCK ACTR C RESET	ATVC 3 DL FMT 21/A DL FMT 23/A DL FMT 32/B		BD		93017G	*
RH_ROCK_RST_D	V79K5365X	RH SRB ROCK ACTR D RESET	ATVC 4 DL FMT 21/1 DL FMT 23/1 DL FMT 32/A		BD		93017G	*
RH_TILT_BYP_A	V79K5551X	RH SRB TILT ACTR A BYPASS	ATVC 1		BD			
RH_TILT_BYP_B	V79K5556X	RH SRB TILT ACTR B BYPASS	ATVC 2		BD			
RH_TILT_BYP_C	V79K5561X	RH SRB TILT ACTR C BYPASS	ATVC 3		BD			
RH_TILT_BYP_D	V79K5566X	RH SRB TILT ACTR D BYPASS	ATVC 4		BD			
RH_TILT_CMD_A	B58K4754C	RH TVC TILT ACTR CONTROL A CMD	ATVC 1 DL FMT 21/1	VDC	AMB		93017G	*
RH_TILT_CMD_B	B58K4755C	RH TVC TILT ACTR CONTROL B CMD	ATVC 2	VDC	AMB			
RH_TILT_CMD_C	B58K4756C	RH TVC TILT ACTR CONTROL C CMD	ATVC 3	VDC	AMB			
RH_TILT_CMD_D	B58K4757C	RH TVC TILT ACTR CONTROL D CMD	ATVC 4	VDC	AMB			
RH_TILT_RST_A	V79K5351X	RH SRB TILT ACTR A RESET	ATVC 1 DL FMT 21/A DL FMT 23/A DL FMT 32/B		BD		93017G	*
RH_TILT_RST_B	V79K5356X	RH SRB TILT ACTR B RESET	ATVC 2 DL FMT 21/A DL FMT 23/A DL FMT 32/B		BD		93017G	*

TABLE 4.62-3. OUTPUT FUNCTIONAL PARAMETERS FROM SRB THRUST VECTOR CONTROL COMMAND SOP (G4.62)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RH_TILT_RST_C	V79K5361X	RH SRB TILT ACTR C RESET	ATVC 3 DL FMT 21/A DL FMT 23/A DL FMT 32/B		BD		93017G	*
RH_TILT_RST_D	V79K5366X	RH SRB TILT ACTR D RESET	ATVC 4 DL FMT 21/1		BD		93017G	*
	V72M8713PA	MDM FA01 DSCR OUT SET	CD 02 CH 1 DL FMT 21/A DL FMT 23/A DL FMT 32/B				93017G	*
	V72M8716PA	MDM FA01 DSCR OUT SET	CD 10 CH 1 DL FMT 21/A DL FMT 23/A DL FMT 32/B				93017G	*
	V72M8733PA	MDM FA02 DSCR OUT SET	CD 02 CH 1 DL FMT 21/A DL FMT 23/A DL FMT 32/B				93017G	*
	V72M8736PA	MDM FA02 DSCR OUT SET	CD 10 CH 1 DL FMT 21/A DL FMT 23/A DL FMT 32/B				93017G	*
	V72M8753PA	MDM FA03 DSCR OUT SET	CD 02 CH 1 DL FMT 21/A DL FMT 23/A DL FMT 32/B				93017G	*
	V72M8756PA	MDM FA03 DSCR OUT SET	CD 10 CH 1 DL FMT 21/A DL FMT 23/A DL FMT 32/B				93017G	*
	V72M8773PA	MDM FA04 DSCR OUT SET	CD 02 CH 1 DL FMT 21/1 DL FMT 23/1 DL FMT 32/A				93017G	*
	V72M8775P	MDM FA04 DSCR OUT SET	CD 10 CH 1 DL FMT 21/1				93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.62-4. SRB THRUST VECTOR CONTROL COMMAND SOP (G4.62) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.62-5. SRB THRUST VECTOR CONTROL COMMAND SOP (G4.62) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
CC4ROCK COMP SCALE FACTOR - SRB 4 ROCK	V97U3926C	00	+6.4379944	E-01	VDC/DEG	F	S	X G4.62	90508B	
CC4TILT COMP SCALE FACTOR - SRB 4 TILT	V97U3930C	00	+6.4379944	E-01	VDC/DEG	F	S	X G4.62	90508B	
CC5ROCK COMP SCALE FACTOR - SRB 5 ROCK	V97U3934C	00	+6.4379944	E-01	VDC/DEG	F	S	X G4.62	90508B	
CC5TILT COMP SCALE FACTOR - SRB 5 TILT	V97U3938C	00	+6.4379944	E-01	VDC/DEG	F	S	X G4.62	90508B	
KC4ROCK COMP BIAS - SRB 4 ROCK	V97U4038C	00	+0.0	E+00	VDC	F	S	X G4.62	90109D	
KC4TILT COMP BIAS - SRB 4 TILT	V97U4042C	00	+0.0	E+00	VDC	F	S	X G4.62	90109D	
KC5ROCK COMP BIAS - SRB 5 ROCK	V97U4046C	00	+0.0	E+00	VDC	F	S	X G4.62	90109D	
KC5TILT COMP BIAS - SRB 5 TILT	V97U4050C	00	+0.0	E+00	VDC	F	S	X G4.62	90109D	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.62-6. SRB THRUST VECTOR CONTROL COMMAND SOP (G4.62) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.64 ORBITAL MANEUVERING SYSTEM THRUST VECTOR CONTROL COMMAND SOP

The purpose of the Orbital Maneuvering System Thrust Vector Control Command (OMS TVC CMD) SOP shall be to perform the following functions during the period in which vehicle checkout is not in progress (GNC GROUND CHECKOUT ENABLE = OFF). If vehicle checkout is in progress (GNC GROUND CHECKOUT ENABLE = ON), the Orbital Maneuver System Thrust Vector Control Command SOP shall be bypassed entirely.

- A. Processing of the active and standby pitch and yaw actuator position commands
- B. Processing of the OMS active/standby select discretes

The OMS TVC position command function shall be processed at the 12.5 Hz rate in Major Modes 104, 105, 106, 202, 301, 302, 303, 304, and 602. In Major Mode 601, the OMS TVC position command function shall be processed at 6.25 Hz. In all other modes, the OMS TVC actuators shall be commanded by cyclic I/O at the cyclic I/O processing rate. The OMS active/standby channel select function shall be processed as follows:

	Condition	
Major Mode	ZAP Off	ZAP On
101	6.25 Hz	N/A
102	6.25 Hz	N/A
103	6.25 Hz	N/A
104	1.04 Hz	12.5 Hz
105	1.04 Hz	12.5 Hz
106	1.04 Hz	12.5 Hz
202	1.04 Hz	12.5 Hz
301	1.04 Hz	12.5 Hz
302	1.04 Hz	12.5 Hz
303	1.04 Hz	12.5 Hz
304	1.04 Hz	12.5 Hz
601	6.25 Hz	N/A
602	1.04 Hz	12.5 Hz
All other modes	N/A (command off via cyclic I/O)	N/A (command off via cyclic I/O)

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The OMS TVC CMD SOP interfaces are indicated on the functional block diagram on Figure 4.64-1. The parameter initialization requirements shall be as follows:

A. OMS Actuator Commands. The OMS actuator command outputs shall be initialized based on cyclic I/O commands to stow position on transition to OPS 1 and on the initial command inputs from TRANS DAP on transition to OPS 3.

B. OMS Active/Standby Commands. The OMS active and standby commands shall be initialized “deselected” on transition to OPS 1 and initialized based on the last channel select/deselect input from the MNVR display on transition to OPS 3.

C. OMS Position Feedbacks. To assure proper OMS position feedback initialization in OPS 1, the OMS TVC FDBK SOP must execute before the first execution of the OMS TVC CMD SOP.

The remaining parameter initialization and I-load parameters are shown in Table 4.64-1. The IDD inputs and outputs are listed in Tables 4.64-2 and 4.64-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.64-4. K-loads are listed in Table 4.64-5. Constants are listed in Table 4.64-6.

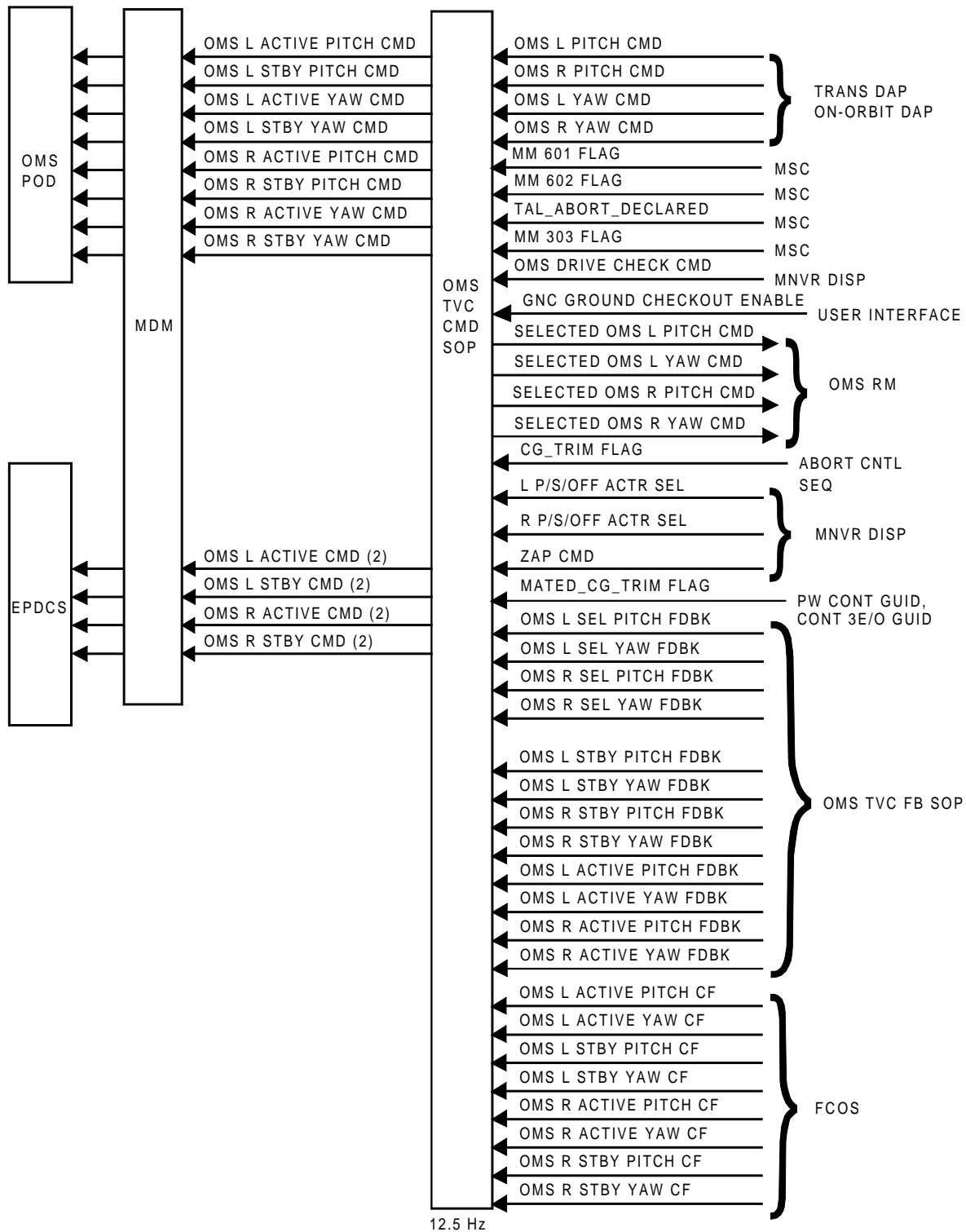


FIGURE 4.64-1. OMS TVC CMD SOP Functional Block Diagram

4.64.1 OMS TVC Command Processing

The OMS TVC command processing function shall compensate selected position commands to the two OMS engines pitch and yaw actuators. The position commands shall be selected as follows:

A. The OMS control law position commands (2 yaw and 2 pitch) from the TRANS DAP during OPS 1 and 3 and from the ON-ORBIT DAP during OPS 2 shall be processed when the OMS gimbal drive check flag, the MM_303 flag, and the MM_602 flag all indicate the “zero” state.

B. The OMS gimbal drive check flag from MNVR display shall be monitored during OPS 1 when MM 101, 102, and 103 all indicate the “zero” state and during OPS 3, when MM 303 indicates the “zero” state and the OMS gimbal drive check flag from ORB MNVR EXEC display shall be monitored during OPS 2. When the OMS gimbal drive check flag indicates the “1” state, the drive check position commands (both pitch and yaw simultaneously) for each of the OMS actuators (4 total) shall be generated in the following order:

- Command to POSN1 for OMS_DRIVE1 number of cycles and set DRIVE_OMS flag to the “1” state (OMS drive in process).
- Command to POSN2 for OMS_DRIVE2 number of cycles.
- Command to POSN3 for OMS_DRIVE3 number of cycles. Once OMS_DRIVE3 cycles have occurred, set DRIVE_OMS flag to the “zero” state (OMS drive not in process) and set command to last DAP command.

During the gimbal drive check, the drive check positions shall take precedence over the control law positions.

C. The MM 303 flag and the TAL_ABORT_DECLARED flag from MSC shall be monitored. When these flags indicate the “zero” state (not in Major Mode 303 and not in TAL), the control law or drive check positions shall be processed. When the MM_303 flag or TAL_ABORT_DECLARED flag indicates the “1” state (in Major Mode 303 or in a TAL), each of the OMS actuators shall be commanded to unique stow positions and remain unchanged until MM304.

D. MM_602 flag from MSC and the CG_TRIM flag from ABT CNTL SEQ shall be monitored. When the MM_602 flag indicates the “zero” state (not in Major Mode 602), the control law, drive check, or stow positions shall be processed. When MM_602 flag indicates the “1” state and the CG_TRIM flag indicates the “1” state (command CG), each of the OMS actuators shall be commanded to unique trim positions taking precedence over all other position commands. When MM_602 flag indicates the “1” state and the CG_TRIM flag indicates the “zero” state, each of the OMS actuators shall be commanded to the stow positions.

E. The MM_304 flag from MSC and CG_TRIM flag from ABT CNTL SEQ shall be monitored. When the MM_304 flag indicates the “zero” state (not in MM 304), the control law, drive check, or stow positions shall be processed.

When the MM_304 flag indicates the “1” state and the CG_TRIM flag indicates “1” state (command CG), each of the OMS actuators shall be commanded to unique trim positions, taking precedence over all other position commands.

When the MM_304 flag indicates the "1" state and the CG_TRIM flag indicates "zero" state (CG not commanded), each of the OMS actuators shall be commanded to unique stow positions and remain unchanged.

F. The ZAP from MNVR Display (6.35) shall be monitored during MM 104, 105, 106, 202, 301, 302, and 303. When the ZAP is other than zero and two 12.5 Hz cycles (160 milliseconds) have elapsed since execution of the associated channel select processing, the compensated command (VDC) for all actuators shall be set to +5.1, -5.1 (or -5.1, +5.1) on consecutive cycles. Upon execution of the commands, the ZAP shall be reset to "zero."

G. The MM_601 flag from MSC, the MATED_CG_TRIM flag from PW CONT GUID and CONT 3E/O GUID, and the CG_TRIM command from ABT CNTL SEQ shall be monitored. When the MM_601 flag indicates the "1" state and the MATED_CG_TRIM flag indicates the "1" state (command mated coast CG trim), each of the OMS actuators shall be commanded to unique trim positions taking precedence over all other position commands. The mated trim positions are specified by the I-loads MATED_OMS_L_TRIM1, MATED_OMS_L_TRIM2, MATED_OMS_R_TRIM1 and MATED_OMS_R_TRIM2.

When the MM_601 flag indicates the "1" state, the CG_TRIM flag indicates the "1" state (command orbiter CG trim), and the MATED_CG_TRIM flag indicates the "0" state, each of the OMS actuators shall be commanded to unique trim positions taking precedence over all other position commands. The orbiter trim positions are specified by the parameters OMSLTRIM1, OMLSTRIM2, OMSRTRIM1 and OMSRTRIM2.

Otherwise, each of the OMS actuators shall be commanded to the stow positions.

The position to which the OMS engine actuators shall be commanded for the drive, trim, and stow position commands are presented in Table 4.64-1, Initialization Parameters.

The selected pitch and yaw actuator positions (control law, check, c.g. trim, or stow) shall be provided to the OMS RM principal function, and shall then be compensated by applying bias and scale factor terms to convert from engineering units to VDC. Provisions shall be made for unique bias and scale factor terms for each actuator. The general compensation equation shall be as follows:

$$\text{COMPCMD} = \text{CMD CC} + \text{KC}$$

where

COMPCMD= Compensated command (VDC)

CMD= Selected actuator position command (DEG)

CC= Compensation scale factor (VDC/DEG)

KC= Compensation bias (VDC)

The output position commands shall consist of two redundant compensated commands (one for the active channel and one for the standby channel) for each of the OMS engines pitch and yaw actuators (four pitch and four yaw total).

4.64.2 OMS TVC Active/Standby Select Processing

The OMS active/standby select processing shall generate dual discrete commands to the OMS engines active and standby channels. Channel selection shall be determined by monitoring the OMS primary/secondary/off indications from MNVR display.

The OMS primary/secondary/off indications shall be processed to generate dual redundant active and standby channel discrete commands as follows:

PRI/SEC/OFF Channel Select	Active Channel Output Command	Standby Channel Output Select
0	"1" state	"0" state
1	"0" state	"1" state
2	"0" state	"0" state

On transitions to OPS 1, the dual redundant active and standby channel discrettes shall be initially set to the "zero" state (deselected).

If either the MATED_CG_TRIM flag from PW CONT GUID or the CG_TRIM flag from ABT_CNTL_SEQ indicate the "1" state (command CG trim) and the Major Mode is 601, the following active/standby select processing shall be performed for both the left and right engines. If both the active and standby channel discrettes indicate the "0" state (channel not selected and powered), then the active channel discrettes shall be set to the "1" state. Comparisons against the stow positions shall be subsequently discontinued for the remainder of MM 601, regardless of the state indicated by MATED_CG_TRIM or CG_TRIM.

In MM 101, 102, 103, and 601, the compensated active and standby, as well as selected, OMS pitch and yaw actuator position feedbacks for each engine shall be individually compared with the associated stow position. When the absolute value of the difference between the actuator feedback and the corresponding stow position is greater than the OMS_THRESHOLD for both active and standby actuators for OMSFAILCYC number of consecutive cycles, the active channel discrettes for that engine shall be set to the "1" state (select and power active channel). A single pass of pitch feedback that exceeds its threshold followed by a single pass of yaw that exceeds its threshold shall result in a channel activation. To provide protection against commfaults, the pitch and yaw actuator commfault flags are evaluated in the test that determines if an actuator has moved out of the stow position. If one channel (either Active or Standby) is commfaulted, the other channel is assumed to be providing correct feedback (e.g. if the Active actuator feedback is commfaulted and Standby actuator feedback indicates that the actuator has moved out of the Stow position, select and power the active channel). If both channels are commfaulted, it is assumed the actuator is in the Stow position and has not moved. The logic for these comparisons is

For Left Engine:

```
((|(AOMSLPFDBK) - OMSLSTOW1| > OMS_THRSHLDL(1)) .OR. (LOMSPPCF)) .AND.
(|(STOMSLPFDBK) - OMSLSTOW1| > OMS_THRSHLDL(1)) .OR. (LOMSSPCF))
.AND. NOT(LOMSPPCF .AND. LOMSSPCF))
.OR.
(((AOMSLYFDBK) - OMSLSTOW2| > OMS_THRSHLDL(2)) .OR. (LOMSPYCF)) .AND.
(|(STOMSLYFDBK) - OMSLSTOW2| > OMS_THRSHLDL(2)) .OR. (LOMSSYCF))
.AND. NOT(LOMSPYCF .AND. LOMSSYCF))
```

For Right Engine:

(((AOMSRPFDBK) - OMSRSTOW1| > OMS_THRSHLDR(1)) .OR. (ROMSPPCF)) .AND.
 ((STOMSRPFDBK) - OMSRSTOW1| > OMS_THRSHLDR(1)) .OR. (ROMSSPCF))
 .AND. NOT(ROMSPPCF .AND. ROMSSPCF))
 .OR.
 (((AOMSRYFDBK) - OMSRSTOW2| > OMS_THRSHLDR(2)) .OR. (ROMSPYCF)) .AND.
 ((STOMSRYFDBK) - OMSRSTOW2| > OMS_THRSHLDR(2)) .OR. (ROMSSYCF))
 .AND. NOT(ROMSPYCF .AND. ROMSSYCF))

These tests, and the resulting actions may be tabularized as

Pitch				Yaw				Active Channel
Out of Stow		Commfault		Out of Stow		Commfault		Active Channel
Active	Standby	Active	Standby	Active	Standby	Active	Standby	Active
1	0	0	1	X	X	X	X	1
0	1	1	0	X	X	X	X	1
1	1	0	0	X	X	X	X	1
1	1	0	1	X	X	X	X	1
1	1	1	0	X	X	X	X	1
X	X	X	X	1	0	0	1	1
X	X	X	X	0	1	1	0	1
X	X	X	X	1	1	0	0	1
X	X	X	X	1	1	0	1	1
X	X	X	X	1	1	1	0	1

X = Don't Care

All other cases leave Active Channel Active Off

Subsequently, if the absolute value of the difference between the selected or standby actuator feedback and stow positions are greater than OMS_THRESHOLD for another OMSFAILCYC consecutive cycles, the active channel discretizes for that engine shall be set to the "zero" state (deselect active channel), and the standby channel discretizes for that engine shall be set to the "1" state (select and power standby channel). The logic for these comparisons is

For Left Engine:

(((SOMSLPFDBK) - OMSLSTOW1| > OMS_THRSHLDL(1)) AND .NOT. (LOMSPPCF)) .OR.

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((|(STOMSLPFDBK) - OMSLSTOW1| > OMS_THRSHLDL(1)) AND .NOT. (LOMSSPCF)) .OR.
 ((|(SOMSLYFDBK) - OMSLSTOW2| > OMS_THRSHLDL(2)) AND .NOT. (LOMSPYCF)) .OR.
 ((|(STOMSLYFDBK) - OMSLSTOW2| > OMS_THRSHLDL(2)) AND .NOT. (LOMSSYCF)))

For Right Engine:

(((|(SOMSRPFDBK) - OMSRSTOW1| > OMS_THRSHLDR(1)) AND .NOT. (ROMSPPCF)) .OR.
 (|(STOMSRPFDBK) - OMSRSTOW1| > OMS_THRSHLDR(1)) AND .NOT. (ROMSPPCF)) .OR.
 ((|(SOMSRYFDBK) - OMSRSTOW2| > OMS_THRSHLDR(2)) AND .NOT. (ROMSPYCF)) .OR.
 ((|(STOMSRYFDBK) - OMSRSTOW2| > OMS_THRSHLDR(2)) AND .NOT. (ROMSSYCF)))

Individual cycle counters shall be used for each engine for both checks; these counters shall be initialized properly and reset if an intervening cycle occurs in which the absolute value of the difference between the actuator feedback and stow position is less than OMS_THRESHOLD. If both actuator channels are commfaulted, the counters shall remain static and are only updated upon receipt of good data. In MM 104, the active/standby channel select discretes shall indicate the last state selected in MM 103. In MM 601, the active/standby channel select discretes shall indicate the last state selected prior to the transition to OPS 6. On all major mode transitions, the active/standby channel select discretes shall reflect the last channel selected by crew input via the MNVR display.

Table 4.64-1. OMS TVC Command SOP Initialization Parameters							
Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
OMSLSTOW1	V97U4131C	OMS-L ENG PITCH STOW POSITION	K	FLOAT PT	+5.89		DEG
OMSLSTOW2	V97U4132C	OMS-L ENG YAW STOW POSITION	K	FLOAT PT	+6.44		DEG
OMSRSTOW1	V97U4133C	OMS-R ENG PITCH STOW POSITION	K	FLOAT PT	+5.89		DEG
OMSRSTOW2	V97U4134C	OMS-R ENG YAW STOW POSITION	K	FLOAT PT	-6.44		DEG
LOMSPOSNP1	V97U4105C	OMS-L DRIVE CHECK PITCH POSN 1	K	FLOAT PT	+5.89		DEG
LOMSPOSNP2	V97U4106C	OMS-L DRIVE CHECK PITCH POSN 2	K	FLOAT PT	-5.89		DEG
LOMSPOSNP3	V97U4107C	OMS-L DRIVE CHECK PITCH POSN 3	K	FLOAT PT	+5.89		DEG
LOMSPOSNY1	V97U4108C	OMS-L DRIVE CHECK YAW POSN 1	K	FLOAT PT	+6.44		DEG
LOMSPOSNY2	V97U4109C	OMS-L DRIVE CHECK YAW POSN 2	K	FLOAT PT	-6.44		DEG
LOMSPOSNY3	V97U4110C	OMS-L DRIVE CHECK YAW POSN 3	K	FLOAT PT	+6.44		DEG
ROMSPOSNP1	V97U4138C	OMS-R DRIVE CHECK PITCH POSN 1	K	FLOAT PT	+5.89		DEC

Table 4.64-1. OMS TVC Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
ROMSPOSNP2	V97U4139C	OMS-R DRIVE CHECK PITCH POSN 2	K	FLOAT PT	-5.89		DEG
ROMSPOSNP3	V97U4140C	OMS-R DRIVE CHECK PITCH POSN 3	K	FLOAT PT	+5.89		DEG
ROMSPOSNY1	V97U4141C	OMS-R DRIVE CHECK YAW POSN 1	K	FLOAT PT	+6.44		DEG
ROMSPOSNY2	V97U4142C	OMS-R DRIVE CHECK YAW POSN 2	K	FLOAT PT	-6.44		DEG
ROMSPOSNY3	V97U4143C	OMS-R DRIVE CHECK YAW POSN 3	K	FLOAT PT	+6.44		DEG
OMS_DRIVE1	V97U4128C	OMS DRIVE CHECK COUNTER 1	R	INTEGER	75		
OMS_DRIVE2	V97U4129C	OMS DRIVE CHECK COUNTER 2	R	INTEGER	75		
OMS_DRIVE3	V97U4130C	OMS DRIVE CHECK COUNTER 3	R	INTEGER	75		
COMSLP	V97U3971C	COMPENSATION SCALE FACTOR-OMS L PITCH CMD	K	FLOAT PT	+0.6097		VDC/ DEG
COMSLY	V97U3973C	COMPENSATION SCALE FACTOR-OMS L YAW CMD	K	FLOAT PT	+0.6114		VDC/ DEG
COMSRP	V97U3975C	COMPENSATION SCALE FACTOR-OMS R PITCH CMD	K	FLOAT PT	+0.6097		VDC/ DEG
COMSRY	V97U3977C	COMPENSATION SCALE FACTOR-OMS R YAW CMD	K	FLOAT PT	-0.6114		VDC/ DEG
KOMSLP	V97U4082C	COMPENSATION BIAS-OMS L PITCH CMD	K	FLOAT PT	-0.0448		VDC
KOMSLY	V97U4084C	COMPENSATION BIAS-OMS L YAW CMD	K	FLOAT PT	-0.2595		VDC
KOMSRP	V97U4086C	COMPENSATION BIAS-OMS R PITCH CMD	K	FLOAT PT	-0.0448		VDC
KOMSRY	V97U4088C	COMPENSATION BIAS-OMS R YAW CMD	K	FLOAT PT	-0.2595		VDC
OMSFALCYC	V97U6137C	OMS FAIL MOVE FROM STOW CYCLES	K	INTEGER	2		CYCL ES
OMS_THRSHLDL(1)	V97U4175C	OMS-L P FAIL STOW THRESHOLD	K	FLOAT PT	+0.7		DEG
OMS_THRSHLDL(2)	V97U4176C	OMS-L Y FAIL STOW THRESHOLD	K	FLOAT PT	+0.7		DEG

Table 4.64-1. OMS TVC Command SOP Initialization Parameters							
Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
OMS_THRSHLDR(1)	V97U4177C	OMS-R P FAIL STOW THRESHOLD	K	FLOAT PT	+0.7		DEG
OMS_THRSHLDR(2)	V97U4178C	OMS-R Y FAIL STOW THRESHOLD	K	FLOAT PT	+0.7		DEG
OMSLTRIM1	V97U4196C	OMS-L ENG PITCH TRIM POSITION	K	FLOAT PT	-0.86		DEG
OMSLTRIM2	V97U4197C	OMS-L ENG YAW TRIM POSITION	K	FLOAT PT	+6.44		DEG
OMSRTRIM1	V97U4198C	OMS-R ENG PITCH TRIM POSITION	K	FLOAT PT	-0.86		DEG
OMSRTRIM2	V97U4199C	OMS-R ENG YAW TRIM POSITION	K	FLOAT PT	-6.44		DEG
MATED_OMS_L_TRIM1	V97U8495C	MATED OMS-L PITCH TRIM CMD	I	FLOAT PT			DEG
MATED_OMS_L_TRIM2	V97U8496C	MATED OMS-L YAW TRIM CMD	I	FLOAT PT			DEG
MATED_OMS_R_TRIM1	V97U8497C	MATED OMS-R PITCH TRIM CMD	I	FLOAT PT			DEG
MATED_OMS_R_TRIM2	V97U8498C	MATED OMS-R YAW TRIM CMD	I	FLOAT PT			DEG
DOMSLAP	V43K1016C	OMS-L ENG ACTV PITCH ACTR CMD		FIXED PT	*		VDC
DOMSLSP	V43K1017C	OMS-L ENG STBY PITCH ACTR CMD		FIXED PT	*		VDC
DOMSLAY	V43K1018C	OMS-L ENG ACTV YAW ACTR CMD		FIXED PT	*		VDC
DOMSLSY	V43K1019C	OMS-L ENG STBY YAW ACTR CMD		FIXED PT	*		VDC
DOMSRAP	V43K2016C	OMS-R ENG ACTV PITCH ACTR CMD		FIXED PT	*		VDC
DOMSRSP	V43K2017C	OMS-R ENG STBY PITCH ACTR CMD		FIXED PT	*		VDC
DOMSRAY	V43K2018C	OMS-R ENG ACTV YAW ACTR CMD		FIXED PT	*		VDC
DOMSRSY	V43K2019C	OMS-R ENG STBY YAW ACTR CMD		FIXED PT	*		VDC
LOMSASEL(1)	V43K1020X	OMS-L ACTR SELECT ACTIVE-1		DISCRETE	0 *		
LOMSASEL(2)	V43K1021X	OMS-L ACTR SELECT ACTIVE-2		DISCRETE	0 *		

Table 4.64-1. OMS TVC Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
LOMSSSEL(1)	V43K1023X	OMS-L ACTR SELECT STBY-1		DISCRETE	0 *		
LOMSSSEL(2)	V43K1024X	OMS-L ACTR SELECT STBY-2		DISCRETE	0 *		
ROMSASEL(1)	V43K2020X	MS-R ACTR SELECT ACTIVE-1		DISCRETE	0 *		
ROMSASEL(2)	V43K2021X	OMS-R ACTR SELECT ACTIVE-2		DISCRETE	0 *		
ROMSSSEL(1)	V43K2023X	OMS-R ACTR SELECT STBY-1		DISCRETE	0 *		
ROMSSSEL(2)	V43K2024X	OMS-R ACTR SELECT STBY-2		DISCRETE	0 *		
SOMSLPCMD	V95X1564X	SELECTED OMS-L PITCH CMD		FLOAT PT	*(STOW)		DEG
SOMSLYCMD	V95X1562X	SELECTED OMS-L YAW CMD		FLOAT PT	*(STOW)		DEG
SOMSRPCMD	V95X1565X	SELECTED OMS-R PITCH CMD		FLOAT PT	*(STOW)		DEG
SOMSRYCMD	V95X1563X	SELECTED OMS-R YAW CMD		FLOAT PT	*(STOW)		DEG
L_OMS_CHAN	V93X6904X	L P/S/OFF GMBL ACTR SEL		INTEGER	0 *		
R_OMS_CHAN	V93X6906X	R P/S/OFF GMBL ACTR SEL		INTEGER	0 *		
POL		POLARITY		INTEGER	+1		
PASS		COUNTER		INTEGER	0		

NOTE: * INDICATES OPS 1 INITIALIZATION OF PARAMETER ONLY. OPS 3 SHALL BE INITIALIZED BY COMMAND INPUT SOURCE INITIALIZATION.

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TABLE 4.64-2. INPUT FUNCTIONAL PARAMETERS FOR OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AOMSLPFDBK	V95H1140C	OMS-L ACTIVE PITCH POSN	OMS TVC FB SOP	DEG			92188B	
AOMSLYFDBK	V95H1141C	OMS-L ACTIVE YAW POSN	OMS TVC FB SOP	DEG			92188B	
AOMSRPFDBK	V95H1144C	OMS-R ACTIVE PITCH POSN	OMS TVC FB SOP	DEG			92188B	
AOMSRYFDBK	V95H1145C	OMS-R ACTIVE YAW POSN	OMS TVC FB SOP	DEG			92188B	
LOMSPPCF	V91X7854X	OMS 1 PRI PITCH ACTR POS COMMFAULT	FCOS				92188B	
LOMSPYCF	V91X7850X	OMS 1 PRI YAW ACTR POS COMMFAULT	FCOS				92188B	
LOMSSPCF	V91X7855X	OMS 1 SEC PITCH ACTR POS COMMFAULT	FCOS				92188B	
LOMSSYCF	V91X7851X	OMS 1 SEC YAW ACTR POS COMMFAULT	FCOS				92188B	
MATED_CG_TRIM	V90X3120X	MATED COAST C.G. TRIM	PW CONT GUID		BD		92504G	
MATED_CG_TRIM	V90X3120XA	MATED COAST C.G. TRIM	CONT 3E/O GUID		BD		92504G	
MM_CODE_303/MM_303	V90X8182X	MAJOR MODE 303 FLAG	MSC				92355B	
MM_CODE_304/MM_304	V90X8161X	MAJOR MODE 304 FLAG	MSC				92355B	
MM_CODE_601/MM_601	V90X8194X	MAJOR MODE 601 FLAG	MSC		BD		93012D	
MM_CODE_602/MM_602	V90X8174X	MAJOR MODE 602 FLAG	MSC				92355B	
OMSL_ACT_SEL	V93J6904CA	L P/S/OFF GMBL ACTR SEL	XXXXX MNVR DISP					
OMSL_PITCH_YAW_CMD(1)	V90H2180CA	OMS CMD PITCH LEFT	TRANS DAP	DEG				
OMSL_PITCH_YAW_CMD(1)	V90H2180CB	OMS CMD PITCH LEFT	ORB DAP	DEG				
OMSL_PITCH_YAW_CMD(2)	V90H2181CA	OMS CMD YAW LEFT	TRANS DAP	DEG			89645A	
OMSL_PITCH_YAW_CMD(2)	V90H2181CB	OMS CMD YAW LEFT	ORB DAP	DEG			89645A	
OMSR_ACT_SEL	V93J6906CA	R P/S/OFF GMBL ACTR SEL	XXXXX MNVR DISP					
OMSR_PITCH_YAW_CMD(1)	V90H2730CA	OMS CMD PITCH RIGHT	TRANS DAP	DEG				
OMSR_PITCH_YAW_CMD(1)	V90H2730CB	OMS CMD PITCH RIGHT	ORB DAP	DEG				
OMSR_PITCH_YAW_CMD(2)	V90H2182CA	OMS CMD YAW RIGHT	TRANS DAP	DEG			89645A	
OMSR_PITCH_YAW_CMD(2)	V90H2182CB	OMS CMD YAW RIGHT	ORB DAP	DEG			89645A	
ROMSPPCF	V91X7848X	OMS 2 PRI PITCH ACTR POS COMMFAULT	FCOS				92188B	
ROMSPYCF	V91X7852X	OMS 2 PRI YAW ACTR POS COMMFAULT	FCOS				92188B	
ROMSSPCF	V91X7849X	OMS 2 SEC PITCH ACTR POS COMMFAULT	FCOS				92188B	
ROMSSYCF	V91X7853X	OMS 2 SEC YAW ACTR POS COMMFAULT	FCOS				92188B	
SOMSLPFDBK	V95H1601C	OMS-L SELECTED PITCH ACTR PFB	OMS TVC FB SOP	DEG	BSS			
SOMSLYFDBK	V95H1602C	OMS-L SELECTED YAW ACTR PFB	OMS TVC FB SOP	DEG	BSS			
SOMSRPFDBK	V95H1603C	OMS-R SELECTED PITCH ACTR PFB	OMS TVC FB SOP	DEG	BSS			
SOMSRYFDBK	V95H1604C	OMS-R SELECTED YAW ACTR PFB	OMS TVC FB SOP	DEG	BSS			
STOMSLPFDBK	V95H1142C	OMS-L STBY PITCH POSN	OMS TVC FB SOP	DEG			92188B	
STOMSLYFDBK	V95H1143C	OMS-L STBY YAW POSN	OMS TVC FB SOP	DEG			92188B	
STOMSRPFDBK	V95H1146C	OMS-R STBY PITCH POSN	OMS TVC FB SOP	DEG			92188B	
STOMSRYFDBK	V95H1147C	OMS-R STBY YAW POSN	OMS TVC FB SOP	DEG			92188B	
ZAP_CMD	V93X6908X	ZAP COMMAND	XXXXX MNVR DISP					
	V90X8309X	C.G. TRIM	ABT CNTL SEQ					
	V93X5538X	GNC GROUND CHECKOUT ENABLE	UI		BD		93017G	*
	V93X6901X	OMS CK ENA CMD	XXXXX MNVR DISP		BD			

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.64-3. OUTPUT FUNCTIONAL PARAMETERS FROM OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DRIVE_OMS	V95X1568X	OMS DRIVE IN PROCESS	XXXXX MNVR DISP		BD			
L_OMS_AP_CMD	V43K1016C	OMS-L ENG ACTV PITCH ACTR CMD	DL FMT 21/B DL FMT 22/A DL FMT 23/B DL FMT 42/3 DL FMT 43/3 DL FMT 44/3 DL FMT 45/3 DL FMT 60/3 OMS POD L	VDC	AMB		93017G	*
L_OMS_AY_CMD	V43K1018C	OMS-L ENG ACTV YAW ACTR CMD	DL FMT 21/B DL FMT 22/A DL FMT 23/B DL FMT 42/3 DL FMT 43/3 DL FMT 44/3 DL FMT 45/3 DL FMT 60/3 OMS POD L	VDC	AMB		93017G	*
L_OMS_SEL_A1	V43K1020X	OMS-L ENG ACTR SELECT ACTIVE-1	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1 LCA A1		BD		93017G	*
L_OMS_SEL_A2	V43K1021X	OMS-L ENG ACTR SELECT ACTIVE-2	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1 LCA A1		BD		93017G	*

TABLE 4.64-3. OUTPUT FUNCTIONAL PARAMETERS FROM OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
L_OMS_SEL_S1	V43K1023X	OMS-L ENG ACTR SELECT STBY-1	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1		BD		93017G	*
L_OMS_SEL_S2	V43K1024X	OMS-L ENG ACTR SELECT STBY-2	LCA A2 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1		BD		93017G	*
L_OMS_SP_CMD	V43K1017C	OMS-L ENG STBY PITCH ACTR CMD	LCA A2 DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 42/3 DL FMT 43/3 DL FMT 44/3 DL FMT 45/3 DL FMT 60/3	VDC	AMB		93017G	*
L_OMS_SY_CMD	V43K1019C	OMS-L ENG STBY YAW ACTR CMD	OMS POD L DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 42/3 DL FMT 43/3 DL FMT 44/3 DL FMT 45/3 DL FMT 60/3	VDC	AMB		93017G	*

TABLE 4.64-3. OUTPUT FUNCTIONAL PARAMETERS FROM OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
R_OMS_AP_CMD	V43K2016C	OMS-R ENG ACTV PITCH ACTR CMD	DL FMT 21/B DL FMT 22/A DL FMT 23/B DL FMT 42/3 DL FMT 43/3 DL FMT 44/3 DL FMT 45/3 DL FMT 60/3 OMS POD R	VDC	AMB		93017G	*
R_OMS_AY_CMD	V43K2018C	OMS-R ENG ACTV YAW ACTR CMD	DL FMT 21/B DL FMT 22/A DL FMT 23/B DL FMT 42/3 DL FMT 43/3 DL FMT 44/3 DL FMT 45/3 DL FMT 60/3 OMS POD R	VDC	AMB		93017G	*
R_OMS_SEL_A1	V43K2020X	OMS-R ENG ACTR SELECT ACTIVE-1	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1 LCA A3		BD		93017G	*
R_OMS_SEL_A2	V43K2021X	OMS-R ENG ACTR SELECT ACTIVE-2	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1 LCA A3		BD		93017G	*

TABLE 4.64-3. OUTPUT FUNCTIONAL PARAMETERS FROM OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
R_OMS_SEL_S1	V43K2023X	OMS-R ENG ACTR SELECT STBY-1	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1		BD		93017G	*
R_OMS_SEL_S2	V43K2024X	OMS-R ENG ACTR SELECT STBY-2	LCA A1 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1		BD		93017G	*
R_OMS_SP_CMD	V43K2017C	OMS-R ENG STBY PITCH ACTR CMD	LCA A1 DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 42/3 DL FMT 43/3 DL FMT 44/3 DL FMT 45/3 DL FMT 60/3	VDC	AMB		93017G	*
R_OMS_SY_CMD	V43K2019C	OMS-R ENG STBY YAW ACTR CMD	OMS POD R DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 42/3 DL FMT 43/3 DL FMT 44/3 DL FMT 45/3 DL FMT 60/3	VDC	AMB		93017G	*
SEL_OMS_LP_CMD	V95H1564C	SELECTED OMS-L PITCH CMD	OMS RM		DEG			
SEL_OMS_LY_CMD	V95H1562C	SELECTED OMS-L YAW CMD	OMS RM		DEG			
SEL_OMS_RP_CMD	V95H1565C	SELECTED OMS-R PITCH CMD	OMS RM		DEG			
SEL_OMS_RY_CMD	V95H1563C	SELECTED OMS-R YAW CMD	OMS RM		DEG			

TABLE 4.64-3. OUTPUT FUNCTIONAL PARAMETERS FROM OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V72M6626P	MDM FF01 DSCR OUT SET	CD 02 CH 2		DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1		93017G	*
	V72M6676P	MDM FF02 DSCR OUT SET	CD 02 CH 2		DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1		93017G	*
	V72M6726PB	MDM FF03 DSCR OUT SET	CD 02 CH 2		DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1		93017G	*
	V72M6776PB	MDM FF04 DSCR OUT SET	CD 02 CH 2		DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 46/1 DL FMT 60/1		93017G	*

TABLE 4.64-3. OUTPUT FUNCTIONAL PARAMETERS FROM OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
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NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
 (HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

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TABLE 4.64-4. OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
MATED_OMS_L_TRIM1	V97U8495C	DEG	F	S	D	P	G4.64	00	ACS	92504G	
MATED_OMS_L_TRIM2	V97U8496C	DEG	F	S	D	P	G4.64	00	ACS	92504G	
MATED_OMS_R_TRIM1	V97U8497C	DEG	F	S	D	P	G4.64	00	ACS	92504G	
MATED_OMS_R_TRIM2	V97U8498C	DEG	F	S	D	P	G4.64	00	ACS	92504G	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.64-5. OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
COMSLP COMPENSATION SCALE FACTOR-OMS L PI	V97U3971C	00	+6.0969997	E-01	VDC/DEG	F	S	X G4.64	90508B	
COMSLY COMPENSATION SCALE FACTOR-OMS L YA	V97U3973C	00	+6.1139998	E-01	VDC/DEG	F	S	X G4.64	90508B	
COMSRP COMPENSATION SCALE FACTOR-OMS R PI	V97U3975C	00	+6.0969997	E-01	VDC/DEG	F	S	X G4.64	90508B	
COMSRY COMPENSATION SCALE FACTOR-OMS R YA	V97U3977C	00	-6.1139998	E-01	VDC/DEG	F	S	X G4.64	90508B	
KOMSLP COMPENSATION BIAS- OMS L PITCH CMD	V97U4082C	00	-4.4799995	E-02	VDC	F	S	X G4.64	90508B	
KOMSLY COMPENSATION BIAS- OMS L YAW CMD	V97U4084C	00	-2.5949997	E-01	VDC	F	S	X G4.64	90508B	
KOMSRP COMPENSATION BIAS- OMS R PITCH CMD	V97U4086C	00	-4.4799995	E-02	VDC	F	S	X G4.64	90508B	
KOMSRY COMPENSATION BIAS- OMS R YAW CMD	V97U4088C	00	-2.5949997	E-01	VDC	F	S	X G4.64	90508B	
LOMSPOSNP1	V97U4105C	00	+5.89	E+00	DEG	F	S	C G4.64	39878	
LOMSPOSNP2	V97U4106C	00	-5.89	E+00	DEG	F	S	C G4.64	39878	
LOMSPOSNP3	V97U4107C	00	+5.89	E+00	DEG	F	S	C G4.64	69648C	
LOMSPOSNY1	V97U4108C	00	+6.44	E+00	DEG	F	S	C G4.64	39878	
LOMSPOSNY2	V97U4109C	00	-6.44	E+00	DEG	F	S	C G4.64	39878	
LOMSPOSNY3	V97U4110C	00	+6.44	E+00	DEG	F	S	C G4.64	69648C	
OMSLSTOW1 OMS-L ENG PITCH STOW POSN	V97U4131C	00	+5.8899993	E+00	DEG	F	S	C G4.64	90508B	
OMSLSTOW2 OMS-L ENG YAW STOW POSN	V97U4132C	00	+6.4399995	E+00	DEG	F	S	C G4.64	90508B	
OMSLTRIM1 OMS L ENG PITCH TRIM POSITION	V97U4196C	00	-8.6	E-01	DEG	F	S	C G4.64	90109D	
OMSLTRIM2 OMS L ENG YAW TRIM POSITION	V97U4197C	00	+6.44	E+00	DEG	F	S	C G4.64	90109D	
OMSRSTOW1 OMS-R ENG PITCH STOW POSN	V97U4133C	00	+5.8899993	E+00	DEG	F	S	C G4.64	90508B	
OMSRSTOW2 OMS-R ENG YAW STOW POSN	V97U4134C	00	-6.4399995	E+00	DEG	F	S	C G4.64	90508B	
OMSRTRIM1 OMS R ENG PITCH TRIM POSITION	V97U4198C	00	-8.6	E-01	DEG	F	S	C G4.64	90109D	
OMSRTRIM2 OMS R ENG YAW TRIM POSITION	V97U4199C	00	-6.44	E+00	DEG	F	S	C G4.64	90109D	
OMS_THRSHLDL(1) OMS-L P FAIL STOW THRESHOLD	V97U4175C	00	+7.0	E-01	DEG	F	S	C G4.64	90109D	

TABLE 4.64-5. OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
OMS_THRSHLDL(2) OMS-L Y FAIL STOW THRESHOLD	V97U4176C	00	+7.0	E-01 DEG	F	S	P	G4.64	90109D	
OMS_THRSHLDR(1) OMS-R P FAIL STOW THRESHOLD	V97U4177C	00	+7.0	E-01 DEG	F	S	P	G4.64	90109D	
OMS_THRSHLDR(2) OMS-R Y FAIL STOW THRESHOLD	V97U4178C	00	+7.0	E-01 DEG	F	S	P	G4.64	90109D	
ROMSPOSNP1	V97U4138C	00	+5.89	E+00 DEG	F	S	P	G4.64	29632A	
ROMSPOSNP2	V97U4139C	00	-5.89	E+00 DEG	F	S	P	G4.64	29632A	
ROMSPOSNP3	V97U4140C	00	+5.89	E+00 DEG	F	S	P	G4.64	69648C	
ROMSPOSNY1	V97U4141C	00	+6.44	E+00 DEG	F	S	P	G4.64	29632A	
ROMSPOSNY2	V97U4142C	00	-6.44	E+00 DEG	F	S	P	G4.64	29632A	
ROMSPOSNY3	V97U4143C	00	+6.44	E+00 DEG	F	S	P	G4.64	69648C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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TABLE 4.64-6. OMS THRUST VECTOR CONTROL COMMAND SOP (G4.64) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
OMSFAILCYC OMS FAIL MOVE FROM STOW CYCLES	V97U6137C	00	+2	CYCLES	I	S	P	G4.64	90374C	
OMS_DRIVE1 OMS DRIVE CHECK COUNTER 1	V97U4128C	00	+75	ND	I	S	P	G4.64	90374C	
OMS_DRIVE2 OMS DRIVE CHECK COUNTER 2	V97U4129C	00	+75	ND	I	S	P	G4.64	90374C	
OMS_DRIVE3 OMS DRIVE CHECK COUNTER 3	V97U4130C	00	+75	ND	I	S	P	G4.64	90374C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.65 ORBITAL MANEUVERING SYSTEM THRUST VECTOR CONTROL FEEDBACK SOP

The purpose of the Orbital Maneuvering Thrust Vector Control Feedback (OMS TVC FB) SOP shall be to monitor the OMS primary/secondary/off channel select indicators and channel commfault discretes to perform data selection and compensation of the OMS TVC pitch and yaw actuator feedback data. The OMS TVC FB SOP shall be performed at the 6.25 Hz rate prior to OMS RM.

The OMS TVC FB SOP shall monitor the primary/secondary/off commands on an engine basis and the commfault discretes on an actuator channel basis. The actuator DATA GOOD indications shall be generated, and feedback data shall be selected for compensation as follows:

Input			Output	
PRI/SEC/OFF Channel Select	PRI CF	SEC CF	Feedback Selected	Data Good
0	0	–	Active	1
0	1	–	Previous Value	0
1	–	0	Standby	1
1	–	1	Previous Value	0
2			Previous Selected*	Previous Data Status
2	0	0	**	1
2	0	1	**	–
2	1	0	**	–
2	1	1	**	–

* If none previously selected, active shall be selected.
** Previous selected will be used independent of CF status on PRI and SEC. If previous selected value is commfaulted, an “M” shall be displayed until a valid input has been selected (PRI or SEC).

When the crew selected channel (primary or secondary) indicates no commfault (i.e., CF = zero), that channel feedback data shall be compensated and the associated DATA GOOD flag shall be set to the “1” state (DATA GOOD). When the crew selected channel indicates a commfault (i.e., CF = 1), the previous selected feedback value shall be used, no data shall be compensated, and that DATA GOOD flag shall be set to the “zero” state. When the commfault is removed, the normal processing shall resume. When neither channel is selected (OFF), the previous cycle channel data and data good flag settings shall be provided. When not commfaulted, feedback data shall be compensated by applying unique bias and scale factor terms to each OMS engine pitch and yaw actuator feedback. In MM 101, 102, 103 and 601, active, standby, and selected actuator position feedbacks are compensated. At all other times, only the selected actuator feedback is compensated. The general compensation equation shall be as follows:

$$YC = YM C + K$$

where

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YC = Compensated position feedback (DEG)

YM = Measured position feedback (VDC)

C = Compensation scale factor (DEG/VDC) and

K = Compensation bias (DEG)

The DATA GOOD flags shall be provided to OMS RM.

The OMS TVC FB SOP interfaces are indicated on the functional block diagram on Figure 4.65-1. The parameter initialization requirements are shown in Table 4.65-1. The IDD inputs and outputs are listed in Tables 4.65-2 and 4.65-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.65-4. K-loads are listed in Table 4.65-5. Constants are listed in Table 4.65-6.

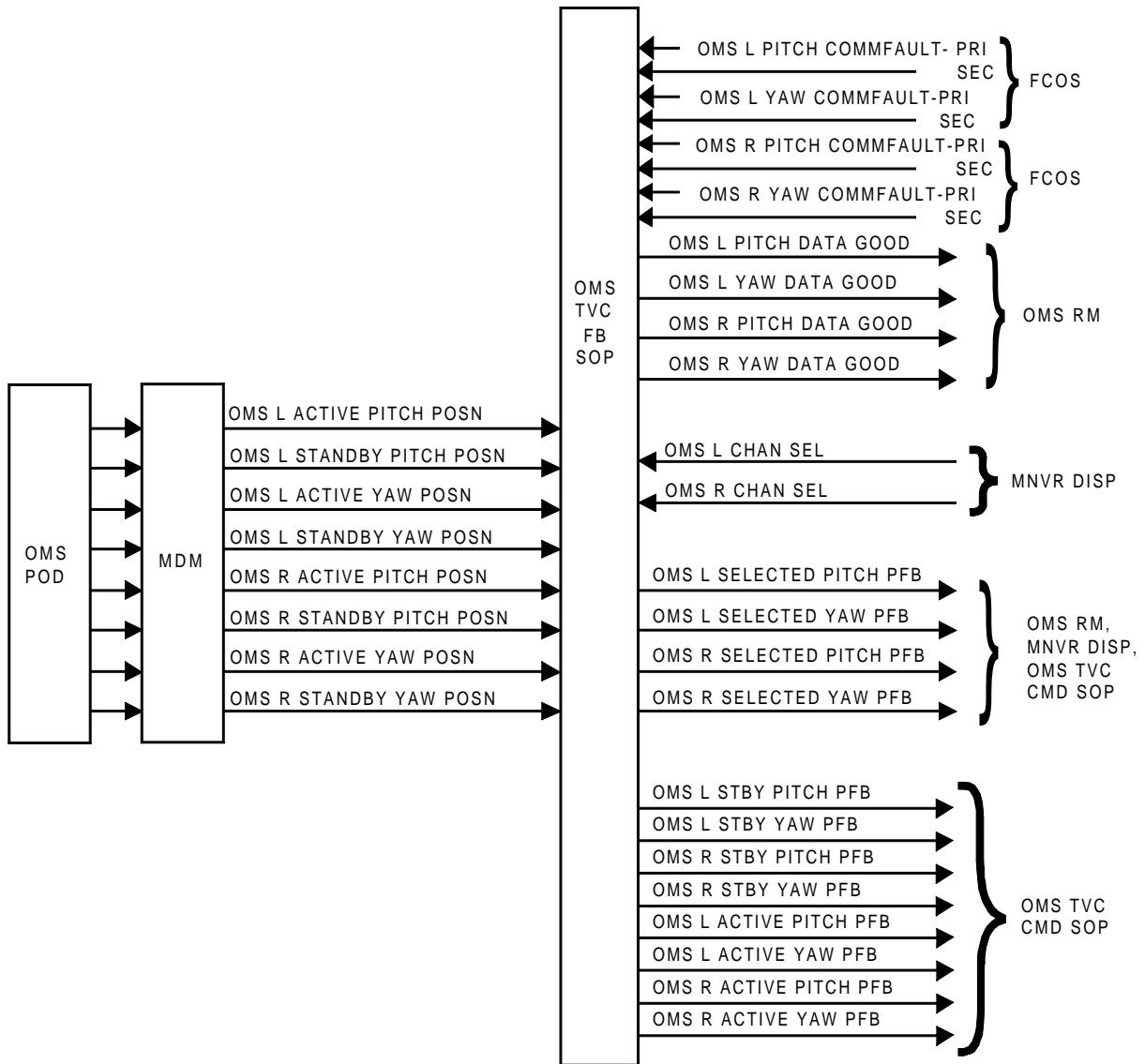


FIGURE 4.65-1. OMS TVC FB SOP Functional Block Diagram

Table 4.65-1. OMS TVC FB SOP Initialization Parameters

Name	MSID	Description	Const Type	Signal Type	Nominal Value	Range	Units
COMSLPFB	V97U3972C	COMP SCALE FACTOR – OMS L PITCH FDBK	K	FLOAT PT	+1.64		DEG/ VDC
COMSLYFB	V97U3974C	COMP SCALE FACTOR – OMS L YAW FDBK	K	FLOAT PT	+1.636		DEG/ VDC
COMSRPFB	V97U3976C	COMP SCALE FACTOR – OMS R PITCH FDBK	K	FLOAT PT	+1.64		DEG/ VDC
COMSRYFB	V97U3978C	COMP SCALE FACTOR – OMS R YAW FDBK	K	FLOAT PT	-1.636		DEG/ VDC
KOMSLPFB	V97U4083C	COMP BIAS–OMS L PITCH FDBK	K	FLOAT PT	+0.0735		DEG
KOMSLYFB	V97U4085C	COMP BIAS–OMS L YAW FDBK	K	FLOAT PT	+0.4244		DEG
KOMSRPFB	V97U4087C	COMP BIAS–OMS R PITCH FDBK	K	FLOAT PT	+0.0735		DEC
KOMSRYFB	V97U4089C	COMP BIAS–OMS R YAW FDBK	K	FLOAT PT	-0.4244		DEC
LOMSPDG	V95X1606X	L OMS PITCH DATA GOOD		DISCRETE	1		
LOMSYDG	V95X1607X	L OMS YAW DATA GOOD		DISCRETE	1		
ROMSPDG	V95X1608X	R OMS PITCH DATA GOOD		DISCRETE	1		
ROMSYDG	V95X1609X	R OMS YAW DATA GOOD		DISCRETE	1		

TABLE 4.65-2. INPUT FUNCTIONAL PARAMETERS FOR OMS THRUST VECTOR CONTROL FEEDBACK SOP (G4.65)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
LOMSPPCF	V91X7854X	OMS 1 PRI PITCH ACTR POS COMMFAULT	FCOS				92188B	
LOMSPYCF	V91X7850X	OMS 1 PRI YAW ACTR POS COMMFAULT	FCOS				92188B	
LOMSPPCF	V91X7855X	OMS 1 SEC PITCH ACTR POS COMMFAULT	FCOS				92188B	
LOMSYCF	V91X7851X	OMS 1 SEC YAW ACTR POS COMMFAULT	FCOS				92188B	
OMSL_ACT_SEL	V93J6904CA	L P/S/OFF GMBL ACTR SEL	XXXXX MNVR DISP					
OMSR_ACT_SEL	V93J6906CA	R P/S/OFF GMBL ACTR SEL	XXXXX MNVR DISP					
ROMSPPCF	V91X7848X	OMS 2 PRI PITCH ACTR POS COMMFAULT	FCOS				92188B	
ROMSPYCF	V91X7852X	OMS 2 PRI YAW ACTR POS COMMFAULT	FCOS				92188B	
ROMSPPCF	V91X7849X	OMS 2 SEC PITCH ACTR POS COMMFAULT	FCOS				92188B	
ROMSYCF	V91X7853X	OMS 2 SEC YAW ACTR POS COMMFAULT	FCOS				92188B	
	V43H2500C	OMS-L ENG ACTV P ACTR POSN IN	OMS POD L	VDC	AMB		93017G	*
	V43H2502C	OMS-L ENG ACTV Y ACTR POSN IN	OMS POD L	VDC	AMB		93017G	*
	V43H2504C	OMS-L ENG STBY P ACTR POSN IN	OMS POD L	VDC	AMB		93017G	*
	V43H2506C	OMS-L ENG STBY Y ACTR POSN IN	OMS POD L	VDC	AMB		93017G	*
	V43H2550C	OMS-R ENG ACTV P ACTR POSN IN	OMS POD R	VDC	AMB		93017G	*
	V43H2552C	OMS-R ENG ACTV Y ACTR POSN IN	OMS POD R	VDC	AMB		93017G	*
	V43H2554C	OMS-R ENG STBY P ACTR POSN IN	OMS POD R	VDC	AMB		93017G	*
	V43H2556C	OMS-R ENG STBY Y ACTR POSN IN	OMS POD R	VDC	AMB		93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.65-3. OUTPUT FUNCTIONAL PARAMETERS FROM OMS THRUST VECTOR CONTROL FEEDBACK SOP (G4.65)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AOMSLPFDBK	V95H1140C	OMS-L ACTIVE PITCH POSN	OMS TVC CMD SOP	DEG			92188B	
AOMSLYFDBK	V95H1141C	OMS-L ACTIVE YAW POSN	OMS TVC CMD SOP	DEG			92188B	
AOMSRPFDBK	V95H1144C	OMS-R ACTIVE PITCH POSN	OMS TVC CMD SOP	DEG			92188B	
AOMSRYFDBK	V95H1145C	OMS-R ACTIVE YAW POSN	OMS TVC CMD SOP	DEG			92188B	
LOMSPDG	V95X1606X	L OMS PITCH DATA GOOD	OMS RM					
LOMSYDG	V95X1607X	L OMS YAW DATA GOOD	OMS RM					
ROMSPDG	V95X1608X	R OMS PITCH DATA GOOD	OMS RM					
ROMSYDG	V95X1609X	R OMS YAW DATA GOOD	OMS RM					
SOMSLPFDBK	V95H1601C	OMS-L SELECTED PITCH ACTR PFB	OMS RM OMS TVC CMD SOP TLM XXXXX MNVR DISP	DEG	BSS			
SOMSLYFDBK	V95H1602C	OMS-L SELECTED YAW ACTR PFB	OMS RM OMS TVC CMD SOP TLM XXXXX MNVR DISP	DEG	BSS			
SOMSRPFDBK	V95H1603C	OMS-R SELECTED PITCH ACTR PFB	OMS RM OMS TVC CMD SOP TLM XXXXX MNVR DISP	DEG	BSS			
SOMSRYFDBK	V95H1604C	OMS-R SELECTED YAW ACTR PFB	OMS RM OMS TVC CMD SOP TLM XXXXX MNVR DISP	DEG	BSS			
STOMSLPFDBK	V95H1142C	OMS-L STBY PITCH POSN	OMS TVC CMD SOP	DEG			92188B	
STOMSLYFDBK	V95H1143C	OMS-L STBY YAW POSN	OMS TVC CMD SOP	DEG			92188B	
STOMSRPFDBK	V95H1146C	OMS-R STBY PITCH POSN	OMS TVC CMD SOP	DEG			92188B	
STOMSRYFDBK	V95H1147C	OMS-R STBY YAW POSN	OMS TVC CMD SOP	DEG			92188B	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.65-4. OMS THRUST VECTOR CONTROL FEEDBACK SOP (G4.65) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.65-5. OMS THRUST VECTOR CONTROL FEEDBACK SOP (G4.65) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
COMSLPFB COMP SCALE FACTOR- OMS L PITCH FDB	V97U3972C	00	+1.6399994	E+00	DEG/VDC	F	S	A G4.65	90508B	
COMSLYFB COMP SCALE FACTOR-OMS L YAW FDBK	V97U3974C	00	+1.6359999	E+00	DEG/VDC	F	S	A G4.65	90508B	
COMSRPFB COMP SCALE FACTOR- OMS R PITCH FDB	V97U3976C	00	+1.6399994	E+00	DEG/VDC	F	S	A G4.65	90508B	
COMSRYFB COMP SCALE FACTOR- OMS R YAW FDBK	V97U3978C	00	-1.6359999	E+00	DEG/VDC	F	S	A G4.65	90508B	
KOMSLPFB COMP BIAS-OMS L PITCH FDBK	V97U4083C	00	+7.3499977	E-02	DEG	F	S	C G4.65	90508B	
KOMSLYFB COMP BIAS-OMS L YAW FDBK	V97U4085C	00	+4.2439997	E-01	DEG	F	S	C G4.65	90508B	
KOMSRPFB COMP BIAS-OMS R PITCH FDBK	V97U4087C	00	+7.3499977	E-02	DEG	F	S	C G4.65	90508B	
KOMSRYFB COMP BIAS-OMS R YAW FDBK	V97U4089C	00	-4.2439997	E-01	DEG	F	S	C G4.65	90508B	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.65-6. OMS THRUST VECTOR CONTROL FEEDBACK SOP (G4.65) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.120 SOLID ROCKET BOOSTER MONITOR FUNCTION

The purpose of the Solid Rocket Booster Monitor Function (SRB MON FCN) shall be to perform data compensation and calibration of all of the six measured SRB chamber pressures. These functions shall be executed at the 12.5 Hz rate prior to the Selection Filter (SF).

The compensation and calibration of the SRB chamber pressures shall be performed by applying a linear calibration equation with I-loadable compensation bias and a constant scale factor (first-order coefficient) to each of the SRB measured chamber pressures. The general calibration equation shall be as follows:

$$\text{CPC} = K_1 + K_2 (\text{CPM})$$

where

CPC = Calibrated compensated chamber pressure (PSIA)

CPM = Measured chamber pressure (VDC)

K_1 = Compensation bias (PSIA)

K_2 = First order coefficient (PSIA/VDC)

The SRB MON FCN interfaces are provided on the functional block diagram on Figure 4.120-1. The parameter initialization requirements are shown in Table 4.120-1. The IDD inputs and outputs are listed in Tables 4.120-2 and 4.120-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.120-4. K-loads are listed in Table 4.120-5. Constants are listed in Table 4.120-6.

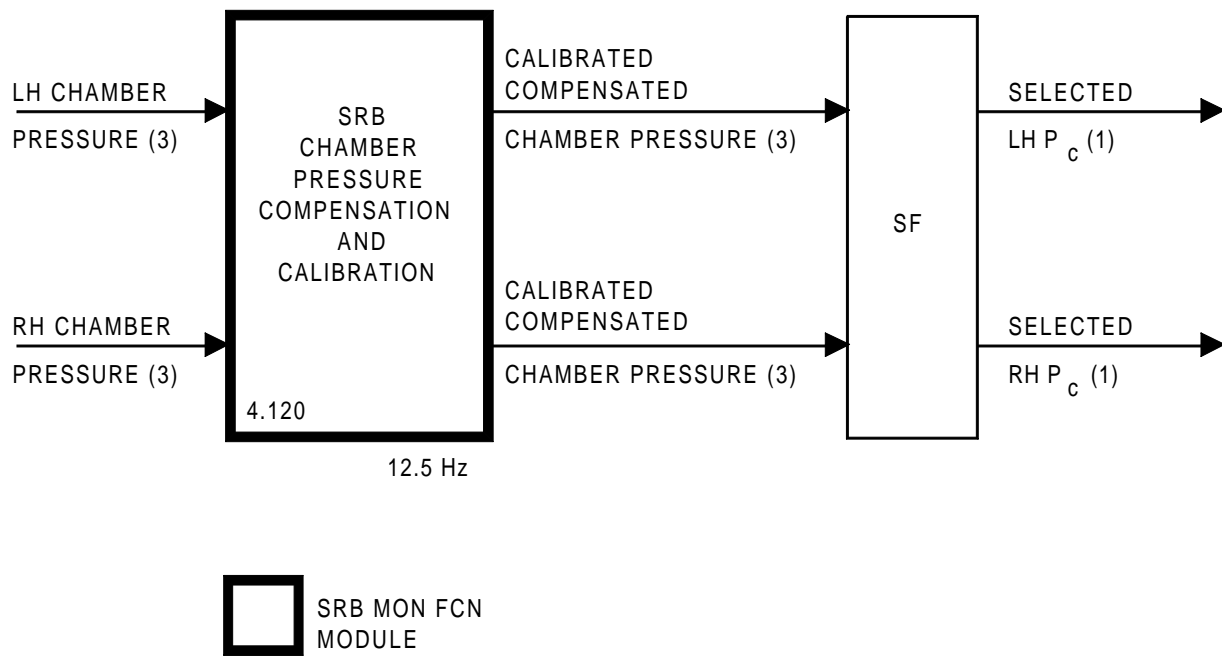


FIGURE 4.120-1. SRB Monitor Function Block Diagram

Table 4.120-1. SRB Monitor Function Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
K4A(1)	V97U4153C	CALIBRATION COEFFICIENT 4A1	L	FLOAT PT			PSIA
K4A(2)	V97U4154C	CALIBRATION COEFFICIENT 4A2	K	FLOAT PT	200.455		PSIA/ VDC
K4B(1)	V97U4156C	CALIBRATION COEFFICIENT 4B1	L	FLOAT PT			PSIA
K4B(2)	V97U4157C	CALIBRATION COEFFICIENT 4B2	K	FLOAT PT	200.455		PSIA/ VDC
K4C(1)	V97U4159C	CALIBRATION COEFFICIENT 4C1	L	FLOAT PT			PSIA
K4C(2)	V97U4160C	CALIBRATION COEFFICIENT 4C2	K	FLOAT PT	200.455		PSIA/ VDC
K5A(1)	V97U4162C	CALIBRATION COEFFICIENT 5A1	L	FLOAT PT			PSIA
K5A(2)	V97U4163C	CALIBRATION COEFFICIENT 5A2	K	FLOAT PT	200.455		PSIA/ VDC
K5B(1)	V97U4165C	CALIBRATION COEFFICIENT 5B1	L	FLOAT PT			PSIA
K5B(2)	V97U4166C	CALIBRATION COEFFICIENT 5B2	K	FLOAT PT	200.455		PSIA/ VDC
K5C(1)	V97U4168C	CALIBRATION COEFFICIENT 5C1	L	FLOAT PT			PSIA
K5C(2)	V97U4169C	CALIBRATION COEFFICIENT 5C2	K	FLOAT PT	200.455		PSIA/ VDC

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TABLE 4.120-2. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER MONITOR FUNCTION (G4.120)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	B47P1300C	LH PRESS A SRM CHAMBER	XDCR LA	VDC	AMU		93017G	*
	B47P1301C	LH PRESS B SRM CHAMBER	XDCR LB	VDC	AMU		93017G	*
	B47P1302C	LH PRESS C SRM CHAMBER	XDCR LC	VDC	AMU		93017G	*
	B47P2300C	RH PRESS A SRM CHAMBER	XDCR RA	VDC	AMU		93017G	*
	B47P2301C	RH PRESS B SRM CHAMBER	XDCR RB	VDC	AMU		93017G	*
	B47P2302C	RH PRESS C SRM CHAMBER	XDCR RC	VDC	AMU		93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.120-3. OUTPUT FUNCTIONAL PARAMETERS FROM SOLID ROCKET BOOSTER MONITOR FUNCTION (G4.120)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
CPC4(1)	V90P8981C	COMPENSATED LH SRM CHMBR PRESS A	SF	PSIA				
CPC4(2)	V90P8982C	COMPENSATED LH SRM CHMBR PRESS B	SF	PSIA				
CPC4(3)	V90P8983C	COMPENSATED LH SRM CHMBR PRESS C	SF	PSIA				
CPC5(1)	V90P8986C	COMPENSATED RH SRM CHMBR PRESS A	SF	PSIA				
CPC5(2)	V90P8987C	COMPENSATED RH SRM CHMBR PRESS B	SF	PSIA				
CPC5(3)	V90P8988C	COMPENSATED RH SRM CHMBR PRESS C	SF	PSIA				

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.120-4. SOLID ROCKET BOOSTER MONITOR FUNCTION (G4.120) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
K4A(1)	V97U4153C	PSIA	F	S	L	C	G4.120	00	SRC	DC0599	
K4B(1)	V97U4156C	PSIA	F	S	L	C	G4.120	00	SRC	DC0599	
K4C(1)	V97U4159C	PSIA	F	S	L	C	G4.120	00	SRC	DC0599	
K5A(1)	V97U4162C	PSIA	F	S	L	C	G4.120	00	SRC	DC0599	
K5B(1)	V97U4165C	PSIA	F	S	L	C	G4.120	00	SRC	DC0599	
K5C(1)	V97U4168C	PSIA	F	S	L	C	G4.120	00	SRC	DC0599	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.120-5. SOLID ROCKET BOOSTER MONITOR FUNCTION (G4.120) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
K4A(2)	V97U4154C	00	+2.00455	E+02	PSI/VOLT	F	S	A G4.120	69905	
K4B(2)	V97U4157C	00	+2.00455	E+02	PSI/VOLT	F	S	A G4.120	69905	
K4C(2)	V97U4160C	00	+2.00455	E+02	PSI/VOLT	F	S	A G4.120	69905	
K5A(2)	V97U4163C	00	+2.00455	E+02	PSI/VOLT	F	S	A G4.120	69905	
K5B(2)	V97U4166C	00	+2.00455	E+02	PSI/VOLT	F	S	A G4.120	69905	
K5C(2)	V97U4169C	00	+2.00455	E+02	PSI/VOLT	F	S	A G4.120	69905	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.120-6. SOLID ROCKET BOOSTER MONITOR FUNCTION (G4.120) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.187 ORBITER ACTUATOR SLEW CHECKS

The purpose of the Orbiter Actuator Slew Check (ORB ACTR SLEW) principal function shall be to monitor aerosurface and main engine slew check flags from LPS and generate normalized commands to slew the aerosurfaces and main engines. These commands shall be provided to the ASC DAP principal function to slew the following:

- Elevon actuators (four panels)
- Rudder actuators
- Speed brake actuators
- Body flap actuators
- MPS pitch actuators (three engines)
- MPS yaw actuators (three engines)

The ORB ACTR SLEW shall be processed outside the transport delay critical processing at the 25 Hz rate after the ASC DAP. The ORB ACT SLEW interfaces are indicated by the functional block diagram on Figure 4.187-1. The parameter initialization requirements are shown in Table 4.187-1. The IDD inputs and outputs are listed in Tables 4.187-2 and 4.187-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.187-4. K-loads are listed in Table 4.187-5. Constants are listed in Table 4.187-6.

The ORB ACTR SLEW shall monitor slew flags from LPS. Whenever the AERO_SLEW flag changes from the “zero” state to the “1” state (initiate aerosurface slew checks), the ORB ACT SLEW shall set V90X8374X “MPS TVC SERVO OVRD CMD” flag FALSE, then delay AERO_NULL_CYC number of cycles, and then generate a normalized aerosurface slew command. A trapezoidal function shall be used for AERO_CYC number of cycles. (AERO_CYC represents the number of cycles of the trapezoidal function to be performed.) When AERO_CYC cycles have occurred, the AERO_SLEW_COMPLETE flag shall be set to the “1” state (aerosurface slew checks complete).

Similarly, whenever the MPS_SLEW flag changes from the “zero” state to the “1” state (initiate the main engine slew checks), the ORB ACTR SLEW shall delay MPS_NULL_CYC number of cycles and then generate a normalized TVC gimbal slew command. A similar trapezoidal function shall be used for MPS_CYC number of cycles. (MPS_CYC represents the total number of cycles of the trapezoidal function to be performed.) When MPS_CYC cycles have occurred, the MPS_SLEW_COMPLETE flag shall be set to the “1” state (main engine gimbal slew complete).

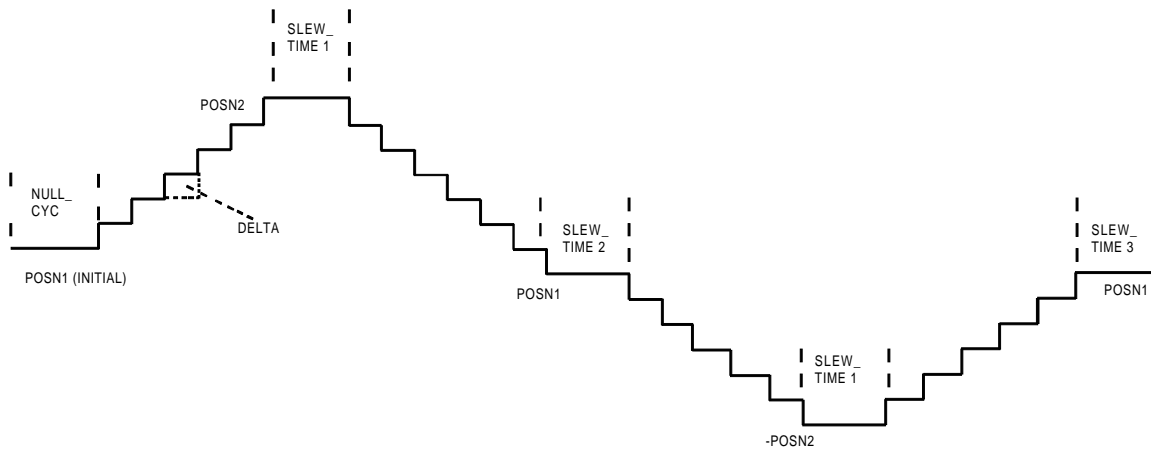
The slew checks for the aerosurfaces shall not be performed simultaneously with the main engine or SRB slew checks. In the event that an LPS slew command for one set of actuators (aerosurfaces, MPS, or SRB) is received during the slewing of another set, the ongoing slew checks shall be completed before the second set is initiated. In the event that multiple LPS slew commands are received simultaneously, the aerosurface slews shall be processed first, the main engine slews second, and the SRB slews last.

The following restrictions on initiation of the slew checks must be observed by the Launch Processing System, as there is no requirement for the flight software to protect against late slew check initiation:

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- The MPS slew check must be completed before the start of the cycle on which the first SSME start command is issued.
- The aerosurface slew check must be completed before the start of the cycle on which the LPS Go-for auto sequence start event (Event 6) occurs.

The trapezoidal function shall be as indicated below:



For each set of actuators, the initial command shall be set to POSN1. The ORB ACTR SLEW shall then generate commands incremented each cycle by the constant DELTA from POSN1 to POSN2. When POSN2 has been reached, the slew commands shall be held constant for SLEW_TIME1 number of cycles, and then decremented each cycle by DELTA from POSN2 to POSN1. After holding the slew commands constant for SLEW_TIME2 number of cycles, the commands shall be decremented to -POSN2, held for SLEW_TIME1 cycles, and then incremented to POSN1 and held for SLEW_TIME3 cycles. This completes one trapezoidal function cycle. Provisions shall be made for unique SLEW_TIME1, SLEW_TIME2, and SLEW_TIME3 for each set of actuators.

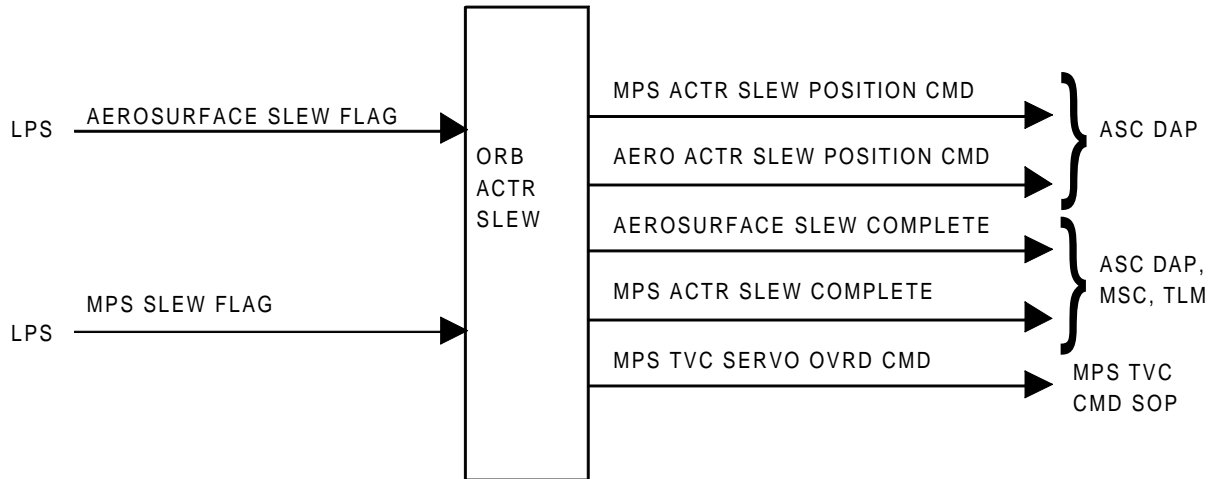


FIGURE 4.187-1. ORB ACTR SLEW Functional Module

Table 4.187-1. Orbiter Actuator Slew Initialization Parameters							
Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
POSN_AERO(1)	V97U4249C	AERO SLEW CHECK POSN 1	K	FLOAT PT	+0.0		N.D.
POSN_AERO(2)	V97U4250C	AERO SLEW CHECK POSN 2	K	FLOAT PT	+1.0		N.D.
POSN_MPS(1)	V97U4251C	MPS SLEW CHECK POSN 1	K	FLOAT PT	+0.0		N.D.
POSN_MPS(2)	V97U4252C	MPS SLEW CHECK POSN 2	K	FLOAT PT	+1.0		N.D.
DELTA_MPS	V97U4256C	MPS SLEW CHECK DELTA INCREMENT	K	FLOAT PT	+0.02		N.D.
DELTA_AERO	V97U4257C	AERO SLEW CHECK DELTA INCREMENT	K	FLOAT PT	+0.04		N.D.
MPS_NULL_CYC	V97U4194C	MPS SLEW NULL POSN DELAY CYCLES	K	INTEGER	+75		CYCLES
AERO_NULL_CYC	V97U4253C	AERO SLEW NULL POSN DELAY CYCLES	K	INTEGER	+20		CYCLES
AERO_CYC	V97U4181C	AERO SLEW COMPLETE CYCLES	K	INTEGER	+1	1, 10	CYCLES
MPS_CYC	V97U4182C	MPS SLEW COMPLETE CYCLES	K	INTEGER	+1	1, 10	CYCLES
MPS_SLEW_COMPLETE		MPS SLEW COMPLETE		DISCRETE	0		
AERO_TRAP		AERO TRAPEZOIDAL FUNCTION COUNTER		INTEGER	0		
MPS_TRAP		MPS TRAPEZOIDAL FUNCTION COUNTER		INTEGER	0		
AERO_HOLD(1)		AERO HOLD POSN 2		INTEGER	0		CYCLES
AERO_HOLD(2)		AERO HOLD POSN 1		INTEGER	0		CYCLES
AERO_HOLD(3)		AERO HOLD POSN -2		INTEGER	0		CYCLES
AERO_HOLD(4)		AERO HOLD POSN FINAL		INTEGER	0		CYCLES
MPS_HOLD(1)		MPS HOLD POSN 2		INTEGER	0		CYCLES
MPS_HOLD(2)		MPS HOLD POSN 1		INTEGER	0		CYCLES
MPS_HOLD(3)		MPS HOLD POSN -2		INTEGER	0		CYCLES
MPS_HOLD(4)		MPS HOLD POSN FINAL		INTEGER	0		CYCLES
AERO_SLEW_TIME(1)	V97U4183C	AERO SLEW TIME 1	K	INTEGER	+100		CYCLES
AERO_SLEW_TIME(2)	V97U4184C	AERO SLEW TIME 2	K	INTEGER	+100		CYCLES

Table 4.187-1. Orbiter Actuator Slew Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
AERO_SLEW_TIME(3)	V97U4185C	AERO SLEW TIME 3	K	INTEGER	+100		CYCLES
MPS_SLEW_TIME(1)	V97U4186C	MPS SLEW TIME 1	K	INTEGER	+125		CYCLES
MPS_SLEW_TIME(2)	V97U4187C	MPS SLEW TIME 2	K	INTEGER	+25		CYCLES
MPS_SLEW_TIME(3)	V97U4188C	MPS SLEW TIME 3	K	INTEGER	+25		CYCLES
MPS_SLEW_CMD	V90X1572X	MPS ACTR SLEW POSITION CMD		FLOAT PT	POSN_MPS(1)		N.D.
AERO_SLEW_CMD	V90X1571X	AERO ACTR SLEW POSITION CMD		FLOAT PT	POSN_AERO(1)		N.D.
AERO_SLEW_COMPLETE		AEROSURFACE SLEW COMPLETE		DISCRETE			

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TABLE 4.187-2. INPUT FUNCTIONAL PARAMETERS FOR ORBITER ACTUATOR SLEW CHECK (G4.187)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AERO_SLEW	V99X8822X	AEROSURFACE SLEW CHECK INDICATOR	LPS				89599C	
MPS_SLEW	V99X8823XB	MPS GIMBAL SLEW CHECK INDICATOR	LPS				89599C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.187-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBITER ACTUATOR SLEW CHECK (G4.187)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AERO_SLEW_CMD	V90H1571C	AERO ACTR SLEW POSITION CMD	ASC DAP				89366B	
AERO_SLEW_CMPL	V90X1570X	AEROSURFACE SLEW COMPLETE	ASC DAP		BD		93017G	*
			DL FMT 21/1					
			MSC					
MPS_OVRD_CMD	V90X8374XB	MPS TVC SERVO OVRD CMD	MPS TVC CMD SOP					
MPS_SLEW_CMD	V90H1572C	MPS ACTR SLEW POSITION CMD	ASC DAP				89366B	
MPS_SLEW_COMPLETE	V90X8400XB	MPS SLEW CHECK COMPLETE FLAG	ASC DAP				89599C	
			MSC					
			TLM					
	V90M3123P	CGPB_SLEW_CMPL\$(1;)	DL FMT 21/1				93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.187-4. ORBITER ACTUATOR SLEW CHECK (G4.187) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.187-5. ORBITER ACTUATOR SLEW CHECK (G4.187) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
AERO_CYC	V97U4181C	00	+1	CYCLES	I	S	P	G4.187	90109D	
AERO SLEW COMPLETE CYCLES										
AERO_NULL_CYC	V97U4253C	00	+20	CYCLES	I	S	P	G4.187	90109D	
AERO SLEW NULL POSN DELAY CYCLES										
AERO_SLEW_TIME(1)	V97U4183C	00	+100	CYCLES	I	S	P	G4.187	90109D	
AERO SLEW TIME 1										
AERO_SLEW_TIME(2)	V97U4184C	00	+100	CYCLES	I	S	P	G4.187	90109D	
AERO SLEW TIME 2										
AERO_SLEW_TIME(3)	V97U4185C	00	+100	CYCLES	I	S	P	G4.187	90109D	
AERO SLEW TIME 3										
DELTA_AERO	V97U4257C	00	+4.0	E-02 ND	F	S	P	G4.187	90109D	
AERO SLEW CHECK DELTA INCREMENT										
DELTA_MPS	V97U4256C	00	+2.0	E-02 ND	F	S	P	G4.187	90109D	
MPS SLEW CHECK DELTA INCREMENT										
MPS_CYC	V97U4182C	00	+1	CYCLES	I	S	P	G4.187	90109D	
MPS SLEW COMPLETE CYCLES										
MPS_NULL_CYC	V97U4194C	00	+75	CYCLES	I	S	P	G4.187	90109D	
MPS SLEW NULL POSN DELAY CYCLES										
MPS_SLEW_TIME(1)	V97U4186C	00	+125	CYCLES	I	S	P	G4.187	90109D	
MPS SLEW TIME 1										
MPS_SLEW_TIME(2)	V97U4187C	00	+25	CYCLES	I	S	P	G4.187	90109D	
MPS SLEW TIME 2										
MPS_SLEW_TIME(3)	V97U4188C	00	+25	CYCLES	I	S	P	G4.187	90109D	
MPS SLEW TIME 3										
POSN_AERO(1)	V97U4249C	00	+0.0	E+00 ND	F	S	P	G4.187	90109D	
AERO SLEW CHECK POSN 1										
POSN_AERO(2)	V97U4250C	00	+1.0000000	E+00 ND	F	S	P	G4.187	90109D	
AERO SLEW CHECK POSN 2										
POSN_MPS(1)	V97U4251C	00	+0.0	E+00 ND	F	S	P	G4.187	90109D	
MPS SLEW CHECK POSN 1										
POSN_MPS(2)	V97U4252C	00	+1.0	E+00 ND	F	S	P	G4.187	90109D	
MPS SLEW CHECK POSN 2										

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.187-6. ORBITER ACTUATOR SLEW CHECK (G4.187) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.188 SRB ACTUATOR SLEW CHECKS

The purpose of the SRB Actuator Slew Checks (SRB SLEW) principal function shall be to monitor the SRB slew flag from LPS and generate normalized commands to slew the SRB's. The SRB SLEW shall be processed outside the transport delay critical processing at the 25 Hz rate after the execution of the ASC DAP and SRB TVC CMD SOP. The SRB SLEW interfaces are indicated by the functional block diagram on Figure 4.188-1. The parameter initialization requirements are shown in Table 4.188-1. The IDD inputs and outputs are listed in Tables 4.188-2 and 4.188-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.188-4. K-loads are listed in Table 4.188-5. Constants are listed in Table 4.188-6.

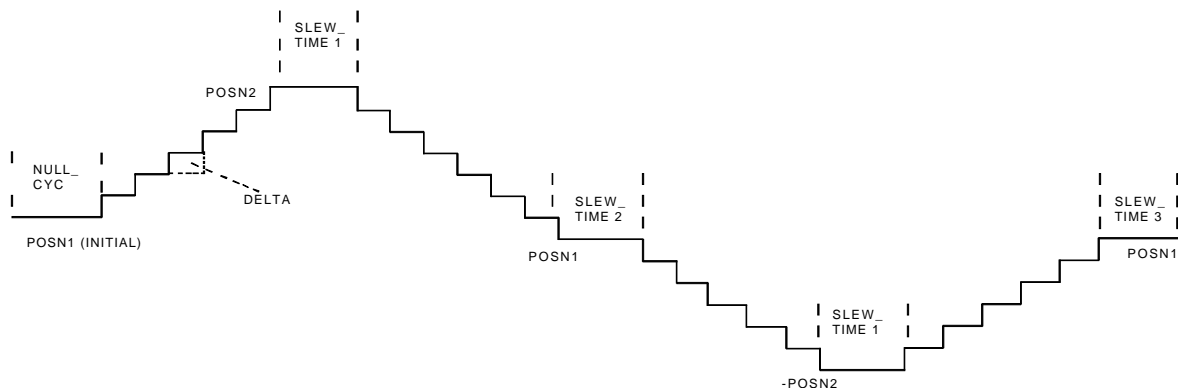
The SRB SLEW shall monitor the SRB_SLEW flag from LPS. Whenever the SRB_SLEW flag changes from the "0" to the "1" state (initiate SRB slew checks), the SRB SLEW shall delay SRB_SLEW_DELAY number of cycles and then generate a normalized TVC gimbal slew command. A trapezoidal function shall be used SRB_CYC number of cycles. (SRB_CYC represents the total number of cycles of the trapezoidal function to be performed.) When SRB_CYC cycles have occurred, the SRB_SLEW_COMPLETE flag shall be set to the "1" state (SRB gimbal slew complete).

The slews for the SRB actuators shall not be performed simultaneously with the aerosurfaces or main engines. In the event that an LPS slew command for one set of actuators (aerosurface, MPS, or SRB) is received during the slewing of another set, the on-going slew checks shall be completed before the second set is initiated. In the event that multiple LPS slew commands are received simultaneously, the aerosurface slews shall be processed first, main engine slews second, and SRB slews last.

The following restriction on initiation of the slew check must be observed by the Launch Processing System, as there is no requirement for the flight software to protect against late slew check initiation:

- The SRB slew check must be completed before the start of the cycle on which the SRB ignition command is issued.

The trapezoidal function shall be as indicated below:



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The SRB actuators shall be initially set to POSN1. The SRB SLEW shall then generate commands incremented each cycle by the constant DELTA from POSN1 to POSN2. When POSN2 has been reached, the slew commands shall be held constant for SLEW_TIME1 number of cycles, and then decremented each cycle by DELTA from POSN2 to POSN1. After holding the slew commands constant for SLEW_TIME2 number of cycles, the commands shall be decremented to -POSN2, held constant for SLEW_TIME1 cycles, and then incremented to POSN1 and held for SLEW_TIME3 cycles.

This completes one trapezoidal function cycle. Provisions shall be made for unique SLEW_TIME1, SLEW_TIME2, and SLEW_TIME3.

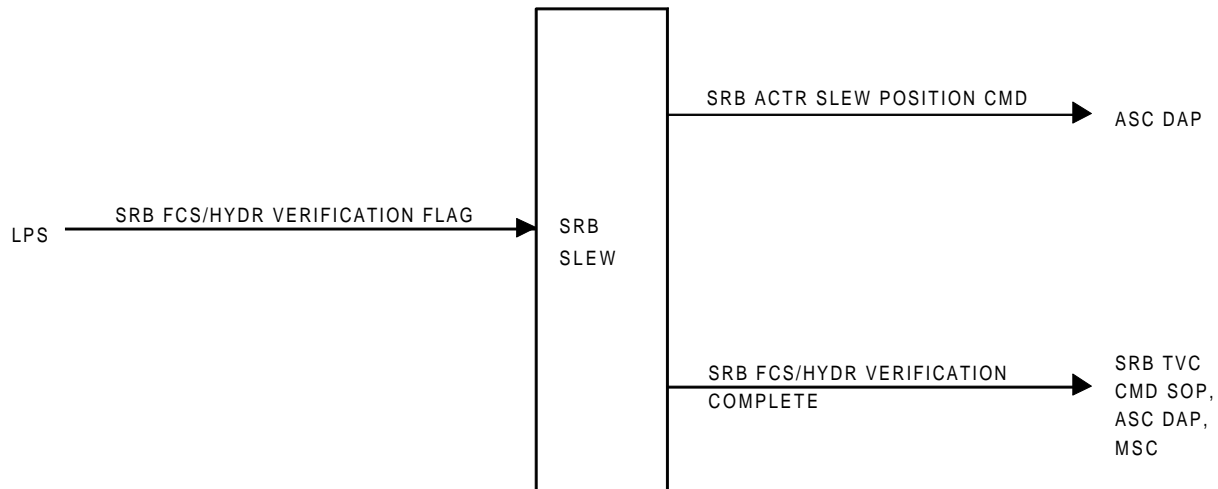


FIGURE 4.188-1. SRB SLEW Functional Module

Table 4.188-1. SRB Slew Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
SRB_SLEW_CMD	V96X0323X	SRB ACTR SLEW POSITION CMD		FLOAT PT	POSN_SRB(1) SRB(1)		N.D.
POSN_SRB(1)	V97U4254C	SRB SLEW CHECK POSN 1	K	FLOAT PT	+0.0		N.D.
POSN_SRB(2)	V97U4255C	SRB SLEW CHECK POSN 2	K	FLOAT PT	+1.0		N.D.
INC_DELTA	V97U4189C	SRB SLEW CHECK DELTA INCREMENT	K	FLOAT PT	+0.2		N.D.
SRB_TIME(1)	V97U4190C	SRB SLEW TIME 1	K	INTEGER	+20		CYCLES
SRB_TIME(2)	V97U4191C	SRB SLEW TIME 2	K	INTEGER	+20		CYCLES
SRB_TIME(3)	V97U4192C	SRB SLEW TIME 3	K	INTEGER	+20		CYCLES
SRB_SLEW_DELAY	V97U4193C	SRB SLEW DELAY FOR TVC OVRD	K	INTEGER	+8		CYCLES
SRB_CYC	V97U4195C	SRB SLEW TRAPEZOIDAL FUNCTION CYCLES	K	INTEGER	+1		
SRB_TRAP		SRB TRAPEZOIDAL FUNCTION COUNTER		INTEGER			
SRB_HOLD(1)		SRB HOLD POSN 2		INTEGER			
SRB_HOLD(2)		SRB HOLD POSN 1		INTEGER			
SRB_HOLD(3)		SRB HOLD POSN -2		INTEGER			
SRB_HOLD(4)		SRB HOLD POSN FINAL		INTEGER			

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TABLE 4.188-2. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER ACTUATOR SLEW CHECK (G4.188)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SRB_SLEW	V99X8820X	SLEW CHECK INDICATOR ACTIVATED	LPS				89599C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.188-3. OUTPUT FUNCTIONAL PARAMETERS FROM SOLID ROCKET BOOSTER ACTUATOR SLEW CHECK (G4.188)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SRB_SLEW_CMD	V96H0323C	SRB ACTR SLEW POSITION CMD	ASC DAP				89366B	
SRB_SLEW_COMPLETE	V96X0321X	SRB SLEW PROFILE COMPLETED	ASC DAP MSC				89599C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.188-4. SOLID ROCKET BOOSTER ACTUATOR SLEW CHECK (G4.188) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.188-5. SOLID ROCKET BOOSTER ACTUATOR SLEW CHECK (G4.188) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
INC_DELTA	V97U4189C	00	+2.0	E-01 ND	F	S	P	G4.188	90109D	
SRB SLEW CHECK DELTA INCREMENT										
POSN_SRB(1)	V97U4254C	00	+0.0	E+00 ND	F	S	P	G4.188	90109D	
SRB SLEW CHECK POSN 1										
POSN_SRB(2)	V97U4255C	00	+1.0000000	E+00 ND	F	S	P	G4.188	90109D	
SRB SLEW CHECK POSN 2										
SRB_CYC	V97U4195C	00	+1	CYCLES	I	S	P	G4.188	90109D	
SRB SLEW TRAPEZOIDAL FUNCTION										
SRB_SLEW_DELAY	V97U4193C	00	+8	CYCLES	I	S	P	G4.188	90109D	
SRB SLEW DELAY FOR TVC OVRD										
SRB_TIME(1)	V97U4190C	00	+20	CYCLES	I	S	P	G4.188	90109D	
SRB SLEW TIME 1										
SRB_TIME(2)	V97U4191C	00	+20	CYCLES	I	S	P	G4.188	90109D	
SRB SLEW TIME 2										
SRB_TIME(3)	V97U4192C	00	+20	CYCLES	I	S	P	G4.188	90109D	
SRB SLEW TIME 3										

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.188-6. SOLID ROCKET BOOSTER ACTUATOR SLEW CHECK (G4.188) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.190 ASCENT RCS COMMAND SOP

The purpose of the Ascent RCS Command (ASC RCS CMD) SOP principal function shall be to generate dual On/Off commands to the individual RCS thrusters in response to commands from the flight control, the SRB SEP SEQ and the ABT CNTL SEQ.

The AS RCS CMD SOP shall be executed at the 25.0 Hz rate after the ASC DAP, TRANS DAP, GRTLS DAP, and ABT CNTL SEQ.

This function shall be operational in major modes 102, 103, 104, 105, 106, 301, 302, 303, 601, 602, and 603.

The AS RCS CMD SOP interfaces are provided on the functional block diagram Figure 4.190-1. Parameter initialization requirements are shown in Table 4.190-1. The IDD inputs and outputs are listed in Tables 4.190-2 and 4.190-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.190-4. K-loads are listed in Table 4.190-5. Constants are listed in Table 4.190-6.

The AS RCS CMD SOP shall monitor the following discreets:

- RCS jet availability from RCS RM
- ABT_20NULL and ABT_X_ON flags from ABT CNTL SEQ
- RCS_1/2_ALL_JET_INHIBIT, RCS_3/4/5_ALL_JET_INHIBIT, AFT_MANIFOLD_1/2_JET_INH, AFT_MANIFOLD_3/4/5_JET_INH, and OMS/RCS_INTERCONNECT_COMPLETE flags from ABT OMS/RCS INTERCONNECT SEQ
- FWD_RCS_DUMP_ENABLE from OVERRIDE display and CONT 3E/O GUID and FWD_RCS_DUMP_DURATION from OVERRIDE display
- NEW_JONLIST from DAP
- RCS FORWARD JET ON CMD FLAG from SRB SEP SEQ
- MM602 FLAG from MSC
- MECO CONFIRMED flag from SSME OPS
- GLIDE_RTLS_INHIBIT from:
 - (1) PW RTLS GUID
 - (2) PW CONT GUID
 - (3) MSC
 - (4) 3 E/O CONT GUID
- RCS jet locations and plume directions are shown in Figure 4.190-2.

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The purpose of this function shall be to generate dual RCS jet commands to the individual RCS thrusters in response to application commands where commands are represented by the “1” state and “zero” states. The input signals shall be processed as follows:

Aft Jets

A. When all of the ABT CNTL SEQ abort flags indicate the “zero” state (no abort commands), the RCS output commands shall be set to the state of the DAP RCS commands (“1” state is on, “zero” state is off). The DAP input signals shall be processed to generate the discrete commands.

When any of the ABT CNTL SEQ abort flags indicate the “1” state, the RCS output commands shall be determined by processing Paragraphs B through E in the order listed. For each abort function, there exists an activation (abort flag becomes true) and deactivation (abort flag becomes false) procedure unique to its function. Each abort function can be re-executed; therefore, re-initialization of flags and counters (e.g., the RCS_CYC1 and RCS_CYC2 counters) used for each function is required at the completion of that function’s deactivation procedure.

B. The RCS_1/2_ALL_JET_INHIBIT_FLAG and the RCS_3/4/5_ALL_JET_INHIBIT_FLAG shall be processed as follows:

- When the RCS_1/2_ALL_JET_INHIBIT_FLAG and/or the RCS_3/4/5_ALL_JET_INHIBIT_FLAG indicates the “zero” state, all RCS jets on the corresponding manifolds (see Table 4.190–1b) will be made available for ABT_20NULL and ABT_X_ON dump commands and DAP commands, subject to availability determined by the AFT_MANIFOLD_JET_INH_FLAGS in Paragraph C.
- When the RCS_1/2_ALL_JET_INHIBIT_FLAG and/or the RCS_3/4/5_ALL_JET_INHIBIT_FLAG indicates the “1” state, availability of RCS jets on the corresponding manifolds (see Table 4.190–1b) for ABT_20NULL and ABT_X_ON dump commands and DAP commands will be determined according to Table 4.190–1c. The rationale for the design of the tables is as follows:

When an ALL_JET_INHIBIT_FLAG becomes true (“1” state), i.e., the availability of propellant to the jets is unknown, jets should not be fired either for dumps or for DAP commands. A delay of RCS_CYC2 cycles is necessary in the event that a dump was in progress when the ALL_JET_INHIBIT_FLAG becomes true. The one exception to this rule is the case in which the OMS/RCS_INTERCONNECT_COMPLETE_FLAG becomes true and the ALL_JET_INHIBIT_FLAG is true: in that case, no dump could have been in progress and the jets can be made unavailable immediately.

- If RCS jets were made unavailable to dump commands and DAP commands as a result of the processing of Table 4.190–1c, all RCS jet commands to the corresponding manifold jets will be set to the “zero” state (see Table 4.190–1b), the ABT_20NULL and ABT_X_ON commands and DAP commands will not be processed for those manifold jets, and, if both ALL_JET_INHIBIT_FLAGS are true, the processing of the AFT_MANIFOLD_JET_INH_FLAGS (Paragraph C) will not be performed for those jets.

C. The AFT_MANIFOLD_1/2_JET_INH_FLAG and/or the AFT_MANIFOLD_3/4/5_JET_INH_FLAG shall be processed as follows:

- When the AFT_MANIFOLD_1/2_JET_INH_FLAG and/or the AFT_MANIFOLD_3/4/5_JET_INH_FLAG indicates the “zero” state, all RCS jets on the corresponding manifolds (see Table 4.190–1a) will be made available for ABT_20NULL and ABT_X_ON dump commands.
- When the AFT_MANIFOLD_1/2_JET_INH_FLAG and/or the AFT_MANIFOLD_3/4/5_JET_INH_FLAG indicates the “1” state, availability of X jets on the corresponding manifolds (see Table 4.190–1a) for ABT_X_ON dump commands, and availability of Y and Z jets on the corresponding manifolds (see Table 4.190–1a) for ABT_20NULL dump commands will be determined according to Table 4.190–1d and 4.190–1e, respectively. The rationale for the design of the tables is as follows:

When an AFT_MANIFOLD_JET_INH_FLAG becomes true (“1” state), i.e., a valve failure has been detected indicating that the RCS jets on the corresponding manifolds are not correctly connected to the OMS propellant tanks, jets should not be fired for the dumps that are intended to assist in dumping OMS propellant. They may, however, be used for DAP commands. Delays of RCS_CYC1 cycles for the Y jets and RCS_CYC2 cycles for the X jets are necessary in the event that a dump was in progress when the AFT_MANIFOLD_JET_INHIBIT_FLAG became true. The one exception to this rule is the case in which the ABT_20NULL or ABT_X_ON flag becomes true and the AFT_MANIFOLD_INHIBIT_FLAG is true: in that case no dumps could have been in progress and the jets can be made unavailable immediately. No delays of unavailability are necessary for the Z jets, because the Z jets will not be requested to fire for the ABT_20NULL dump after the ABT_20NULL flag is set false.

D. When the ABT_X_ON flag indicates the “1” state (four + X jets on), the RCS output commands to each of the available four + X thrusters, as determined by ASC RM, and the all jet inhibit flags and aft manifold inhibit flags, shall be set to the “1” state. Subsequently, when this flag changes from the “1” state to the “zero” state and the ABT_20NULL flag has not changed state, the available, as determined by the all jet inhibit flags, four + X thrusters shall be set to the DAP RCS commands.

If the ABT_X_ON flag and the ABT_20NULL flag change from the “1” state to the “zero” state, the available, as determined by RCS RM and the all jet and aft manifold inhibit flags, four + X thrusters shall be commanded to the “1” state for RCS_CYC2 cycles, and shall be set to the DAP RCS commands (availability determined by the “all jet inhibit flags”).

NOTE: The ABT_X_ON flag will never be in the “zero” state when the ABT_20NULL flag is in the “1” state.

E. The ABT_20NULL flag shall flag shall be processed as follows:

- When the ABT_20NULL flag indicates the “1” state (20 NULL jets on), the available, as determined by the all jet inhibit flags, eight aft Y and twelve aft Z jets shall be set to the DAP RCS commands for the RCS_CYC1 cycles and RCS_CYC2 cycles, respectively.
- Once RCS–CYC1 cycles have occurred, the available eight aft Y jets, as determined by RCS RM, the all jet inhibit flags, and the aft manifold inhibit flags, shall be set to the “1” state. If any of the Y jets is unavailable by RCS RM, its opposing jet shall be set to the “zero” state. Any subsequent DAP commands to the Y jets in the “1” state will result in the setting of the opposing jets to the “zero” state (see following list of the opposing jets). If the DAP

commands a jet that is turned off during a dump because its opposing jet is unavailable, then the DAP command jet shall be allowed to fire.

- Once RCS_CYC2 cycles have occurred, the available twelve aft Z jets, as determined by RCS_RM, the all jet inhibit flags, and the aft manifold inhibit flags, shall be set to the “1” state. If any of the Z jets are unavailable by RCS_RM, its opposing jet shall be set to the “zero” state. Any subsequent DAP commands to the Z jets in the “1” state will result in the setting of the opposing jets to the “zero” state (see the following list of the opposing jets). If the DAP commands a jet that is turned off during a dump because its opposing jet is unavailable, then the DAP commanded jet shall be allowed to fire.
- Once ABT_20NULL flag subsequently indicates the “zero” state (20 null jets off), the available, as determined by the all jet inhibit flags, twelve aft Z jets and shall be set to the DAP RCS commands for RCS_CYC1 cycles.
- Once RCS_CYC1 cycles have occurred, the available, as determined by the all jet inhibit flags, twelve aft Z jets and the eight aft Y jets shall be set to the DAP RCS commands.

NEW_JONLIST_A

<u>DAP JET NO.</u>	<u>OPPOSING JET NO. OUTPUT</u>
NEW_JONLIST_A(19)	RCS_ON_A(23)
NEW_JONLIST_A(20)	RCS_ON_A(24)
NEW_JONLIST_A(21)	RCS_ON_A(25)
NEW_JONLIST_A(22)	RCS_ON_A(26)
NEW_JONLIST_A(23)	RCS_ON_A(19)
NEW_JONLIST_A(24)	RCS_ON_A(20)
NEW_JONLIST_A(25)	RCS_ON_A(21)
NEW_JONLIST_A(26)	RCS_ON_A(22)
NEW_JONLIST_A(27)	RCS_ON_A(33)
NEW_JONLIST_A(28)	RCS_ON_A(34)
NEW_JONLIST_A(29)	RCS_ON_A(35)
NEW_JONLIST_A(30)	RCS_ON_A(36)
NEW_JONLIST_A(31)	RCS_ON_A(37)
NEW_JONLIST_A(32)	RCS_ON_A(38)
NEW_JONLIST_A(33)	RCS_ON_A(27)
NEW_JONLIST_A(34)	RCS_ON_A(28)
NEW_JONLIST_A(35)	RCS_ON_A(29)
NEW_JONLIST_A(36)	RCS_ON_A(30)
NEW_JONLIST_A(37)	RCS_ON_A(31)
NEW_JONLIST_A(38)	RCS_ON_A(32)

Forward Jets

F. The ASC RCS CMD SOP shall monitor the GLIDE_RTLS_INHIBIT from Powered RTLS Guidance, Powered Contingency Guidance, 3 E/O CONT GUID and MSC. If GLIDE_RTLS_INHIBIT equals “ON”, then one time only the FWD_RCS_DUMP_ENABLE shall be reset. The ASC RCS CMD SOP shall monitor the forward RCS yaw jets’ availability from RCS_RM and the FWD_RCS_DUMP_ENABLE discrete and FWD_RCS_DUMP_DURATION from OVERRIDE display

while in MM 602 and 603. FWD_RCS_DUMP_ENABLE is also monitored from CONT_3E/O_GUID during MM601. When FWD_RCS_DUMP_ENABLE equals “ON” and RTLS_FRCS_DUMP_START_TIME has elapsed since Major Mode 602 was entered, the available forward yaw jets shall be commanded on.

To maintain null burn effects, do the following:

1. For a single forward yaw jet made unavailable by RM, the lowest priority jet on the opposite side shall be commanded off.
2. For two forward yaw jets on opposite sides of the vehicle made unavailable by RM, the two remaining jets shall be commanded on.
3. For two forward yaw jets on the same side of the vehicle made unavailable by RM, the two remaining jets shall be commanded off.

The forward yaw jet dump priorities are as follows:

DAP Jet No.	Priority
F1L	1
F3L	2
F2R	1
F4R	2

Unavailable Jets	Corresponding Jet Commands
F1L	F4R – off
F3L	F4R – off
F2R	F3L – off
F4R	F3L – off
F1L and F3L	F2R and F4R – off
F1L and F2R	F3L and F4R – on
F1L and F4R	F3L and F2R – on
F3L and F2R	F1L and F4R – on
F3L and F4R	F1L and F2R – on
F2R and F4R	F1L and F3L – off

The FWD_RCS_DUMP_COUNTER shall monitor dump duration and shall be initialized to zero (0.0) and incremented by 80–msec increments if the dump is in progress with four jets and by 40–msec increments if the dump involves only two jets. The FWD_RCS_TTG_SF shall be computed as the ratio of the counter increment (0, 40, 80 ms) to 80 msec. The forward RCS jets will fire as long as the FWD_RCS_DUMP_COUNTER is less than or equal to the FWD_RCS_DUMP_DURATION and the dump initiation and enable conditions are true. Whenever the dump is stopped automatically (i.e.,

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FWD_RCS_DUMP_COUNTER > FWD_RCS_DUMP_DURATION), the FWD_RCS_DUMP_ENABLE discrete shall be reset. The forward null jet dump shall be terminated when the FWD_RCS_DUMP_ENABLE discrete is off. This forward dump command logic shall be executed at 12.5 Hz on the RCS Command SOP cycle following GRTLS DAP execution. The FWD_RCS_DUMP_COUNTER and FWD_RCS_TTG_SF shall be provided to OVERRIDE display to support the display of forward RCS burn time.

G. The ASC RCS CMD SOP shall monitor the RCS FORWARD JET ON CMD FLAG from the SRB Separation Sequence and the MECO CONFIRMED flag from the SSME OPS Sequence to determine when Group 4 jets (F1U, F2U, F3U) should be fired for window protection. If the MECO CONFIRMED flag is true, then the RCS FORWARD JET ON CMD FLAG shall be set false. When the RCS FORWARD JET ON CMD FLAG is true ("1" state), and MECO CONFIRMED flag is false and the Group 4 jets (F1U, F2U, F3U) are available, as determined by the RCS RM, the Group 4 jets shall be commanded on. If a jet is unavailable, it is not commanded on. When the RCS FORWARD JET ON CMD FLAG is false ("0" state), the jets are not fired for window protection but may be fired for other reasons.

Final Output Commands

H. After completion of processing in any one or all of the previous steps, A, B, C, D, E, F and G, the RCS commands (determined in the previous steps) shall be processed to generate dual output commands to the RCS thrusters. For each RCS thruster, there shall be two commands to the RJDs (the RJD AND's the dual commands prior to firing a jet). The CMD "A" word shall be initially set to the logic "1" state, while the CMD "B" word shall be initially set to the logic "zero" state. At the first "ON" command, the CMD "A" word will go to "zero" for 40 ms and the CMD "B" word will go to and maintain a steady state "1". The CMD "A" word will toggle at 40 ms intervals (40 ms "LOW" and 40 ms "HIGH") as long as the jet is commanded "ON". For a jet firing, the CMD "B" shall be maintained in the logic "1" state for a minimum of 80 ms until commanded "OFF"; between firings CMD "B" shall be maintained at the logic "zero" state for a minimum of 80 ms.

The NEW_JONLIST signal name referenced throughout this section and Section 5 is consistent with the ASC DAP and TRANS DAP. However, the following equivalent names are in the GRTLS DAP:

<u>SOP</u>	<u>GRTLS DAP</u>
NEW_JONLIST (4)	F1L_ON
NEW_JONLIST (5)	F3L_ON
NEW_JONLIST (6)	F2R_ON
NEW_JONLIST (7)	F4R_ON
NEW_JONLIST (8)	F2U_ON
NEW_JONLIST (9)	F3U_ON
NEW_JONLIST (10)	F1U_ON
NEW_JONLIST (11)	F2D_ON
NEW_JONLIST (12)	F1D_ON
NEW_JONLIST (13)	F4D_ON
NEW_JONLIST (14)	F3D_ON
NEW_JONLIST (19)	L4L_ON
NEW_JONLIST (20)	L2L_ON
NEW_JONLIST (21)	L3L_ON
NEW_JONLIST (22)	L1L_ON
NEW_JONLIST (23)	R4R_ON
NEW_JONLIST (24)	R2R_ON
NEW_JONLIST (25)	R3R_ON
NEW_JONLIST (26)	R1R_ON
NEW_JONLIST (27)	L4U_ON
NEW_JONLIST (28)	L2U_ON
NEW_JONLIST (29)	L1U_ON
NEW_JONLIST (30)	R4U_ON
NEW_JONLIST (31)	R2U_ON
NEW_JONLIST (32)	R1U_ON
NEW_JONLIST (33)	L4D_ON
NEW_JONLIST (34)	L2D_ON
NEW_JONLIST (35)	L3D_ON
NEW_JONLIST (36)	R4D_ON
NEW_JONLIST (37)	R2D_ON
NEW_JONLIST (38)	R3D_ON

Table 4.190-1a. Aft Manifold Jet Inhibit Table	
Manifold 1/2 JET INH	Manifold 3/4/5 JET INH
R1R	R3R
R2R	R4R
R2U	R4U
R1U	R3D
R3D*	R1U*
R2D	R4D
R1A	R3A
L1U	L4U
L3D*	L1U*
L2U	L3D
L2D	L4D
L1L	L3L
L2L	L4L
L1A	L3A

* These jets are included in order to maintain a balanced dump.

Table 4.190-1b. All Manifold Jet Inhibit Table	
Manifold 1/2 JET INH	Manifold 3/4/5 JET INH
R1R	R3R
R2R	R4R
R2U	R4U
R1U	R3D
R2D	R4D
R1A	R3A
L2U	L4U
L1U	L3D
L2D	L4D
L1L	L3L
L2L	L4L
L1A	L3A

NOTE: If only one of the ALL_JET_INHIBIT_FLAGS is true, the corresponding AFT_MANIFOLD_JET_INH_FLAG will be true; therefore, it is not necessary to include jets R3D and L3D in the 1/2 All Jet Inhibit Table, nor to included jets R1U and L1U in the 3/4/5 All Jet Inhibit Table.

Table 4.190-1c. All Jet Inhibit Availability Table				
Inputs				Outputs
IC_CPLT_ LAST	IC_CPLT	ALL_JET_ INH_LAST	ALL_JET_INH	DUMP COMMANDS AND DAP COMMAND AVAILABILITY
ANY	ANY	ANY	0	AVAILABLE
1	ANY	0	1	A
1	ANY	1	1	B
0	1	ANY	1	UNAVAILABLE
0	0	0	1	A
0	0	1	1	B

LEGEND:

- IC_CPT_LAST – OMS/RCS_INTERCONNECT_COMPLETE_FLAG_LAST_PASS
- IC_CPLT – OMS/RCS_INTERCONNECT_COMPLETE_FLAG
- ALL_JET_INH_LAST – RCS_ALL_JET_INHIBIT_FLAG_LAST_PASS (1/2 or 3/4/5)
- ALL_JET_INH – RCS_ALL_JET_INHIBIT_FLAG (1/2 or 3/4/5)
- A – Available. Begin counter for condition B.
- B – If RCS_CYC2 cycles have occurred since condition A, jets will be made unavailable. Otherwise, maintain previous cycle's availability.

Table 4.190-1d. ABT_X_ON Availability Table				
Inputs				Outputs
ABT_X_ON LAST_PASS	ABT_X_ON	MANF_INH_ LAST	MANF_INH	DUMP COMMAND AVAILABILITY FOR X JETS
ANY	ANY	ANY	0	AVAILABLE
1	ANY	0	1	A
1	ANY	1	1	B
0	1	ANY	1	UNAVAILABLE
0	0	0	1	A
0	0	1	1	B

LEGEND:

- MAN_INH_LAST – AFT_MANIFOLD_JET_INH_FLAG_LAST_PASS (1/2 or 3/4/5)
 MAN_INH – AFT_MANIFOLD_JET_INH_FLAG_LAST_PASS (1/2 or 3/4/5)
 A – Available. Begin counter for condition B.
 B – If RCS_CYC2 cycles have occurred since condition A, jets will be made unavailable. Otherwise, maintain previous cycle's availability.

Table 4.190-1e. ABT_20NULL Availability Table					
Inputs				Outputs	
ABT_ 20NULL_ LAST_PASS	ABT_20NULL	MANF_INH_ LAST	MANF_INH	DUMP COMMAND AVAILABILITY	
				FOR Y JETS	FOR Z JETS
ANY	ANY	ANY	0	AVAILABLE	AVAILABLE
1	ANY	0	1	A	UNAVAILABLE
1	ANY	1	1	B	UNAVAILABLE
0	1	ANY	1	UNAVAILABLE	UNAVAILABLE
0	0	0	1	A	X
0	0	1	1	B	X

LEGEND:

- MAN_INH_LAST – AFT_MANIFOLD_JET_INH_FLAG_LAST_PASS (1/2 or 3/4/5)
 MAN_INH – AFT_MANIFOLD_JET_INH_FLAG (1/2 or 3/4/5)
 A – Available. Begin counter for condition B.
 B – If RCS_CYC1 cycles have occurred since condition A, jets will be made unavailable. Otherwise, maintain previous cycle's availability.
 X – Not applicable.

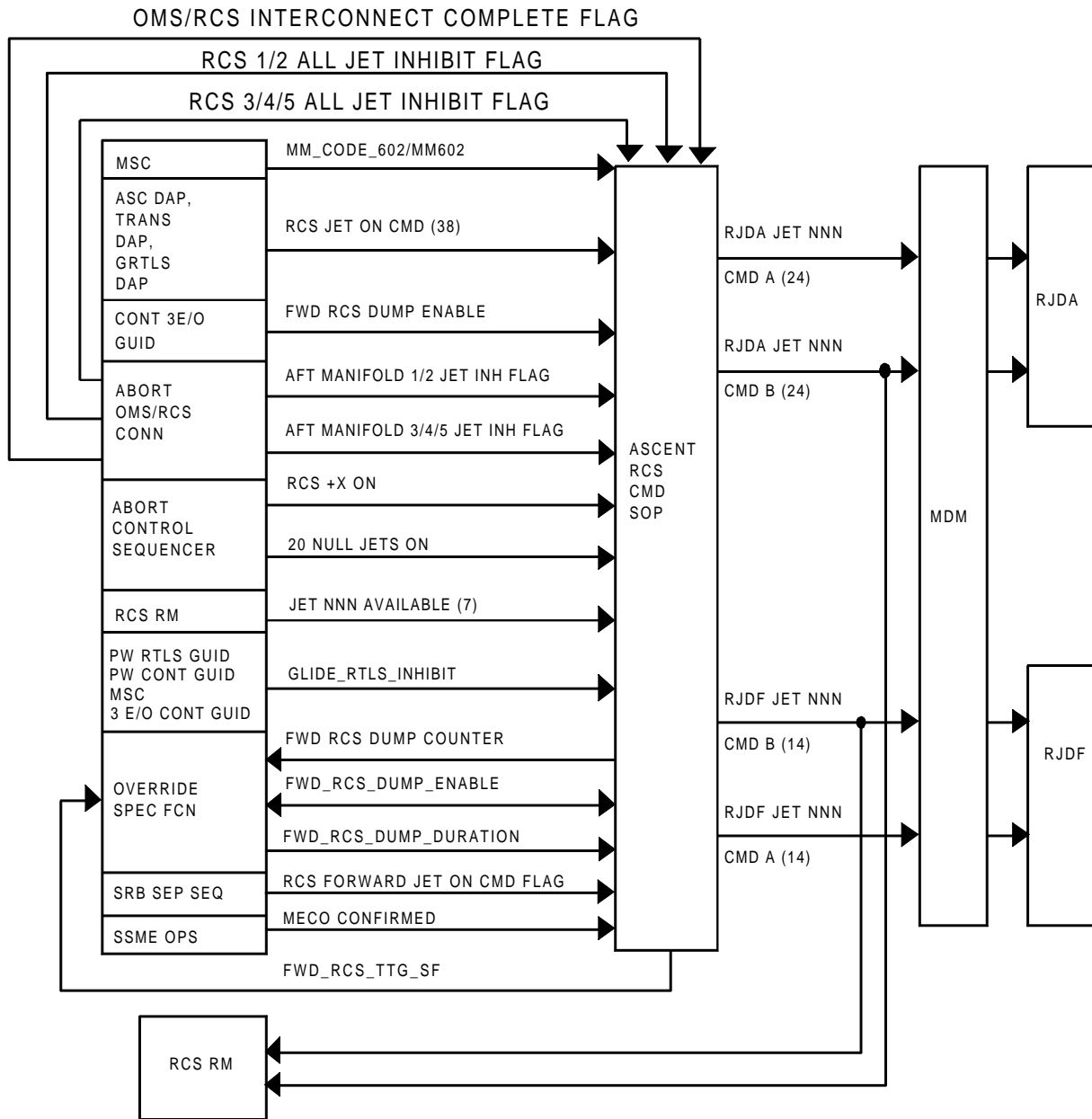


FIGURE 4.190-1. Ascent RCS CMD SOP Functional Block Diagram

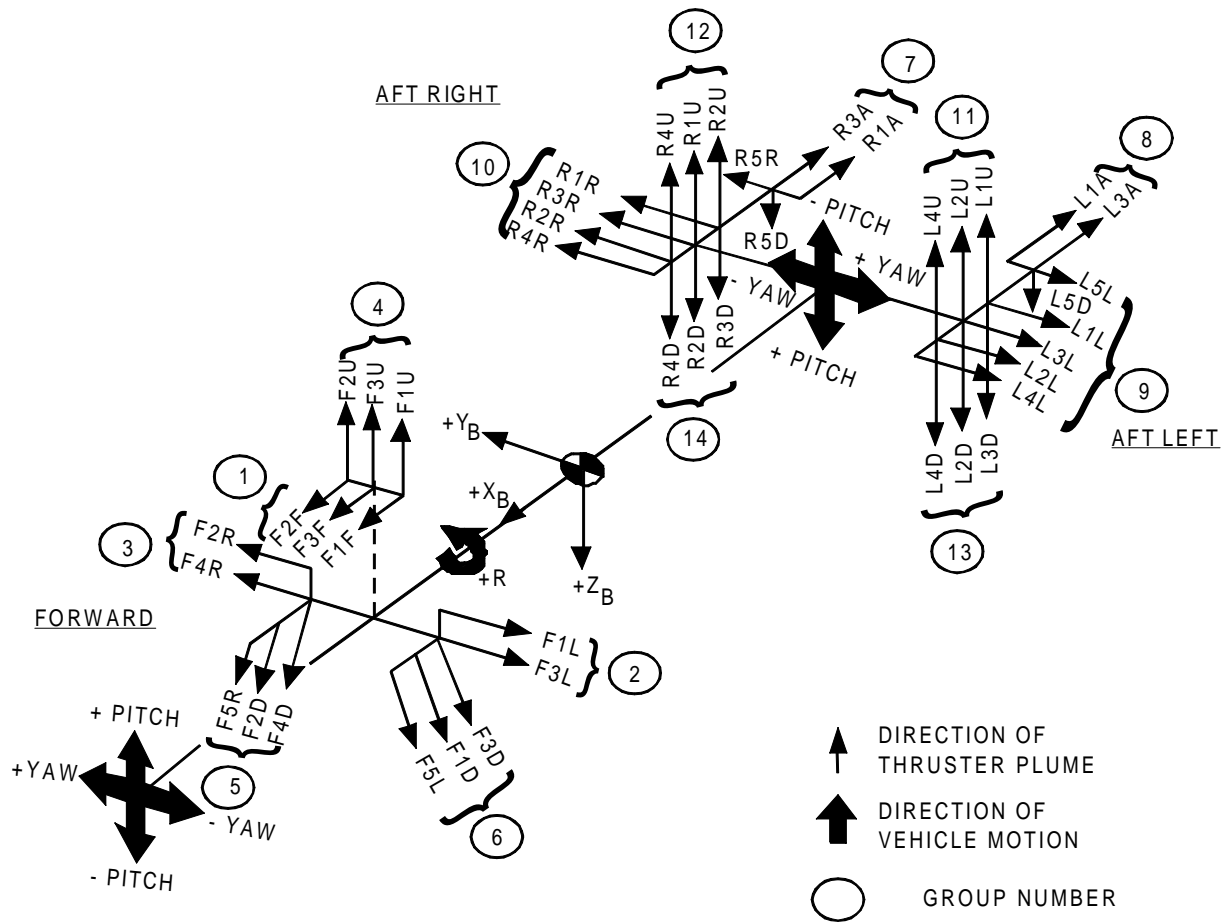


FIGURE 4.190-2. RCS Jet Locations and Plume Directions

Table 4.190-1. Ascent RCS Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
RCS_ON_A(3)	V79K2401XA	RJDF 1 JET FIF CMD A		DISCRETE			
RCS_ON_A(4)	V79K2402XA	RJDF 1 JET FIL CMD A		DISCRETE			
RCS_ON_A(10)	V79K2403XA	RJDF 1 JET FIU CMD A		DISCRETE			
RCS_ON_A(12)	V79K2404XA	RJDF 1 JET F1D CMD A		DISCRETE			
RCS_ON_A(1)	V79K2405XA	RJDF 1 JET F2F CMD A		DISCRETE			
RCS_ON_A(6)	V79K2406XA	RJDF 1 JET F2R CMD A		DISCRETE			
RCS_ON_A(8)	V79K2407XA	RJDF 1 JET F2U CMD A		DISCRETE			
RCS_ON_A(11)	V79K2408XA	RJDF 1 JET F2D CMD A		DISCRETE			
RCS_ON_A(2)	V79K2409XA	RJDF 2 JET F3F CMD A		DISCRETE			
RCS_ON_A(5)	V79K2410XA	RJDF 2 JET F3L CMD A		DISCRETE			
RCS_ON_A(9)	V79K2411XA	RJDF 2 JET F3U CMD A		DISCRETE			
RCS_ON_A(14)	V79K2412XA	RJDF 2 JET F3D CMD A		DISCRETE			
RCS_ON_A(7)	V79K2413XA	RJDF 2 JET F4R CMD A		DISCRETE			
RCS_ON_A(13)	V79K2414XA	RJDF 2 JET F4D CMD A		DISCRETE			
RCS_ON_A(18)	V79K2417XA	RJDA 1 JET L1A CMD A		DISCRETE			
RCS_ON_A(22)	V79K2418XB	RJDA 1 JET L1L CMD A		DISCRETE			
RCS_ON_A(29)	V79K2419XB	RJDA 1 JET L1U CMD A		DISCRETE			
RCS_ON_A(20)	V79K2420XB	RJDA 1 JET L2L CMD A		DISCRETE			
RCS_ON_A(28)	V79K2421XB	RJDA 1 JET L2U CMD A		DISCRETE			
RCS_ON_A(34)	V79K2422XB	RJDA 1 JET L2D CMD A		DISCRETE			
RCS_ON_A(17)	V79K2423XB	RJDA 2 JET L3A CMD A		DISCRETE			
RCS_ON_A(21)	V79K2424XB	RJDA 2 JET L3L CMD A		DISCRETE			
RCS_ON_A(35)	V79K2425XB	RJDA 2 JET L3D CMD A		DISCRETE			
RCS_ON_A(19)	V79K2426XB	RJDA 2 JET L4L CMD A		DISCRETE			
RCS_ON_A(27)	V79K2427XB	RJDA 2 JET L4U CMD A		DISCRETE			
RCS_ON_A(33)	V79K2428XB	RJDA 2 JET L4D CMD A		DISCRETE			
RCS_ON_A(16)	V79K2431XB	RJDA 1 JET R1A CMD A		DISCRETE			
RCS_ON_A(26)	V79K2432XB	RJDA 1 JET R1R CMD A		DISCRETE			
RCS_ON_A(32)	V79K2433XB	RJDA 1 JET R1U CMD A		DISCRETE			
RCS_ON_A(24)	V79K2434XB	RJDA 1 JET R2R CMD A		DISCRETE			
RCS_ON_A(31)	V79K2435XB	RJDA 1 JET R2U CMD A		DISCRETE			
RCS_ON_A(37)	V79K2436XB	RJDA 1 JET R2D CMD A		DISCRETE			
RCS_ON_A(15)	V79K2437XB	RJDA 2 JET R3A CMD A		DISCRETE			
RCS_ON_A(25)	V79K2438XB	RJDA 2 JET R3R CMD A		DISCRETE			
RCS_ON_A(38)	V79K2439XB	RJDA 2 JET R3D CMD A		DISCRETE			
RCS_ON_A(23)	V79K2440XB	RJDA 2 JET R4R CMD A		DISCRETE			
RCS_ON_A(30)	V79K2441XB	RJDA 2 JET R4U CMD A		DISCRETE			

Table 4.190-1. Ascent RCS Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
RCS_ON_A(36)	V79K2442XB	RJDA 2 JET R4D CMD A		DISCRETE			
RCS_ON_B(3)	V79K2501XA	RJDF 1 JET F1F CMD B		DISCRETE			
RCS_ON_B(4)	V79K2502XA	RJDF 1 JET F1L CMD B		DISCRETE			
RCS_ON_B(10)	V79K2503XA	RJDF 1 JET F1U CMD B		DISCRETE			
RCS_ON_B(12)	V79K2504XA	RJDF 1 JET F1D CMD B		DISCRETE			
RCS_ON_B(1)	V79K2505XA	RJDF 1 JET F2F CMD B		DISCRETE			
RCS_ON_B(6)	V79K2506XA	RJDF 1 JET F2R CMD B		DISCRETE			
RCS_ON_B(8)	V79K2507XA	RJDF 1 JET F2U CMD B		DISCRETE			
RCS_ON_B(11)	V79K2508XA	RJDF 1 JET F2D CMD B		DISCRETE			
RCS_ON_B(2)	V79K2509XA	RJDF 2 JET F3F CMD B		DISCRETE			
RCS_ON_B(5)	V79K2510XA	RJDF 2 JET F3L CMD B		DISCRETE			
RCS_ON_B(9)	V79K2511XA	RJDF 2 JET F3U CMD B		DISCRETE			
RCS_ON_B(14)	V79K2512XA	RJDF 2 JET F3D CMD B		DISCRETE			
RCS_ON_B(7)	V79K2513XA	RJDF 2 JET F4R CMD B		DISCRETE			
RCS_ON_B(13)	V79K2514XA	RJDF 2 JET F4D CMD B		DISCRETE			
RCS_ON_B(18)	V79K2517XA	RJDA 1 JET L1A CMD B		DISCRETE			
RCS_ON_B(22)	V79K2518XB	RJDA 1 JET L1L CMD B		DISCRETE			
RCS_ON_B(29)	V79K2519XB	RJDA 1 JET LIU CMD B		DISCRETE			
RCS_ON_B(20)	V79K2520XB	RJDA 1 JET L2L CMD B		DISCRETE			
RCS_ON_B(28)	V79K2521XB	RJDA 1 JET L2U CMD B		DISCRETE			
RCS_ON_B(34)	V79K2522XB	RJDA 1 JET L2D CMD B		DISCRETE			
RCS_ON_B(17)	V79K2523XB	RJDA 2 JET L3A CMD B		DISCRETE			
RCS_ON_B(21)	V79K2524XB	RJDA 2 JET L3L CMD B		DISCRETE			
RCS_ON_B(35)	V79K2525XB	RJDA 2 JET L3D CMD B		DISCRETE			
RCS_ON_B(19)	V79K2526XB	RJDA 2 JET L4L CMD B		DISCRETE			
RCS_ON_B(27)	V79K2527XB	RJDA 2 JET L4U CMD B		DISCRETE			
RCS_ON_B(33)	V79K2528XB	RJDA 2 JET L4D CMD B		DISCRETE			
RCS_ON_B(16)	V79K2531XA	RJDA 1 JET R1A CMD B		DISCRETE			
RCS_ON_B(26)	V79K2532XB	RJDA 2 JET R1R CMD B		DISCRETE			
RCS_ON_B(32)	V79K2533XB	RJDA 1 JET R1U CMD B		DISCRETE			
RCS_ON_B(24)	V79K2534XB	RJDA 1 JET R2R CMD B		DISCRETE			
RCS_ON_B(31)	V79K2535XB	RJDA 1 JET R2U CMD B		DISCRETE			
RCS_ON_B(37)	V79K2536XB	RJDA 1 JET R2D CMD B		DISCRETE			
RCS_ON_B(15)	V79K2537XB	RJDA 2 JET R3A CMD B		DISCRETE			
RCS_ON_B(25)	V79K2538XB	RJDA 2 JET R3R CMD B		DISCRETE			
RCS_ON_B(38)	V79K2539XB	RJDA 2 JET R3D CMD B		DISCRETE			
RCS_ON_B(23)	V79K2540XB	RJDA 2 JET R4R CMD B		DISCRETE			

Table 4.190-1. Ascent RCS Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
RCS_ON_B(30)	V79K2541XB	RJDA 2 JET R4U CMD B		DISCRETE			
RCS_ON_B(36)	V79K2542XB	RJDA 2 JET R4D CMD B		DISCRETE			
FWD_RCS_DUMP_CNTR	V90W8228C	FWD RCS DUMP COUNTER					
FWD_RCS_TTG_SF	V94J3756C	FWD RCS TIME SCALE FACTOR					
ABT_JETS		ABORT CONTROL JET COMMAND FLAG		DISCRETE			
ABT_X_ON_LAST_PASS		PREVIOUS STATE – +X RCS DUMP COMMAND		DISCRETE	0		
ABT_20_NULL_LAST_PASS		PREVIOUS STATE – RCS 20NULL DUMP COMMAND		DISCRETE	0		
AFT_MANIFOLD_1/2_JET_INH_FLAG_LAST_PASS		PREVIOUS STATE – AFT MANIFOLD 1/2 JET INHIBIT FLAG		DISCRETE	0		
AFT_MANIFOLD_3/4/5_JET_INH_FLAG_LAST_PASS		PREVIOUS STATE – AFT MANIFOLD 3/4/5 JET INHIBIT FLAG		DISCRETE	0		
DELAY 1		120 MSEC DELAY FLAG		DISCRETE			
DELAY 2		240 MSEC DELAY FLAG		DISCRETE			
JET ABT		ABORT CONTROL COMMAND LATCH FLAG		DISCRETE			
NCYC1		DELAY CYC COUNTER 1		INTEGER			
NCYC2		DELAY CYC COUNTER 2		INTEGER			
OLD20NULL		PREVIOUS STATE – 20 RCS NULL JETS CMD		DISCRETE			
OLDDELAY1		PREVIOUS STATE – 1ST 120 MSEC DELAY		DISCRETE			
OMS/RCS_INTERCONNECT_COMPLETE_FLAG_LAST_PASS		PREVIOUS STATE – OMS/RCS_INTERCONNECT_COMPLETE_FLAG		DISCRETE	0		
RCS_CYC1		RCS DELAY 1 CYCLE COUNTER	R	INTEGER	4		

Table 4.190-1. Ascent RCS Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
RCS_CYC2		RCS DELAY 2 CYCLE COUNTER	R	INTEGER	6		
RCS_OFF		ABORT CONTROL OFF CYCLE COUNTER		INTEGER			
RCS_1/2_ALL_JET_INHIBIT_FLAG_LAST_PASS		PREVIOUS STATE – 1/2 ALL JET INHIBIT FLAG		DISCRETE	0		
RCS_3/4/5_ALL_JET_INHIBIT_FLAG_LAST_PASS		PREVIOUS STATE – 3/4/5 ALL JET INHIBIT FLAG		DISCRETE	0		

TABLE 4.190-2. INPUT FUNCTIONAL PARAMETERS FOR ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AVAILABLE_JET_FWD(02)	V90X4549X	JET F1L AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(03)	V90X4550X	JET F1U AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(06)	V90X4553X	JET F2R AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(07)	V90X4554X	JET F2U AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(09)	V90X4560X	JET F4R AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(14)	V90X4557X	JET F3L AVAILABLE	RCS RM		BD		93017G	*
AVAILABLE_JET_FWD(15)	V90X4558X	JET F3U AVAILABLE	RCS RM		BD		93017G	*
FWD_RCS_DUMP_ENABLE	V93X6948XA	FWD RCS DUMP ENABLE	VERRIDE DISP		BD		89149B	
FWD_RCS_DUMP_ENABLE	V93X6948XD	FWD RCS DUMP ENABLE	CONT 3E/O GUID		BD		90964	
GLIDE_RTLS_INHIBIT	V90X2090XA	RTLS CONTINGENCY FLAG	PW RTLS GUID		BD		93017G	*
GLIDE_RTLS_INHIBIT	V90X2090XB	RTLS CONTINGENCY FLAG	MSC		BD		93090E	
GLIDE_RTLS_INHIBIT	V90X2090XC	RTLS CONTINGENCY FLAG	PW CONT GUID		BD		93017G	*
GLIDE_RTLS_INHIBIT	V90X2090XD	RTLS CONTINGENCY FLAG	CONT 3E/O GUID		BD		93017G	*
MECO_CONFIRMED	V90X8561X	MECO CONFIRMED FLAG	SME OPS		BD		93017G	*
MM_CODE	V90Q8001C	MAJOR MODE CODE	UI		HXS		93017G	*
MM_CODE_602/MM_602	V90X8174X	MAJOR MODE 602 FLAG	MSC				92355B	
NEW_JONLST(04)	V90X1442XD	RCS JET F1L ON CMD	ASC DAP				92157	
NEW_JONLST(05)	V90X1450XD	RCS JET F3L ON CMD	ASC DAP				92157	
NEW_JONLST(06)	V90X1446XD	RCS JET F2R ON CMD	ASC DAP				92157	
NEW_JONLST(07)	V90X1453XD	RCS JET F4R ON CMD	ASC DAP				92157	
NEW_JONLST(10)	V90X1443XD	RCS JET F1U ON CMD	ASC DAP				92565A	
NEW_JONLST(19)	V90X1680XE	RCS JET L4L ON CMD	ASC DAP				92157	
NEW_JONLST(20)	V90X1675XE	RCS JET L2L ON CMD	ASC DAP				92157	
NEW_JONLST(21)	V90X1678XE	RCS JET L3L ON CMD	ASC DAP				92157	
NEW_JONLST(22)	V90X1673XE	RCS JET L1L ON CMD	ASC DAP				92157	
NEW_JONLST(23)	V90X1690XE	RCS JET R4R ON CMD	ASC DAP				92157	
NEW_JONLST(24)	V90X1685XE	RCS JET R2R ON CMD	ASC DAP				92157	
NEW_JONLST(25)	V90X1688XE	RCS JET R3R ON CMD	ASC DAP				92157	
NEW_JONLST(26)	V90X1683XE	RCS JET R1R ON CMD	ASC DAP				92157	
NEW_JONLST(27)	V90X1681XE	RCS JET L4U ON CMD	ASC DAP				92157	
NEW_JONLST(28)	V90X1676XE	RCS JET L2U ON CMD	ASC DAP				92157	
NEW_JONLST(29)	V90X1674XE	RCS JET L1U ON CMD	ASC DAP				92157	
NEW_JONLST(30)	V90X1691XE	RCS JET R4U ON CMD	ASC DAP				92157	
NEW_JONLST(31)	V90X1686XE	RCS JET R2U ON CMD	ASC DAP				92157	
NEW_JONLST(32)	V90X1684XE	RCS JET R1U ON CMD	ASC DAP				92157	
NEW_JONLST(33)	V90X1682XE	RCS JET L4D ON CMD	ASC DAP				92157	
NEW_JONLST(34)	V90X1677XE	RCS JET L2D ON CMD	ASC DAP				92157	
NEW_JONLST(35)	V90X1679XE	RCS JET L3D ON CMD	ASC DAP				92157	
NEW_JONLST(36)	V90X1692XE	RCS JET R4D ON CMD	ASC DAP				92157	
NEW_JONLST(37)	V90X1687XE	RCS JET R2D ON CMD	ASC DAP				92157	
NEW_JONLST(38)	V90X1689XE	RCS JET R3D ON CMD	ASC DAP				92157	
NEW_JONLST(8)	V90X1447XD	RCS JET F2U ON CMD	ASC DAP				92565A	
NEW_JONLST(9)	V90X1451XD	RCS JET F3U ON CMD	ASC DAP				92565A	
NEW_JONLST_AFT(01)	V90X1455XA	RCS JET L1A ON CMD	TRANS DAP				89495B	
NEW_JONLST_AFT(01)/L1A_ON	V90X1455XC	RCS JET L1A ON CMD	GRTLS DAP				92504G	
NEW_JONLST_AFT(02)	V90X1673XB	RCS JET L1L ON CMD	TRANS DAP				89495B	

TABLE 4.190-2. INPUT FUNCTIONAL PARAMETERS FOR ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
NEW_JONLST_AFT(02)/L1L_ON	V90X1673XA	RCS JET L1L ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(03)	V90X1674XB	RCS JET L1U ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(03)/L1U_ON	V90X1674XA	RCS JET L1U ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(04)	V90X1457XA	RCS JET R1A ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(04)/R1A_ON	V90X1457XC	RCS JET R1A ON CMD	GRTLS	DAP			92504G	
NEW_JONLST_AFT(05)	V90X1683XB	RCS JET R1R ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(05)/R1R_ON	V90X1683XA	RCS JET R1R ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(06)	V90X1684XB	RCS JET R1U ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(06)/R1U_ON	V90X1684XA	RCS JET R1U ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(09)	V90X1456XA	RCS JET L3A ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(09)/L3A_ON	V90X1456XC	RCS JET L3A ON CMD	GRTLS	DAP			92504G	
NEW_JONLST_AFT(10)	V90X1678XB	RCS JET L3L ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(10)/L3L_ON	V90X1678XA	RCS JET L3L ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(11)	V90X1679XB	RCS JET L3D ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(11)/L3D_ON	V90X1679XA	RCS JET L3D ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(12)	V90X1459XA	RCS JET R3A ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(12)/R3A_ON	V90X1459XC	RCS JET R3A ON CMD	GRTLS	DAP			92504G	
NEW_JONLST_AFT(13)	V90X1688XB	RCS JET R3R ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(13)/R3R_ON	V90X1688XA	RCS JET R3R ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(14)	V90X1689XB	RCS JET R3D ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(14)/R3D_ON	V90X1689XA	RCS JET R3D ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(17)	V90X1675XB	RCS JET L2L ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(17)/L2L_ON	V90X1675XA	RCS JET L2L ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(18)	V90X1676XB	RCS JET L2U ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(18)/L2U_ON	V90X1676XA	RCS JET L2U ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(19)	V90X1677XB	RCS JET L2D ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(19)/L2D_ON	V90X1677XA	RCS JET L2D ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(20)	V90X1685XB	RCS JET R2R ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(20)/R2R_ON	V90X1685XA	RCS JET R2R ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(21)	V90X1686XB	RCS JET R2U ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(21)/R2U_ON	V90X1686XA	RCS JET R2U ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(22)	V90X1687XB	RCS JET R2D ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(22)/R2D_ON	V90X1687XA	RCS JET R2D ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(23)	V90X1680XB	RCS JET L4L ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(23)/L4L_ON	V90X1680XA	RCS JET L4L ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(24)	V90X1681XB	RCS JET L4U ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(24)/L4U_ON	V90X1681XA	RCS JET L4U ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(25)	V90X1682XB	RCS JET L4D ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(25)/L4D_ON	V90X1682XA	RCS JET L4D ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(26)	V90X1690XB	RCS JET R4R ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(26)/R4R_ON	V90X1690XA	RCS JET R4R ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(27)	V90X1691XB	RCS JET R4U ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(27)/R4U_ON	V90X1691XA	RCS JET R4U ON CMD	GRTLS	DAP			89463	
NEW_JONLST_AFT(28)	V90X1692XB	RCS JET R4D ON CMD	TRANS	DAP			89495B	
NEW_JONLST_AFT(28)/R4D_ON	V90X1692XA	RCS JET R4D ON CMD	GRTLS	DAP			89463	
NEW_JONLST_FWD(01)	V90X1441XA	RCS JET F1F ON CMD	TRANS	DAP			89495B	

TABLE 4.190-2. INPUT FUNCTIONAL PARAMETERS FOR ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
NEW_JONLST_FWD(02)	V90X1442XB	RCS JET F1L ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(02)/F1L_ON	V90X1442XA	RCS JET F1L ON CMD	GRTLS DAP				89463	
NEW_JONLST_FWD(03)	V90X1443XB	RCS JET F1U ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(03)/F1U_ON	V90X1443XA	RCS JET F1U ON CMD	GRTLS DAP				92504G	
NEW_JONLST_FWD(04)	V90X1444XB	RCS JET F1D ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(04)/F1D_ON	V90X1444XA	RCS JET F1D ON CMD	GRTLS DAP				89463	
NEW_JONLST_FWD(05)	V90X1445XA	RCS JET F2F ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(06)	V90X1446XB	RCS JET F2R ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(06)/F2R_ON	V90X1446XA	RCS JET F2R ON CMD	GRTLS DAP				89463	
NEW_JONLST_FWD(07)	V90X1447XB	RCS JET F2U ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(07)/F2U_ON	V90X1447XA	RCS JET F2U ON CMD	GRTLS DAP				92504G	
NEW_JONLST_FWD(08)	V90X1448XB	RCS JET F2D ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(08)/F2D_ON	V90X1448XA	RCS JET F2D ON CMD	GRTLS DAP				89463	
NEW_JONLST_FWD(09)	V90X1453XB	RCS JET F4R ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(09)/F4R_ON	V90X1453XA	RCS JET F4R ON CMD	GRTLS DAP				89463	
NEW_JONLST_FWD(10)	V90X1454XB	RCS JET F4D ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(10)/F4D_ON	V90X1454XA	RCS JET F4D ON CMD	GRTLS DAP				89463	
NEW_JONLST_FWD(13)	V90X1449XA	RCS JET F3F ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(14)	V90X1450XB	RCS JET F3L ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(14)/F3L_ON	V90X1450XA	RCS JET F3L ON CMD	GRTLS DAP				89463	
NEW_JONLST_FWD(15)	V90X1451XB	RCS JET F3U ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(15)/F3U_ON	V90X1451XA	RCS JET F3U ON CMD	GRTLS DAP				92504G	
NEW_JONLST_FWD(16)	V90X1452XB	RCS JET F3D ON CMD	TRANS DAP				89495B	
NEW_JONLST_FWD(16)/F3D_ON	V90X1452XA	RCS JET F3D ON CMD	GRTLS DAP				89463	
S_RCS_IGN	V90X8314X	ABORT RCS +X ON CMD	ABT CNTL SEQ		BD		93017G	*
S_RCS_NULL20	V90X8317X	20 RCS NULL JETS ON CMD	ABT CNTL SEQ		BD		93017G	*
	V90X1000X	RCS FORWARD JET ON CMD FLAG	SRB SEP SEQ		BD		92306A	
	V90X2728X	JSL FIRST HALF FLAG	TRANS DAP					
	V90X8282X	OMS TO RCS INTERCONNECT COMP FLAG	ABT OMS/RCS CONN		BD		93017G	*
	V90X8285X	AFT MANIFOLD 1/2 JET INH FLAG	ABT OMS/RCS CONN		BD		93017G	*
	V90X8286X	AFT MANIFOLD 3/4/5 JET INH FLAG	ABT OMS/RCS CONN		BD		93017G	*
	V90X8290X	RCS 1/2 ALL JET INHIBIT FLAG	ABT OMS/RCS CONN		BD		90705H	
	V90X8291X	RCS 3/4/5 ALL JET INHIBIT FLAG	ABT OMS/RCS CONN		BD		90705H	
	V93W6957C	FWD RCS DUMP DURATION	OVERRIDE DISP	S			92392C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.190-3. OUTPUT FUNCTIONAL PARAMETERS FROM ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FWD_RCS_DUMP_CNTR	V90W8228CB	FWD RCS DUMP COUNTER	OVERRIDE SPEC	S				
FWD_RCS_DUMP_ENABLE	V93X6948XB	FWD RCS DUMP ENABLE	OVERRIDE DISP		BD		89149B	
FWD_RCS_TTG_SF	V94J3756CB	FWD RCS TIME SCALE FACTOR	OVERRIDE SPEC					
RCS_ON_A(1)	V79K2405XA	RJDF 1 JET F2F CMD A	RJDF 1					
			TLM					
RCS_ON_A(10)	V79K2403XA	RJDF 1 JET F1U CMD A	RJDF 1					
			TLM					
RCS_ON_A(11)	V79K2408XA	RJDF 1 JET F2D CMD A	RJDF 1					
			TLM					
RCS_ON_A(12)	V79K2404XA	RJDF 1 JET F1D CMD A	RJDF 1					
			TLM					
RCS_ON_A(13)	V79K2414XA	RJDF 2 JET F4D CMD A	RJDF 2					
			TLM					
RCS_ON_A(14)	V79K2412XA	RJDF 2 JET F3D CMD A	RJDF 2					
			TLM					
RCS_ON_A(15)	V79K2437XA	RJDA 2 JET R3A CMD A	RJDA 2					
			TLM					
RCS_ON_A(16)	V79K2431XA	RJDA 1 JET R1A CMD A	RJDA 1					
			TLM					
RCS_ON_A(17)	V79K2423XA	RJDA 2 JET L3A CMD A	RJDA 2					
			TLM					
RCS_ON_A(18)	V79K2417XA	RJDA 1 JET L1A CMD A	RJDA 1					
			TLM					
RCS_ON_A(19)	V79K2426XB	RJDA 2 JET L4L CMD A	RJDA 2					
			TLM					
RCS_ON_A(2)	V79K2409XA	RJDF 2 JET F3F CMD A	RJDF 2					
			TLM					
RCS_ON_A(20)	V79K2420XB	RJDA 1 JET L2L CMD A	RJDA 1					
			TLM					
RCS_ON_A(21)	V79K2424XB	RJDA 2 JET L3L CMD A	RJDA 2					
			TLM					
RCS_ON_A(22)	V79K2418XB	RJDA 1 JET L1L CMD A	RJDA 1					
			TLM					
RCS_ON_A(23)	V79K2440XB	RJDA 2 JET R4R CMD A	RJDA 2					
			TLM					
RCS_ON_A(24)	V79K2434XB	RJDA 1 JET R2R CMD A	RJDA 1					
			TLM					
RCS_ON_A(25)	V79K2438XB	RJDA 2 JET R3R CMD A	RJDA 2					
			TLM					
RCS_ON_A(26)	V79K2432XB	RJDA 1 JET R1R CMD A	RJDA 1					
			TLM					
RCS_ON_A(27)	V79K2427XB	RJDA 2 JET L4U CMD A	RJDA 2					
			TLM					
RCS_ON_A(28)	V79K2421XB	RJDA 1 JET L2U CMD A	RJDA 1					
			TLM					

TABLE 4.190-3. OUTPUT FUNCTIONAL PARAMETERS FROM ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_A(29)	V79K2419XB	RJDA 1 JET L1U CMD A	RJDA 1					
			TLM					
RCS_ON_A(3)	V79K2401XA	RJDF 1 JET F1F CMD A	RJDF 1					
			TLM					
RCS_ON_A(30)	V79K2441XB	RJDA 2 JET R4U CMD A	RJDA 2					
			TLM					
RCS_ON_A(31)	V79K2435XB	RJDA 1 JET R2U CMD A	RJDA 1					
			TLM					
RCS_ON_A(32)	V79K2433XB	RJDA 1 JET R1U CMD A	RJDA 1					
			TLM					
RCS_ON_A(33)	V79K2428XB	RJDA 2 JET L4D CMD A	RJDA 2					
			TLM					
RCS_ON_A(34)	V79K2422XB	RJDA 1 JET L2D CMD A	RJDA 1					
			TLM					
RCS_ON_A(35)	V79K2425XB	RJDA 2 JET L3D CMD A	RJDA 2					
			TLM					
RCS_ON_A(36)	V79K2442XB	RJDA 2 JET R4D CMD A	RJDA 2					
			TLM					
RCS_ON_A(37)	V79K2436XB	RJDA 1 JET R2D CMD A	RJDA 1					
			TLM					
RCS_ON_A(38)	V79K2439XB	RJDA 2 JET R3D CMD A	RJDA 2					
			TLM					
RCS_ON_A(4)	V79K2402XA	RJDF 1 JET F1L CMD A	RJDF 1					
			TLM					
RCS_ON_A(5)	V79K2410XA	RJDF 2 JET F3L CMD A	RJDF 2					
			TLM					
RCS_ON_A(6)	V79K2406XA	RJDF 1 JET F2R CMD A	RJDF 1					
			TLM					
RCS_ON_A(7)	V79K2413XA	RJDF 2 JET F4R CMD A	RJDF 2					
			TLM					
RCS_ON_A(8)	V79K2407XA	RJDF 1 JET F2U CMD A	RJDF 1					
			TLM					
RCS_ON_A(9)	V79K2411XA	RJDF 2 JET F3U CMD A	RJDF 2					
			TLM					
RCS_ON_B(1)	V79K2505XA	RJDF 1 JET F2F CMD B	DL FMT 21/A				93017G	*
			DL FMT 23/A					
			RCS RM					
			RJDF 1					
RCS_ON_B(10)	V79K2503XA	RJDF 1 JET F1U CMD B	DL FMT 21/A				93017G	*
			DL FMT 23/A					
			RCS RM					
			RJDF 1					
RCS_ON_B(11)	V79K2508XA	RJDF 1 JET F2D CMD B	DL FMT 21/A				93017G	*
			DL FMT 23/A					
			RCS RM					
			RJDF 1					

TABLE 4.190-3. OUTPUT FUNCTIONAL PARAMETERS FROM ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(12)	V79K2504XA	RJDF 1 JET F1D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 1				93017G	*
RCS_ON_B(13)	V79K2514XA	RJDF 2 JET F4D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 2				93017G	*
RCS_ON_B(14)	V79K2512XA	RJDF 2 JET F3D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 2				93017G	*
RCS_ON_B(15)	V79K2537XA	RJDA 2 JET R3A CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(16)	V79K2531XA	RJDA 1 JET R1A CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(17)	V79K2523XA	RJDA 2 JET L3A CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(18)	V79K2517XA	RJDA 1 JET L1A CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(19)	V79K2526XB	RJDA 2 JET L4L CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(2)	V79K2509XA	RJDF 2 JET F3F CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 2				93017G	*
RCS_ON_B(20)	V79K2520XB	RJDA 1 JET L2L CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(21)	V79K2524XB	RJDA 2 JET L3L CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*

TABLE 4.190-3. OUTPUT FUNCTIONAL PARAMETERS FROM ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(22)	V79K2518XB	RJDA 1 JET L1L CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(23)	V79K2540XB	RJDA 2 JET R4R CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(24)	V79K2534XB	RJDA 1 JET R2R CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(25)	V79K2538XB	RJDA 2 JET R3R CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(26)	V79K2532XB	RJDA 1 JET R1R CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(27)	V79K2527XB	RJDA 2 JET L4U CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(28)	V79K2521XB	RJDA 1 JET L2U CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(29)	V79K2519XB	RJDA 1 JET L1U CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(3)	V79K2501XA	RJDF 1 JET F1F CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 1				93017G	*
RCS_ON_B(30)	V79K2541XB	RJDA 2 JET R4U CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(31)	V79K2535XB	RJDA 1 JET R2U CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*

TABLE 4.190-3. OUTPUT FUNCTIONAL PARAMETERS FROM ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(32)	V79K2533XB	RJDA 1 JET R1U CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(33)	V79K2528XB	RJDA 2 JET L4D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(34)	V79K2522XB	RJDA 1 JET L2D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(35)	V79K2525XB	RJDA 2 JET L3D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(36)	V79K2542XB	RJDA 2 JET R4D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(37)	V79K2536XB	RJDA 1 JET R2D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 1				93017G	*
RCS_ON_B(38)	V79K2539XB	RJDA 2 JET R3D CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDA 2				93017G	*
RCS_ON_B(4)	V79K2502XA	RJDF 1 JET F1L CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 1				93017G	*
RCS_ON_B(5)	V79K2510XA	RJDF 2 JET F3L CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 2				93017G	*
RCS_ON_B(6)	V79K2506XA	RJDF 1 JET F2R CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 1				93017G	*
RCS_ON_B(7)	V79K2513XA	RJDF 2 JET F4R CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 2				93017G	*

TABLE 4.190-3. OUTPUT FUNCTIONAL PARAMETERS FROM ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(8)	V79K2507XA	RJDF 1 JET F2U CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 1				93017G	*
RCS_ON_B(9)	V79K2511XA	RJDF 2 JET F3U CMD B	DL FMT 21/A DL FMT 23/A RCS RM RJDF 2				93017G	*
	V72M6633PB	MDM FF01 DSCR OUT SET	CD 13 CH 0	DL FMT 21/A DL FMT 23/A			93017G	*
	V72M6683PB	MDM FF02 DSCR OUT SET	CD 13 CH 0	DL FMT 21/A DL FMT 23/A			93017G	*
	V72M6733PB	MDM FF03 DSCR OUT SET	CD 13 CH 0	DL FMT 21/A DL FMT 23/A			93017G	*
	V72M6783PB	MDM FF04 DSCR OUT SET	CD 13 CH 0	DL FMT 21/A DL FMT 23/A			93017G	*
	V72M8715PB	MDM FA01 DSCR OUT SET	CD 10 CH 0	DL FMT 21/A DL FMT 23/A			93017G	*
	V72M8735PB	MDM FA02 DSCR OUT SET	CD 10 CH 0	DL FMT 21/A DL FMT 23/A			93017G	*
	V72M8755PB	MDM FA03 DSCR OUT SET	CD 10 CH 0	DL FMT 21/A DL FMT 23/A			93017G	*
	V72M8774PB	MDM FA04 DSCR OUT SET	CD 10 CH 0	DL FMT 21/A DL FMT 23/A			93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

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TABLE 4.190-4. ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
RTLS_FRCS_DUMP_START_TIME	V99U9643C	SEC	F	S	M	C	G4.190	00	QFR	DC0599	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.190-5. ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.190-6. ASCENT REACTION CONTROL SYSTEM COMMAND SOP (G4.190) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
RCS_CYC1 RCS DELAY 1 CYCLE COUNTER	V97U6214C	00	+4	CYCLES	I	S	P	G4.190 G4.58	90374C	
RCS_CYC2 RCS DELAY 2 CYCLE COUNTER	V97U6215C	00	+6	CYCLES	I	S	P	G4.190 G4.58	90374C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.191 ORBIT RCS COMMAND SOP

The purpose of the Orbit RCS Command (ORB RCS CMD) SOP principal function shall be to perform the following functions:

- A. Processing of dual On/Off signals to each RCS thruster
- B. Processing of RCS duty cycle information to user functions

The ORB RCS CMD SOP shall be executed at the 25.0 Hz rate after ON-ORBIT DAP and ORB OMS/RCS CONN and prior to RCS RM and OMS/RCS GAUGING.

The ORB RCS CMD SOP shall generate dual on/off signals to the individual RCS thrusters. These signals shall be processed to generate dual output commands to the RCS thrusters. The CMD "A" word shall be initially set to the logic "1" state, while the CMD "B" word shall be initially set to the logic "0" state. At the first "ON" command from the DAP, the CMD "A" word will go to "0" for 40 ms and the CMD "B" word will go to and maintain a steady state "1". The CMD "A" word will toggle at 40 ms intervals (40 ms "LOW" and 40 ms "HIGH"). For a jet firing, the CMD "B" shall be maintained in the logic "1" state for a minimum of 80 ms until commanded "OFF" by the DAP; between firings CMD "B" shall be maintained at logic "0" for a minimum of 80 ms.

In addition, the On/Off signals shall be made available for RCS RM.

The ORB RCS CMD SOP shall also monitor the PRESS ENA flags. When either of these flags indicates the "1" state (activate gauging counters), RCS commands shall be monitored and the following counters shall be provided as follows:

If ROMS TO AFT RCS PRESS ENA is true or LOMS TO AFT RCS PRESS ENA is true, then perform (A), (B), and (C) below.

If ROMS TO AFT RCS PRESS ENA and LOMS TO AFT RCS PRESS ENA are both false, set the aft vernier, aft main and aft main startup counters to zero.

- A. For each aft vernier jet commanded On during an 80 ms cycle, the aft vernier jet on-cycle counter shall be incremented by one.
- B. For the first 80 ms cycle that an aft main jet is commanded On, the aft main jet startup counter shall be incremented by one.
- C. For each aft main jet commanded On during an 80 ms cycle, the aft main jet on-cycle counter shall be incremented by one.

The ORB RCS CMD SOP interfaces are provided on the functional diagram of Figure 4.191-1. Parameter initialization requirements are shown in Table 4.191-1. The IDD inputs and outputs are listed in Tables 4.191-2 and 4.191-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.191-4. K-loads are listed in Table 4.191-5. Constants are listed in Table 4.191-6.

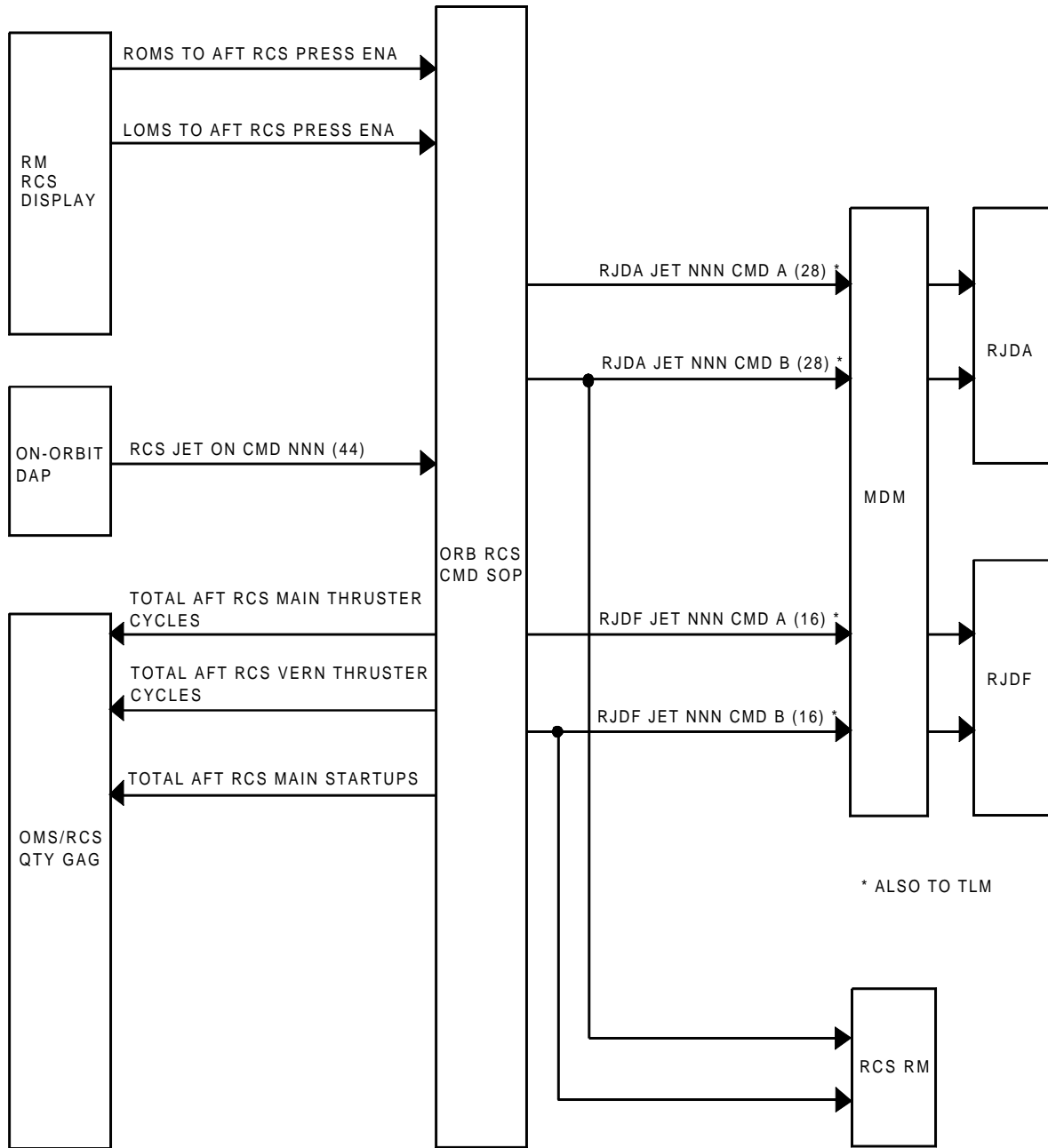


FIGURE 4.191-1. Orbit RCS CMD SOP Functional Module

Table 4.191-1. Orbit RCS Command SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
RCS_AFT_MN	V95Q1650C	TOT NO AFT RCS MN THRUSTER CYC		INTEGER	0		COUNTS
RCS_AFT_VR	V95Q1651C	TOT NO AFT RCS VR THRUSTER CYC		INTEGER	0		COUNTS
RCS_AFT_MN_ST	V95Q1652C	TOT NO AFT MN THRUSTER START UPS		INTEGER	0		COUNTS
RCS_ON_A	V95K2401X THRU V95K2444X	ARRAY OF RJD JET A CMD		DISCRETE	0		
RCS_ON_B	V95K2501X THRU V95K2544X	ARRAY OF RJD JET B CMD		DISCRETE	0		
OLD_OMS_RCS		PAST ORBIT OMS RCS INTERCONNECT READY		DISCRETE	0		
OLD_JON		ARRAY OF PAST RCS JET ON CMDS		DISCRETE	0		

TABLE 4.191-2. INPUT FUNCTIONAL PARAMETERS FOR ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
NEW_JONLST_AFT(01)	V90X1455XB	RCS JET L1A ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(02)	V90X1673XD	RCS JET L1L ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(03)	V90X1674XD	RCS JET L1U ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(04)	V90X1457XB	RCS JET R1A ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(05)	V90X1683XD	RCS JET R1R ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(06)	V90X1684XD	RCS JET R1U ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(07)	V90X2159X	RCS JET L5D ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(08)	V90X2158X	RCS JET L5L ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(09)	V90X1456XB	RCS JET L3A ON CMD	ORB DAP				89490C	
NEW_JONLST_AFT(10)	V90X1678XD	RCS JET L3L ON CMD	ORB DAP					
NEW_JONLST_AFT(11)	V90X1679XD	RCS JET L3D ON CMD	ORB DAP					
NEW_JONLST_AFT(12)	V90X1459XB	RCS JET R3A ON CMD	ORB DAP					
NEW_JONLST_AFT(13)	V90X1688XD	RCS JET R3R ON CMD	ORB DAP					
NEW_JONLST_AFT(14)	V90X1689XD	RCS JET R3D ON CMD	ORB DAP					
NEW_JONLST_AFT(15)	V90X2172X	RCS JET R5R ON CMD	ORB DAP					
NEW_JONLST_AFT(16)	V90X2173X	RCS JET R5D ON CMD	ORB DAP					
NEW_JONLST_AFT(17)	V90X1675XD	RCS JET L2L ON CMD	ORB DAP					
NEW_JONLST_AFT(18)	V90X1676XD	RCS JET L2U ON CMD	ORB DAP					
NEW_JONLST_AFT(19)	V90X1677XD	RCS JET L2D ON CMD	ORB DAP					
NEW_JONLST_AFT(20)	V90X1685XD	RCS JET R2R ON CMD	ORB DAP					
NEW_JONLST_AFT(21)	V90X1686XD	RCS JET R2U ON CMD	ORB DAP					
NEW_JONLST_AFT(22)	V90X1687XD	RCS JET R2D ON CMD	ORB DAP					
NEW_JONLST_AFT(23)	V90X1680XD	RCS JET L4L ON CMD	ORB DAP					
NEW_JONLST_AFT(24)	V90X1681XD	RCS JET L4U ON CMD	ORB DAP					
NEW_JONLST_AFT(25)	V90X1682XD	RCS JET L4D ON CMD	ORB DAP					
NEW_JONLST_AFT(26)	V90X1690XD	RCS JET R4R ON CMD	ORB DAP					
NEW_JONLST_AFT(27)	V90X1691XD	RCS JET R4U ON CMD	ORB DAP					
NEW_JONLST_AFT(28)	V90X1692XD	RCS JET R4D ON CMD	ORB DAP					
NEW_JONLST_FWD(01)	V90X1441XB	RCS JET F1F ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(02)	V90X1442XC	RCS JET F1L ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(03)	V90X1443XC	RCS JET F1U ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(04)	V90X1444XC	RCS JET F1D ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(05)	V90X1445XB	RCS JET F2F ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(06)	V90X1446XC	RCS JET F2R ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(07)	V90X1447XC	RCS JET F2U ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(08)	V90X1448XC	RCS JET F2D ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(09)	V90X1453XC	RCS JET F4R ON CMD	ORB DAP				89490C	
NEW_JONLST_FWD(10)	V90X1454XC	RCS JET F4D ON CMD	ORB DAP					
NEW_JONLST_FWD(11)	V90X2139X	RCS JET F5L ON CMD	ORB DAP					
NEW_JONLST_FWD(12)	V90X2140X	RCS JET F5R ON CMD	ORB DAP				89490B	
NEW_JONLST_FWD(13)	V90X1449XB	RCS JET F3F ON CMD	ORB DAP					
NEW_JONLST_FWD(14)	V90X1450XC	RCS JET F3L ON CMD	ORB DAP					
NEW_JONLST_FWD(15)	V90X1451XC	RCS JET F3U ON CMD	ORB DAP					
NEW_JONLST_FWD(16)	V90X1452XC	RCS JET F3D ON CMD	ORB DAP					
	V93X5100X	LOMS TO AFT RCS PRESS ENA	RM RCS DISP		BD		92320D	
	V93X5101X	ROMS TO AFT RCS PRESS ENA	RM RCS DISP		BD		92320D	

TABLE 4.191-2. INPUT FUNCTIONAL PARAMETERS FOR ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
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NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_AFT_MN	V95Q1650C	TOT NO AFT RCS MN THRUSTER CYC	OMS/RCS GAUGING	COUNTS		D	92320D	
RCS_AFT_MN_ST	V95Q1652C	TOT NO AFT MN THRUSTER START UPS	OMS/RCS GAUGING	COUNTS			92320D	
RCS_AFT_VR	V95Q1651C	TOT NO AFT RCS VR THRUSTER CYC	OMS/RCS GAUGING	COUNTS		D	92320D	
RCS_ON_A(1)	V79K2405XB	RJDF 1 JET F2F CMD A	RJDF 1					
			TLM					
RCS_ON_A(10)	V79K2403XB	RJDF 1 JET F1U CMD A	RJDF 1					
			TLM					
RCS_ON_A(11)	V79K2408XB	RJDF 1 JET F2D CMD A	RJDF 1					
			TLM					
RCS_ON_A(12)	V79K2404XB	RJDF 1 JET F1D CMD A	RJDF 1					
			TLM					
RCS_ON_A(13)	V79K2414XB	RJDF 2 JET F4D CMD A	RJDF 2					
			TLM					
RCS_ON_A(14)	V79K2412XB	RJDF 2 JET F3D CMD A	RJDF 2					
			TLM					
RCS_ON_A(15)	V79K2437XB	RJDA 2 JET R3A CMD A	RJDA 2					
			TLM					
RCS_ON_A(16)	V79K2431XB	RJDA 1 JET R1A CMD A	RJDA 1					
			TLM					
RCS_ON_A(17)	V79K2423XB	RJDA 2 JET L3A CMD A	RJDA 2					
			TLM					
RCS_ON_A(18)	V79K2417XB	RJDA 1 JET L1A CMD A	RJDA 1					
			TLM					
RCS_ON_A(19)	V79K2426XC	RJDA 2 JET L4L CMD A	RJDA 2					
			TLM					
RCS_ON_A(2)	V79K2409XB	RJDF 2 JET F3F CMD A	RJDF 2					
			TLM					
RCS_ON_A(20)	V79K2420XC	RJDA 1 JET L2L CMD A	RJDA 1					
			TLM					
RCS_ON_A(21)	V79K2424XC	RJDA 2 JET L3L CMD A	RJDA 2					
			TLM					
RCS_ON_A(22)	V79K2418XC	RJDA 1 JET L1L CMD A	RJDA 1					
			TLM					
RCS_ON_A(23)	V79K2440XC	RJDA 2 JET R4R CMD A	RJDA 2					
			TLM					
RCS_ON_A(24)	V79K2434XC	RJDA 1 JET R2R CMD A	RJDA 1					
			TLM					
RCS_ON_A(25)	V79K2438XC	RJDA 2 JET R3R CMD A	RJDA 2					
			TLM					
RCS_ON_A(26)	V79K2432XC	RJDA 1 JET R1R CMD A	RJDA 1					
			TLM					
RCS_ON_A(27)	V79K2427XC	RJDA 2 JET L4U CMD A	RJDA 2					
			TLM					
RCS_ON_A(28)	V79K2421XC	RJDA 1 JET L2U CMD A	RJDA 1					
			TLM					

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_A(29)	V79K2419XC	RJDA 1 JET L1U CMD A	RJDA 1					
			TLM					
RCS_ON_A(3)	V79K2401XB	RJDF 1 JET F1F CMD A	RJDF 1					
			TLM					
RCS_ON_A(30)	V79K2441XC	RJDA 2 JET R4U CMD A	RJDA 2					
			TLM					
RCS_ON_A(31)	V79K2435XC	RJDA 1 JET R2U CMD A	RJDA 1					
			TLM					
RCS_ON_A(32)	V79K2433XC	RJDA 1 JET R1U CMD A	RJDA 1					
			TLM					
RCS_ON_A(33)	V79K2428XC	RJDA 2 JET L4D CMD A	RJDA 2					
			TLM					
RCS_ON_A(34)	V79K2422XC	RJDA 1 JET L2D CMD A	RJDA 1					
			TLM					
RCS_ON_A(35)	V79K2425XC	RJDA 2 JET L3D CMD A	RJDA 2					
			TLM					
RCS_ON_A(36)	V79K2442XC	RJDA 2 JET R4D CMD A	RJDA 2					
			TLM					
RCS_ON_A(37)	V79K2436XC	RJDA 1 JET R2D CMD A	RJDA 1					
			TLM					
RCS_ON_A(38)	V79K2439XC	RJDA 2 JET R3D CMD A	RJDA 2					
			TLM					
RCS_ON_A(39)	V79K2415X	RJDF 2 JET F5L CMD A	RJDF 2		BD			
			TLM					
RCS_ON_A(4)	V79K2402XB	RJDF 1 JET F1L CMD A	RJDF 1					
			TLM					
RCS_ON_A(40)	V79K2416X	RJDF 2 JET F5R CMD A	RJDF 2		BD			
			TLM					
RCS_ON_A(41)	V79K2430X	RJDA 1 JET L5L CMD A	RJDA 1		BD			
			TLM					
RCS_ON_A(42)	V79K2443X	RJDA 2 JET R5R CMD A	RJDA 2		BD			
			TLM					
RCS_ON_A(43)	V79K2429X	RJDA 1 JET L5D CMD A	RJDA 1		BD			
			TLM					
RCS_ON_A(44)	V79K2444X	RJDA 2 JET R5D CMD A	RJDA 2		BD			
			TLM					
RCS_ON_A(5)	V79K2410XB	RJDF 2 JET F3L CMD A	RJDF 2					
			TLM					
RCS_ON_A(6)	V79K2406XB	RJDF 1 JET F2R CMD A	RJDF 1					
			TLM					
RCS_ON_A(7)	V79K2413XB	RJDF 2 JET F4R CMD A	RJDF 2					
			TLM					
RCS_ON_A(8)	V79K2407XB	RJDF 1 JET F2U CMD A	RJDF 1					
			TLM					
RCS_ON_A(9)	V79K2411XB	RJDF 2 JET F3U CMD A	RJDF 2					
			TLM					

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(1)	V79K2505XB	RJDF 1 JET F2F CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 1				93017G	*
RCS_ON_B(10)	V79K2503XB	RJDF 1 JET F1U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 1				93017G	*
RCS_ON_B(11)	V79K2508XB	RJDF 1 JET F2D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 1				93017G	*
RCS_ON_B(12)	V79K2504XB	RJDF 1 JET F1D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 1				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(13)	V79K2514XB	RJDF 2 JET F4D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 2				93017G	*
RCS_ON_B(14)	V79K2512XB	RJDF 2 JET F3D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 2				93017G	*
RCS_ON_B(15)	V79K2537XB	RJDA 2 JET R3A CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*
RCS_ON_B(16)	V79K2531XB	RJDA 1 JET R1A CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(17)	V79K2523XB	RJDA 2 JET L3A CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*
RCS_ON_B(18)	V79K2517XB	RJDA 1 JET L1A CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(19)	V79K2526XC	RJDA 2 JET L4L CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*
RCS_ON_B(2)	V79K2509XB	RJDF 2 JET F3F CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 2				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(20)	V79K2520XC	RJDA 1 JET L2L CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(21)	V79K2524XC	RJDA 2 JET L3L CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*
RCS_ON_B(22)	V79K2518XC	RJDA 1 JET L1L CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(23)	V79K2540XC	RJDA 2 JET R4R CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(24)	V79K2534XC	RJDA 1 JET R2R CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(25)	V79K2538XC	RJDA 2 JET R3R CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*
RCS_ON_B(26)	V79K2532XC	RJDA 1 JET R1R CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(27)	V79K2527XC	RJDA 2 JET L4U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(28)	V79K2521XC	RJDA 1 JET L2U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(29)	V79K2519XC	RJDA 1 JET L1U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(3)	V79K2501XB	RJDF 1 JET F1F CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 1				93017G	*
RCS_ON_B(30)	V79K2541XC	RJDA 2 JET R4U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(31)	V79K2535XC	RJDA 1 JET R2U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(32)	V79K2533XC	RJDA 1 JET R1U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(33)	V79K2528XC	RJDA 2 JET L4D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*
RCS_ON_B(34)	V79K2522XC	RJDA 1 JET L2D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(35)	V79K2525XC	RJDA 2 JET L3D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*
RCS_ON_B(36)	V79K2542XC	RJDA 2 JET R4D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*
RCS_ON_B(37)	V79K2536XC	RJDA 1 JET R2D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1				93017G	*
RCS_ON_B(38)	V79K2539XC	RJDA 2 JET R3D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(39)	V79K2515X	RJDF 2 JET F5L CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 2		BD		93017G	*
RCS_ON_B(4)	V79K2502XB	RJDF 1 JET F1L CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 1				93017G	*
RCS_ON_B(40)	V79K2516X	RJDF 2 JET F5R CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 2		BD		93017G	*
RCS_ON_B(41)	V79K2530X	RJDA 1 JET L5L CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1		BD		93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(42)	V79K2543X	RJDA 2 JET R5R CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2		BD		93017G	*
RCS_ON_B(43)	V79K2529X	RJDA 1 JET L5D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 1		BD		93017G	*
RCS_ON_B(44)	V79K2544X	RJDA 2 JET R5D CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDA 2		BD		93017G	*
RCS_ON_B(5)	V79K2510XB	RJDF 2 JET F3L CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 2				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RCS_ON_B(6)	V79K2506XB	RJDF 1 JET F2R CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 1				93017G	*
RCS_ON_B(7)	V79K2513XB	RJDF 2 JET F4R CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 2				93017G	*
RCS_ON_B(8)	V79K2507XB	RJDF 1 JET F2U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 1				93017G	*
RCS_ON_B(9)	V79K2511XB	RJDF 2 JET F3U CMD B	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 RCS RM RJDF 2				93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V72M6633PH	MDM FF01 DSCR OUT SET	CD 13 CH 0	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1			93017G	*
	V72M6683PH	MDM FF02 DSCR OUT SET	CD 13 CH 0	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1			93017G	*
	V72M6733PH	MDM FF03 DSCR OUT SET	CD 13 CH 0	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1			93017G	*
	V72M6783PA	MDM FF04 DSCR OUT SET	CD 13 CH 0	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1			93017G	*
	V72M8715PC	MDM FA01 DSCR OUT SET	CD 10 CH 0	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1			93017G	*

TABLE 4.191-3. OUTPUT FUNCTIONAL PARAMETERS FROM ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V72M8735PC	MDM FA02 DSCR OUT SET	CD 10 CH 0	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1			93017G	*
	V72M8755PC	MDM FA03 DSCR OUT SET	CD 10 CH 0	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1			93017G	*
	V72M8774PC	MDM FA04 DSCR OUT SET	CD 10 CH 0	DL FMT 21/A DL FMT 21/A DL FMT 22/A DL FMT 22/A DL FMT 23/A DL FMT 23/A DL FMT 32/A DL FMT 32/A DL FMT 42/1 DL FMT 42/1 DL FMT 43/1 DL FMT 44/1 DL FMT 44/1 DL FMT 45/1 DL FMT 45/1 DL FMT 60/1 DL FMT 60/1			93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec

TABLE 4.191-4. ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.191-5. ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.191-6. ORBIT REACTION CONTROL SYSTEM COMMAND SOP (G4.191) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.193 ELEVON DELTA PRESSURE FEEDBACK SOP

The purpose of the Elevon Delta Pressure Feedback (ΔP F/B) SOP principal function shall be to perform data compensation on the selected elevon pressure feedback signals. The compensation function shall be processed during MM 102 at the 3.125 Hz rate after the Selection Filtering principal function and prior to the ASC DAP principal function.

The elevon pressure feedback compensation function shall consist of compensating the selected elevon pressure feedback data by applying bias and scale factor terms to convert the selected pressure feedback data into engineering units (PSI) in floating point format. Provisions shall be made for unique bias and scale factor terms for each of the four elevon panel delta pressures. The general compensation equation shall be as follows:

$$YC = YM C + K$$

where

YC = Compensated pressure feedback (PSI)

YM = Selected measured pressure feedback (VDC)

C = Compensation scale factor (PSI/VDC)

K = Compensation bias (PSI)

The ΔP F/B SOP interfaces are indicated by the functional block diagram on Figure 4.193-1. The parameter initialization requirements are shown in Table 4.193-1. The IDD inputs and outputs are listed in Tables 4.193-2 and 4.193-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.193-4. K-loads are listed in Table 4.193-5. Constants are listed in Table 4.193-6.

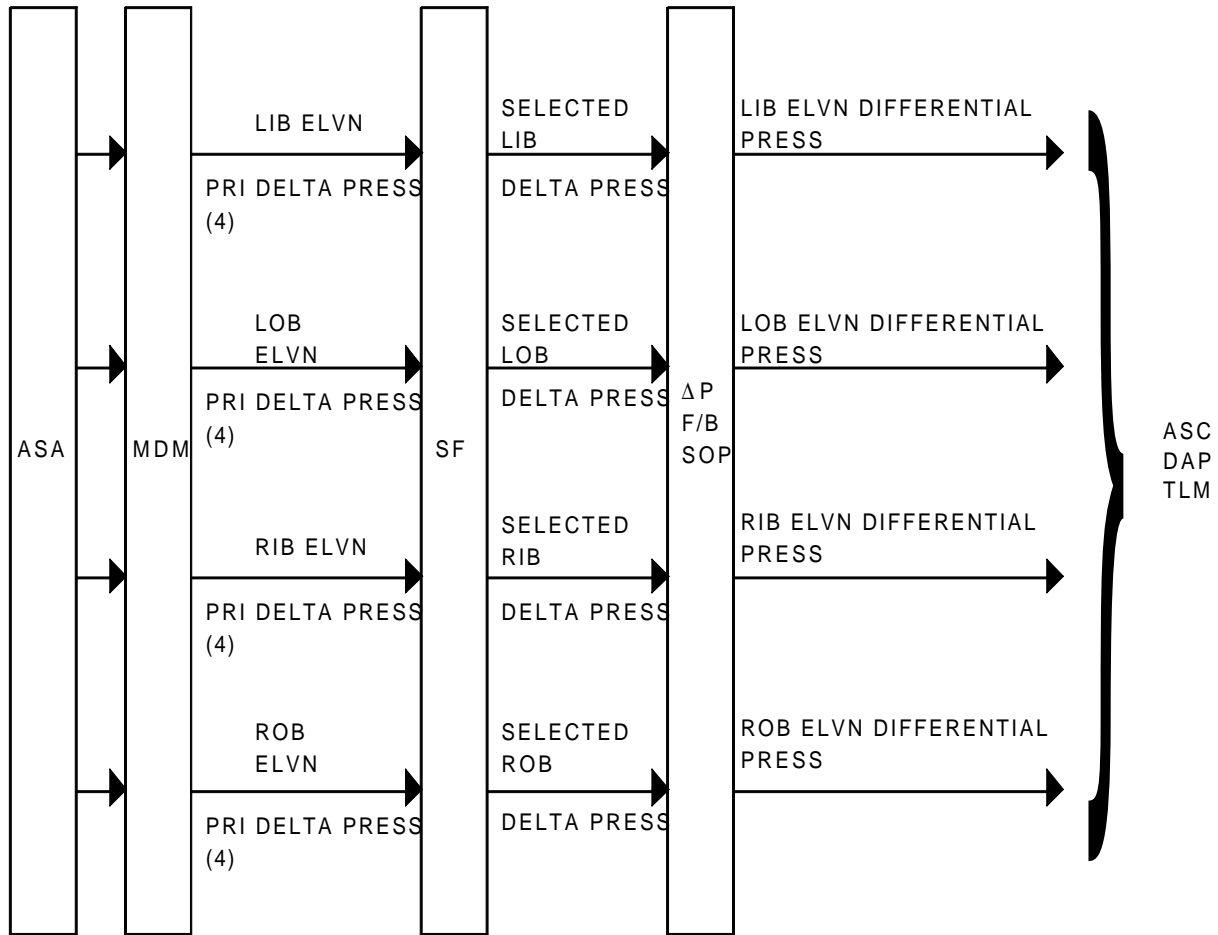


FIGURE 4.193-1. Elevon Delta Pressure Feedback SOP Functional Block Diagram

Table 4.193-1. Delta P Feedback SOP Initialization Parameters

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
CLIBP	V97U3943C	COMP SCALE FACTOR – LIB ELVN DELTA PRESS	K	FLOAT PT	+600.		PSI/ VDC
CLOBP	V97U3945C	COMP SCALE FACTOR – LOB ELVN DELTA PRESS	K	FLOAT PT	+600.		PSI/ VDC
CRIBP	V97U3984C	COMP SCALE FACTOR – RIB ELVN DELTA PRESS	K	FLOAT PT	+600.		PSI/ VDC
CROBP	V97U3986C	COMP SCALE FACTOR – ROB ELVN DELTA PRESS	K	FLOAT PT	+600.		PSI/ VDC
KLIBP	V97U4055C	COMP BIAS – LIB ELVN DELTA PRESS	K	FLOAT PT	+0.0		PSI
KLOBP	V97U4057C	COMP BIAS – LOB ELVN DELTA PRESS	K	FLOAT PT	+0.0		PSI
KRIBP	V97U4095C	COMP BIAS – RIB ELVN DELTA PRESS	K	FLOAT PT	+0.0		PSI
KROBP	V97U4097C	COMP BIAS – ROB ELVN DELTA PRESS	K	FLOAT PT	+0.0		PSI

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TABLE 4.193-2. INPUT FUNCTIONAL PARAMETERS FOR ELEVON DELTA PRESSURE FEEDBACK SOP (G4.193)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V90P2515C	SELECTED LOB ELVN PRI DELTA PRESS	SF	VDC	SPL		93017G	*
	V90P2516C	SELECTED LIB ELVN PRI DELTA PRESS	SF	VDC	SPL		93017G	*
	V90P2517C	SELECTED ROB ELVN PRI DELTA PRESS	SF	VDC	SPL		93017G	*
	V90P2518C	SELECTED RIB ELVN PRI DELTA PRESS	SF	VDC	SPL		93017G	*

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.193-3. OUTPUT FUNCTIONAL PARAMETERS FROM ELEVON DELTA PRESSURE FEEDBACK SOP (G4.193)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTAP_LIB	V95P8015C	LIB ELVN ACTR DIFFERENTIAL PRESS	ASC DAP TLM	PSI				
DELTAP_LOB	V95P8017C	LOB ELVN ACTR DIFFERENTIAL PRESS	ASC DAP TLM	PSI				
DELTAP_RIB	V95P8016C	RIB ELVN ACTR DIFFERENTIAL PRESS	ASC DAP TLM	PSI				
DELTAP_ROB	V95P8018C	ROB ELVN ACTR DIFFERENTIAL PRESS	ASC DAP TLM	PSI				

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.193-4. ELEVON DELTA PRESSURE FEEDBACK SOP (G4.193) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.193-5. ELEVON DELTA PRESSURE FEEDBACK SOP (G4.193) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
CLIBP COMP SCALE FACTOR - LIB ELVN DELTA	V97U3943C	00	+5.9999962	E+02 (LBS/IN**2)/VDC	F	S	A	G4.193	90508B	
CLOBP COMP SCALE FACTOR - LOB ELVN DELTA	V97U3945C	00	+5.9999962	E+02 (LBS/IN**2)/VDC	F	S	A	G4.193	90508B	
CRIBP COMP SCALE FACTOR - RIB ELVN DELTA	V97U3984C	00	+5.9999962	E+02 (LBS/IN**2)/VDC	F	S	A	G4.193	90508B	
CROBP COMP SCALE FACTOR - ROB ELVN DELTA	V97U3986C	00	+5.9999962	E+02 (LBS/IN**2)/VDC	F	S	A	G4.193	90508B	
KLIBP COMP BIAS - LIB ELVN DELTA PRESS	V97U4055C	00	+0.0	E+00 LBS/IN**2	F	S	C	G4.193	90109D	
KLOBP COMP BIAS - LOB ELVN DELTA PRESS	V97U4057C	00	+0.0	E+00 LBS/IN**2	F	S	C	G4.193	90109D	
KRIBP COMP BIAS - RIB ELVN DELTA PRESS	V97U4095C	00	+0.0	E+00 LBS/IN**2	F	S	C	G4.193	90109D	
KROBP COMP BIAS - ROB ELVN DELTA PRESS	V97U4097C	00	+0.0	E+00 LBS/IN**2	F	S	C	G4.193	90109D	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.193-6. ELEVON DELTA PRESSURE FEEDBACK SOP (G4.193) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.232 HYDRAULIC THERMAL CONDITIONING

The purpose of the Hydraulic Thermal Conditioning (HYD THERM COND) principal function shall be to monitor the surface drive flag from DEORB MNVR DISP and generate slew position commands to all aerosurfaces at specified slew rates. The HYD THERM COND function is required to thermally condition the hydraulic systems for entry.

The HYD THERM COND principal function shall be processed at the 25 Hz rate prior to the AERO ACT SOP. The interfaces are indicated by the functional block diagram on Figure 4.232-1. The parameter initialization requirements are shown in Table 4.232-1. The initialization of the output commands to the aerosurface are also specified in Table 4.232-1. The IDD inputs and outputs are listed in Tables 4.232-2 and 4.232-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.232-4. K-loads are listed in Table 4.232-5. Constants are listed in Table 4.232-6.

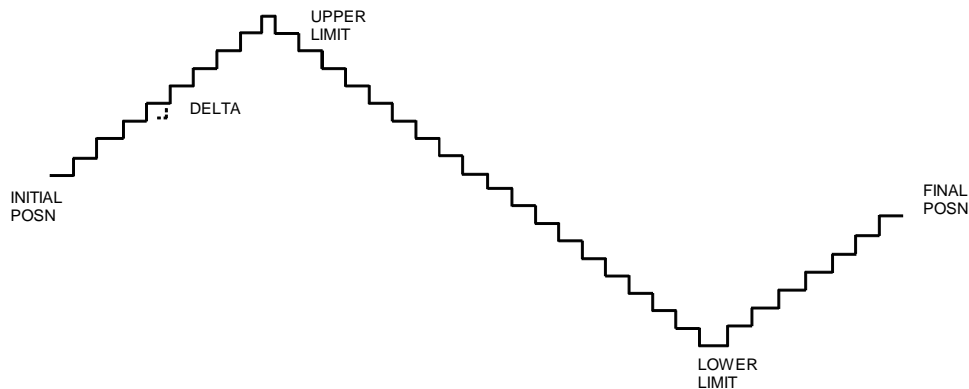
The HYD THERM COND function shall monitor the SURF_DRIVE flag from DEORB MNVR DISP. Once this flag indicates the "1" state, HYD THERM COND shall ramp the elevons, rudder, and speed brake from their initial position to their conditioning upper limit. HYD THERM COND shall then generate slew position commands simultaneously to the four elevons, the speed brake, and the rudder using a triangular function and to the body flap using an integer (± 1) command.

In order to prevent mechanical interference between the rudder/speed brake hinges and the rudder conical seal, the rudder must not be driven past 20 degrees deflection. To accomplish this, the following conditions must be met:

$$\text{DRUL: } < 20^\circ$$

$$\text{DRLL: } > -20^\circ$$

The triangular function shall be as indicated below:



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HYD THERM COND shall generate slew position commands to the four elevons, the speed brake, and the rudder from their initial position, which is based on the selected feedback position data*, to the upper limit incremented each cycle by a unique constant DELTA. Once the upper limit is reached, the command to that aerosurface shall be decremented by DELTA to the lower limit. The commands shall continue to be generated in this cyclic fashion between the upper and lower limits until the SURF_DRIVE flag indicates the “zero” state (terminate thermal conditioning). At this time, commands shall remain unchanged from the previous commanded position.

- * Initial positions can be determined alternately through current aerosurface commands being sent to hardware. These commands are initialized on transition into OPS 3 based on:
 1. Feedback data on rudder and speed brake
 2. Major function base transfer data on elevons

The values for all DELTA's, and the upper and lower limits for each aerosurface are shown in Table 4.232-1.

When the SURF_DRIVE flag indicates the “1” state and the other aerosurfaces have reached their upper limit, the HYD THERM COND shall enable all three body flap pilot valves (“1” state) and generate a slew position command to the body flap. The body flap slew command shall be cycled between upper and lower limits by integer commands ± 1 . The HYD THERM COND shall compare the body flap position feedback signal from BF PFB SOP with the specified upper or lower limit. The slew command shall be reversed when the feedback indicates the body flap has reached the limit. When SURF_DRIVE indicates the “zero” state, the body flap command shall be set to “zero”; and the pilot valves shall be set to the “zero” state.

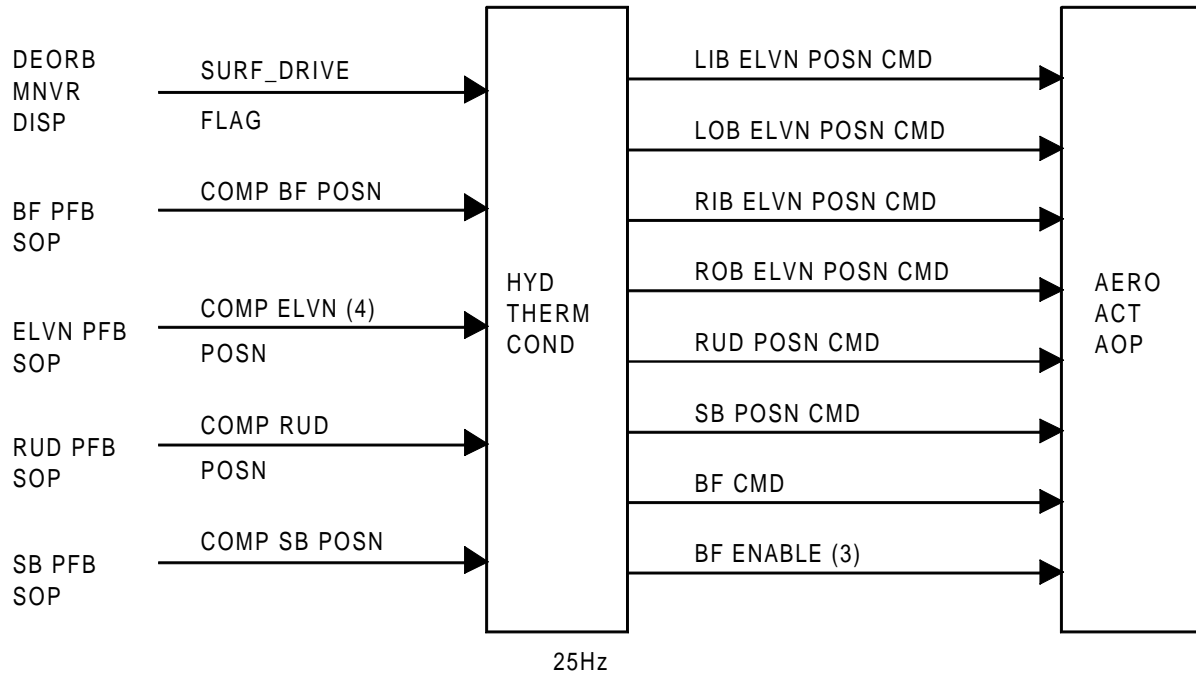


FIGURE 4.232-1. Hydraulic Thermal Conditioning Functional Block Diagram

Table 4.232-1. Hydraulic Thermal Conditioning Initialization Parameters							
Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
DEUL	V97U4004C	ELEVON UPPER LIMIT	D	FLOAT PT			DEG
DELL	V97U4002C	ELEVON LOWER LIMIT	D	FLOAT PT			DEG
DRUL	V97U4006C	RUDDER UPPER LIMIT	D	FLOAT PT			DEG
DRLL	V97U4005C	RUDDER LOWER LIMIT	D	FLOAT PT			DEG
DSBUL	V97U4008C	SPEED BRAKE UPPER LIMIT	D	FLOAT PT			DEG
DSBLL	V97U4007C	SPEED BRAKE LOWER LIMIT	D	FLOAT PT			DEG
DBFUL	V97U3995C	BODY FLAP UPPER LIMIT	D	FLOAT PT			DEG
DBFLL	V97U3994C	BODY FLAP LOWER LIMIT	D	FLOAT PT			DEG
DELDE	V97U3996C	ELEVON RATE LIMIT	D	FLOAT PT			DEG/ CYCLE
DELDR	V97U3998C	RUDDER RATE LIMIT	D	FLOAT PT			DEG/ CYCLE
DELDSB	V97U4000C	SPEED BRAKE RATE LIMIT	D	FLOAT PT			DEG/ CYCLE
BFPVE (1)	V90X6430XB	ENABLE BODY FLAP PILOT VALVE-1			DISCRETE	0,1	
BFPVE (2)	V90X6431XB	ENABLE BODY FLAP PILOT VALVE-2			DISCRETE	0,1	
BFPVE (3)	V90X6432XB	ENABLE BODY FLAP PILOT VALVE-3			DISCRETE	0,1	
DBFRC	V90H1580CC	BODY FLAP DEFLECTION CMD			INTEGER	± 1	

TABLE 4.232-2. INPUT FUNCTIONAL PARAMETERS FOR HYDRAULIC THERMAL CONDITIONING (G4.232)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DBFOFB	V95H8310C	COMP BODY FLAP POS	BF PFB SOP	DEG				
DELIBOFB	V95H8010C	COMP LIB ELEVON POS	ELVN PFB SOP	DEG	BSS			
DELOBOFB	V95H8060C	COMP LOB ELEVON POS	ELVN PFB SOP	DEG	BSS			
DERIBOFB	V95H8110C	COMP RIB ELEVON POS	ELVN PFB SOP	DEG	BSS		92230F	
DEROBOFB	V95H8160C	COMP ROB ELEVON POS	ELVN PFB SOP	DEG	BSS			
DROFB	V95H8210C	COMP RUDDER POS	RUD PFB SOP	DEG	BSS			
DSBOFB	V95H8260C	COMP SPDBK POS	SB PFB SOP	DEG			93087E	
	V93X6961X	SURF DRIVE ON/OFF CMD	XXXXX MNVR DISP		BD			

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.232-3. OUTPUT FUNCTIONAL PARAMETERS FROM HYDRAULIC THERMAL CONDITIONING (G4.232)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BFPVE(1)	V90X6430XB	ENABLE BODY FLAP PILOT VALVE-1	AERO ACT SOP					
BFPVE(2)	V90X6431XB	ENABLE BODY FLAP PILOT VALVE-2	AERO ACT SOP					
BFPVE(3)	V90X6432XB	ENABLE BODY FLAP PILOT VALVE-3	AERO ACT SOP					
DBFRC	V90H1580CD	BODY FLAP DEFLECTION CMD	AERO ACT SOP					
DLIBPC	V90H1734CC	LIB ELEVON POSITION CMD	AERO ACT SOP	DEG				
DLOBPC	V90H1735CC	LOB ELEVON POSITION CMD	AERO ACT SOP	DEG				
DRIBPC	V90H1737CC	RIB ELEVON POSITION CMD	AERO ACT SOP	DEG				
DROBPC	V90H1738CC	ROB ELEVON POSITION CMD	AERO ACT SOP	DEG				
DRPC	V90R1550CD	RATE LIMITED RUDDER CMD	AERO ACT SOP	DEG				
DSBPC	V90R1560CD	RATE LIMITED SPDBK CMD	AERO ACT SOP	DEG				

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.232-4. HYDRAULIC THERMAL CONDITIONING (G4.232) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
DBFLL	V97U3994C	DEG	F	S	D	C	G4.232	00	ZSL	DC0691	
DBFUL	V97U3995C	DEG	F	S	D	C	G4.232	00	ZSL	DC0691	
DELDE	V97U3996C	DEG/CYCLE	F	S	D	X	G4.232	00	ZFL	DC0691	
DELDR	V97U3998C	DEG/CYCLE	F	S	D	C	G4.232	00	ZFL	DC0691	
DELDSB	V97U4000C	DEG/CYCLE	F	S	D	C	G4.232	00	ZFL	DC0691	
DELL	V97U4002C	DEG	F	S	D	X	G4.232	00	ZSL	DC0691	
DEUL	V97U4004C	DEG	F	S	D	X	G4.232	00	ZFL	DC0691	
DRLL	V97U4005C	DEG	F	S	D	C	G4.232	00	ZSL	DC0691	
DRUL	V97U4006C	DEG	F	S	D	C	G4.232	00	ZFL	DC0691	
DSBLL	V97U4007C	DEG	F	S	D	C	G4.232	00	ZSL	DC0691	
DSBUL	V97U4008C	DEG	F	S	D	C	G4.232	00	ZFL	DC0691	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.232-5. HYDRAULIC THERMAL CONDITIONING (G4.232) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.232-6. HYDRAULIC THERMAL CONDITIONING (G4.232) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
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NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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4.250 STRUCTURAL PROGRAM TEST INPUT SOP

The purpose of the structural program test input (SPTI) principal function will be to generate a group of square wave doublets to the rudder, ROB elevon, and LOB elevon when the following conditions are met.

The SPTI SOP shall monitor the PTI_INHIBIT discrete. When the PTI_INHIBIT is reset and the VEL_REL_MAG is greater than SPTI_LOW_VEL_ALIM for ascent and less than SPTI_HIGH_VEL_ALIM for ascent; a group of square wave doublets shall be generated and distributed as shown in Figure 4.250-2 (SPTI Waveform and distribution).

During ascent, the wave generation will be inhibited if not in progress, or if in process, will be terminated and the outputs set to zero by any of the following conditions: PTI_INHIBIT set; main engine fail-shutdown (ME1, ME2, or ME3); hydraulic system fail flag (1, 2, 3); VEL_REL_MAG greater than SPTI_HIGH_VEL_ALIM; CSS mode selected; or RTLS, ATO or AOA abort declared.

The SPTI interfaces are shown in the functional block diagram Figure 4.250-1. Parameter initialization requirements are in Table 4.250-1. The IDD inputs and outputs are listed in Tables 4.250-2 and 4.250-3. Values for the I-loads are contained in the I-loads requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.250-4. K-loads are listed in Table 4.250-5. Constants are listed in Table 4.250-6.

When the conditions for test initiation have been met, the module will generate a group of square wave doublets for each of the three output conditions that follow:

1. RUD_SPTI = 0, ROB_SPTI = LOB_SPTI = Pulse train set
2. RUD_SPTI = 0, ROB_SPTI = Pulse train set; LOB_SPTI = -Pulse train set
3. RUD_SPTI = Pulse train set; ROB SPTI = LOB SPTI = 0

When initiated, the output will cycle through the three output conditions beginning with number one and continue to cycle through them until the process is terminated by the crew or automatically as defined previously.

A pulse train set shall consist of four unique square waves, each of two full cycles (i.e., doublet) followed by a delay of SPTI_DELAY times the period of the wave. The periods of the waves are 80 msec, 160 ms, 240 ms, and 320 ms and shall be processed in that order. The amplitude of each square wave will be held constant over the entire set of four square wave doublets with an amplitude of SPTI_AMP_RUD for output condition 3 and of SPTI_AMP_ELEV for output conditions 1 and 2. Figure 4.250-2 is a function representation of this process.

If the test sequence is terminated by an auto interlock or by the crew, the SPTI SOP outputs are set to zero and upon reinitiation by the crew, with no auto interlocks present, the tests begin again as described above with output condition 1 as the lead square wave group.

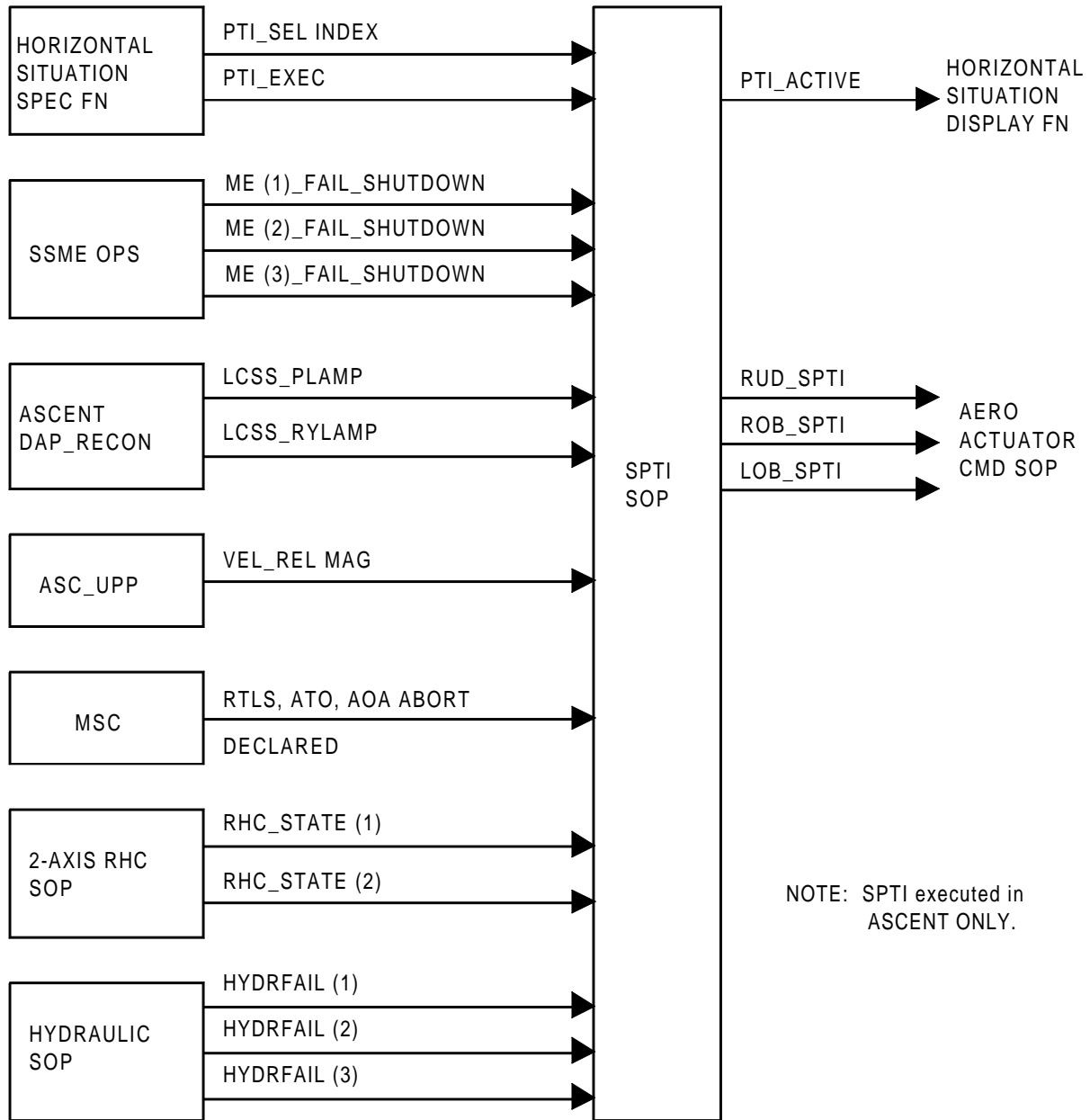
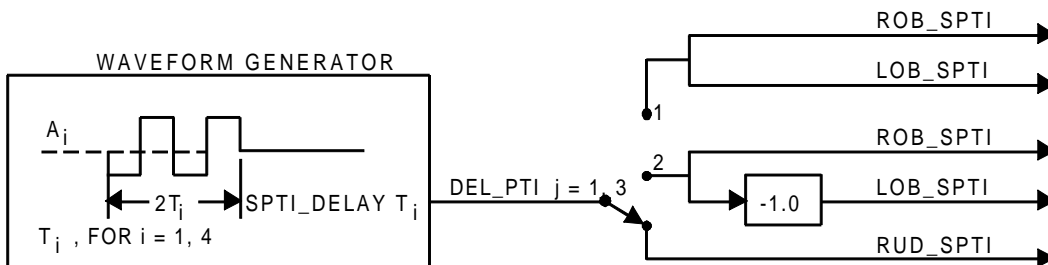


FIGURE 4.250-1. SPTI SOP Functional Block Diagram



i	PERIOD, T_i (SEC)	AMPLITUDE, A DEG (0 → PEAK)
1	0.080	SPTI_AMP
2	0.160	SPTI_AMP
3	0.240	SPTI_AMP
4	0.320	SPTI_AMP

WHERE SPTI_AMP IS EITHER
SPTI_AMP_RUD OR
SPTI_AMP_ELEV

NOTES:

1. WAVEFORM GENERATOR WILL CYCLE THROUGH THE AMPLITUDE-PERIOD TABLE FOR $i = 1, 4$ FOR EACH OF THE AEROSURFACE PATHS (ELEVON, AILERON, RUDDER) AND CONTINUE TO REPEAT WHILE PTI_EXEC IS ACTIVE
2. RE-ENTRANCE CAPABILITY: IF INTERRUPTED, PTI_INHIBIT IS SET TO 0.0 AND IF PTI_INHIBIT IS AGAIN RESET, THE PTI SEQUENCE SHALL BE RESTARTED AT $i = 1, j = 1$

FIGURE 4.250-2. SPTI Waveform and Distribution

Table 4.250-1. SPTI SOP Initialization Requirements

Name	MSID/MML	Description	Const Type	Signal Type	Nominal Value	Range	Units
SPTI_LOW_VEL_ALIM	V96U7800C	VELOCITY TO INITIATE SPTI ASCENT	K	FLOAT PT	450.		FT/SEC
SPTI_HIGH_VEL_ALIM	V96U7801C	VELOCITY TO TERMINATE SPTI ASCENT	K	FLOAT PT	2000.		FT/SEC
SPTI_AMP_RUD	V96U7804C	SPTI PULSE AMPLITUDE RUDDER	K	FLOAT PT	.44		DEG
SPTI_AMP_ELEV	V96U7805C	SPTI PULSE AMPLITUDE ELEVON	K	FLOAT PT	.62		DEG
SPTI_DELAY	V96U7806C	DELAY BETWEEN PULSE DOUBLET OUTPUTS	K	INTEGER	5		N.D.
LOB_SPTI	V96U7807C	LEFT OUTBOARD ELEVON SPTI	K	FLOAT PT	0.0		DEC
ROB_SPTI	V96U7808C	RIGHT OUTBOARD ELEVON SPTI	K	FLOAT PT	0.0		DEG
RUD_SPTI	V96U7809C	RUDDER SPTI	K	FLOAT PT	0.0		DEG

TABLE 4.250-2. INPUT FUNCTIONAL PARAMETERS FOR STRUCTURAL PROGRAMMED TEST INPUT SOP (G4.250)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
HYDRFAIL(1)	V96X3005X	HYDR SYS 1 FAIL STATUS	HYD SYS SOP		BD		93017G	*
HYDRFAIL(2)	V96X3006X	HYDR SYS 2 FAIL STATUS	HYD SYS SOP		BD		93017G	*
HYDRFAIL(3)	V96X3007X	HYDR SYS 3 FAIL STATUS	HYD SYS SOP		BD		93017G	*
LCSS_PLAMP	V72X5241XB	FCS MODE-LH PITCH CSS	ASC DAP				93017G	*
LCSS_RYLAMP	V72X5245XB	FCS MODE-LH R-Y CSS	ASC DAP				93017G	*
M/MACH	V95L3029C	GN&C MACH NUMBER	ADTA SOP		SPL		93017G	*
ME1_FAIL_SHUTDOWN	V95X1207X	MPS E1 FAIL FLAG	SSME OPS		BD		93017G	*
ME2_FAIL_SHUTDOWN	V95X1208X	MPS E2 FAIL FLAG	SSME OPS		BD		93017G	*
ME3_FAIL_SHUTDOWN	V95X1209X	MPS E3 FAIL FLAG	SSME OPS		BD		93017G	*
PTI_INHIBIT	V93X5227XA	INHIBIT PTI EXECUTION	HORIZ SIT DISP				89599C	
REL_VEL_MAG	V95L0151CE	GND REL VEL MAGNITUDE IN M50 SYS	ASC UPP	FT/S			93017G	*
RHC_STATE(1)	V96J0015CB	RHC OUT OF DETENT ROLL	2-AX RHC SOP				89740B	
RHC_STATE(2)	V96J0017CB	RHC OUT OF DETENT PITCH	2-AX RHC SOP				89740B	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.250-3. OUTPUT FUNCTIONAL PARAMETERS FROM STRUCTURAL PROGRAMMED TEST INPUT SOP (G4.250)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
LOB_SPTI	V90H3243C	LEFT OUTBOARD ELEVON SPTI	AERO ACT SOP	DEG			79994C	
PTI_IND	V90X3220XB	PTI INDICATOR	HORIZ SIT DISP		BD		79994C	
PTI_INHIBIT	V93X5227XD	INHIBIT PTI EXECUTION	MSC				89599C	
ROB_SPTI	V90H3242C	RIGHT OUTBOARD ELEVON SPTI	AERO ACT SOP	DEG			79994C	
RUD_SPTI	V90H3241C	RUDDER SPTI	AERO ACT SOP	DEG			79994C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

**Rate Codes: (HDR Only) 1 = 1 sample/sec 2 = 5 samples/sec 3 = 12.5 samples/sec 4 = 25 samples/sec 5 = 100 samples/sec
(HDR and LDR) A = 1 sample/sec B = 5 samples/sec C = 12.5 samples/sec D = 25 samples/sec E = 100 samples/sec**

TABLE 4.250-4. STRUCTURAL PROGRAMMED TEST INPUT SOP (G4.250) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
-----------	------	-----------	----	----	---	---	---------	----	-----	---------	-------------

NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.250-5. STRUCTURAL PROGRAMMED TEST INPUT SOP (G4.250) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
LOB_SPTI LEFT OUTBOARD ELEVON SPTI	V96U7807C	00	+0.0	E+00 DEG	F	S	P	G4.250	79994C	
ROB_SPTI RIGHT OUTBOARD ELEVON SPTI	V96U7808C	00	+0.0	E+00 DEG	F	S	P	G4.250	79994C	
RUD_SPTI RUDDER SPTI	V96U7809C	00	+0.0	E+00 DEG	F	S	P	G4.250	79994C	
SPTI_AMP_ELEV SPTI PULSE AMPLITUDE ELEVON	V96U7805C	00	+6.2	E-01 DEG	F	S	P	G4.250	79994C	
SPTI_AMP_RUD SPTI PULSE AMPLITUDE RUDDER	V96U7804C	00	+4.4	E-01 DEG	F	S	P	G4.250	79994C	
SPTI_DELAY DELAY BETWEEN PULSE DOUBLET OUTPUTS	V96U7806C	00	+5	ND	I	S	P	G4.250	79994C	
SPTI_HIGH_VEL_ALIM VELOCITY TO TERMINATE SPTI ASCENT	V96U7801C	00	+2.0	E+03 FT/SEC	F	S	P	G4.250	79994C	
SPTI_LOW_VEL_ALIM VELOCITY TO INITIATE SPTI ASCENT	V96U7800C	00	+4.5	E+02 FT/SEC	F	S	P	G4.250	79994C	

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

TABLE 4.250-6. STRUCTURAL PROGRAMMED TEST INPUT SOP (G4.250) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
--------------------------	------	----	----------------	-----------	----	--------	---	---------	---------	-------------

NO REQUIREMENTS

NOTE: REFERENCE TABLE 1.3-1 FOR EXPLANATION OF DATA ELEMENTS.

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5.0 FORMULATIONS

A formulation of the detailed requirements consisting of top level and detailed structured flow charts are presented in this section. The structured flow charts indicate what must be done, and should not be construed to specify how it must be done. The users of these flow charts should be advised that this section is not under configuration control and therefore is not necessarily reflective of the latest requirements.

Table 5–1 provides a cross–reference between the functions defined in Section 4 and the formulations provided here. Definitive notes for the SOP formulations are provided below:

A. Functional Module – A functional module is defined as a set of related functions grouped together which performs a specific task. A functional module may consist of algorithms and/or may schedule (i.e., call) other functional or common modules.

A functional module should not be confused with a software module which is defined as a set of software statements or code that implement a given function. It is assumed that the actual implementation of the functional module requirements will permit verification at the module level.

B. Common Module – A common module is similar to a functional module. A common module is called by functional modules or by other common modules to perform a specific common task. However, with each call, the common module operates on a variable list of parameters. The variable list of parameters is determined by the calling module. The common module input/output parameters are defined by data modules (see item C, below).

C. Data Module – The data modules define two categories of parameters. The REFERENCE category contains those parameters which are used by the common module as input reference data only. This category includes constants and variables which are required but whose values are not changed. The ASSIGN category contains those parameters which are either (i) required as input to the common module and are assigned new values, or (ii) generated by the common module and supplied as output data.

Data modules are specified for all common modules. Wherever possible, the data modules are included on the structured flow charts. In cases where the parameters in the data module are numerous, a table is referenced. All arrays within the data modules are designated by [brackets].

D. Array subscripts are denoted by use of parentheses; such as “Y(I)” to indicate the Ith element in the array [Y].

E. Except for the local parameters, the parameter names utilized are defined in the appropriate interface and initialization tables. The local parameters are described either in the text or by the data module tables.

F. Structured Flow Charts – Structured flow charts are used to indicate a formulation of the detailed requirements specified. Each flow chart begins at a terminal point and ends at a terminal point. Thus, only one entry and one return point is provided for each module. Between the terminals, mathematical equations and/or decisions are inserted to accomplish the desired task. Control within the flow is performed by the decision statements. Logic flow is generally from top to bottom and left to right; thus no arrowheads or connections are required on the flows. Figure 5–1 shows the structured flow chart legend used in this document. Note that “return in–line” means to return to the statement immediately below the decision. If there is no such statement, retrace path to the previous decision and repeat this logic.

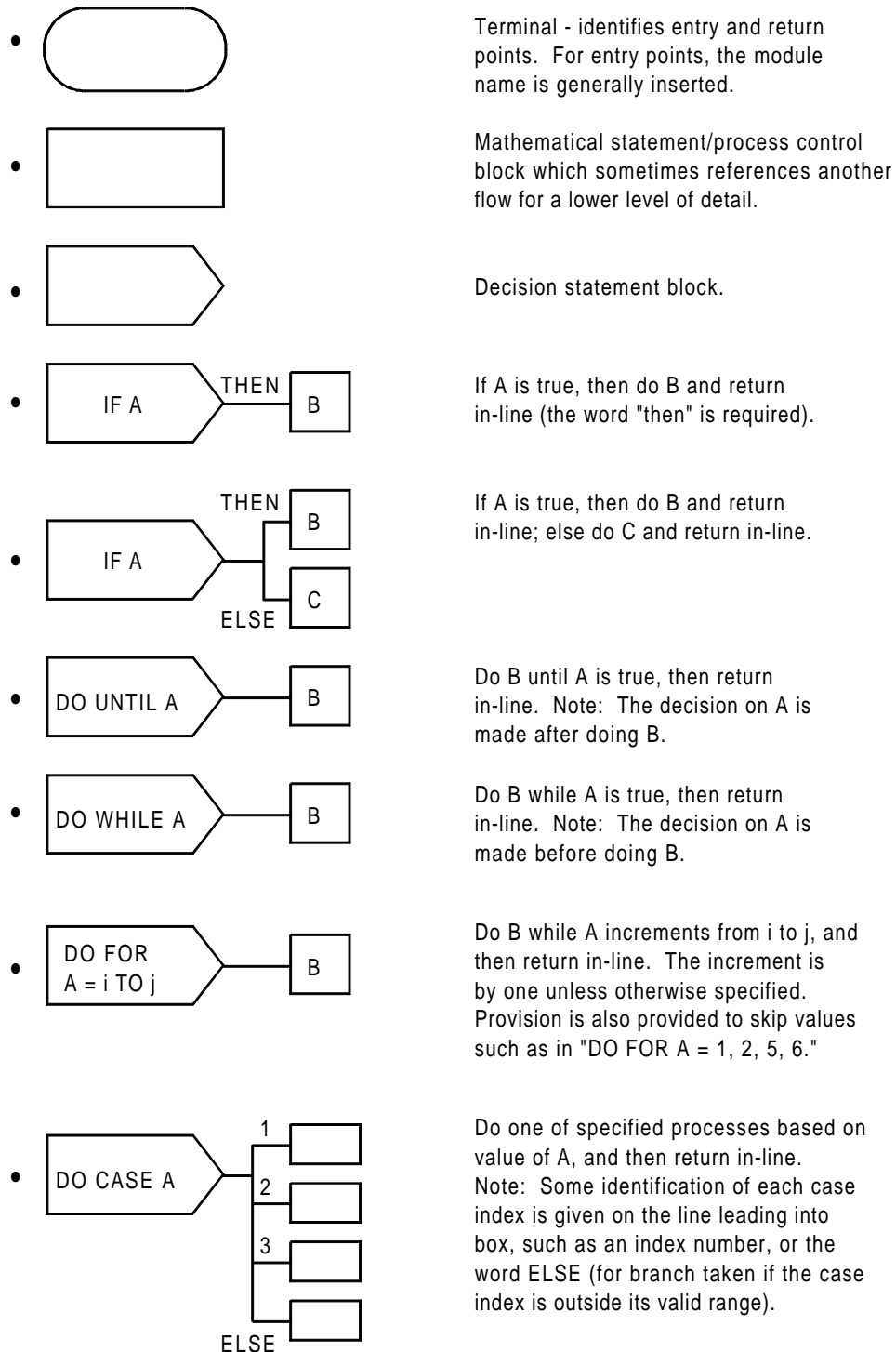


FIGURE 5-1. Structured Flow Chart Legend

Table 5-1. Requirements/Formulation Cross-Reference

Principal Function	Section 4 Paragraph No.	Module Name	Figure No.
ELVN PFB SOP	4.46	ELVN_PFB_SOP	5.46-1
RUD PFB SOP	4.47	RUD_PFB_SOP	5.47-1
SB PFB SOP	4.48	SB_PFB_SOP	5.48-1
BF PFB SOP	4.49	BF_PFB_SOP	5.49-1
ACT COMP	4.50.1	ACT_COMP	5.50-1
		CMDCOMP	5.50-2
	4.50.2	NW_STEER_CMD	5.50-3
	4.50.3	BF_CMD	5.50-4
	4.50.4	AERO_RST_OVRD	5.50-5
HYD SOP	4.52	HYD_SOP	5.52-1
E/L RCS CMD SOP	4.58	E/L_RCS_CMD	5.58-1
MPS TVC CMD SOP	4.60.1	MPS_TVC_CMD_COMP	5.60-1
		MPS_RAMP	5.60-3
	4.60.2	MPS_TVC_RST_OVRD	5.60-2
SRB TVC CMD COMP	4.62.1	SRB_COMP	5.62-1
	4.62.2	SRB_TVC_OVR_RST	5.62-2
OMS TVC CMD COMP	4.64.1	OMS_TVC_CMD_COMP	5.64-1
		DRIVE_CHECK	5.64-2
		OMS_CHAN_SEL	5.64-4
		OMS_CHAN1	5.64-5
		OMS_CHAN2	5.64-6
	4.64.2	OMS_TVC_ACTV_STBY	5.64-3
		OMS_TVC_FDBK_COMP	5.65-1
OMS TVC FB SOP	4.65	OMS_TVC_FDBK_COMP	5.65-1
SRB MON FCN	4.120	SRB_MON_FCN	5.120-1
ORB ACT SLEW CHKS	4.187	SRB_ORB_SLEW_CHK	5.187-1
SRB ACT SLEW CHK	4.188	SLEW_CHK	5.187-2
AS RCS CMD SOP	4.190	AS_RCS_CMD_SOP	5.190-1
		N_CYCLE	5.190-2
ORB RCS CMD SOP	4.191	ORB_RCS_CMD_SOP	5.191-1
Δ P F/B SOP	4.193	Δ P_F/B_SOP	5.193-1

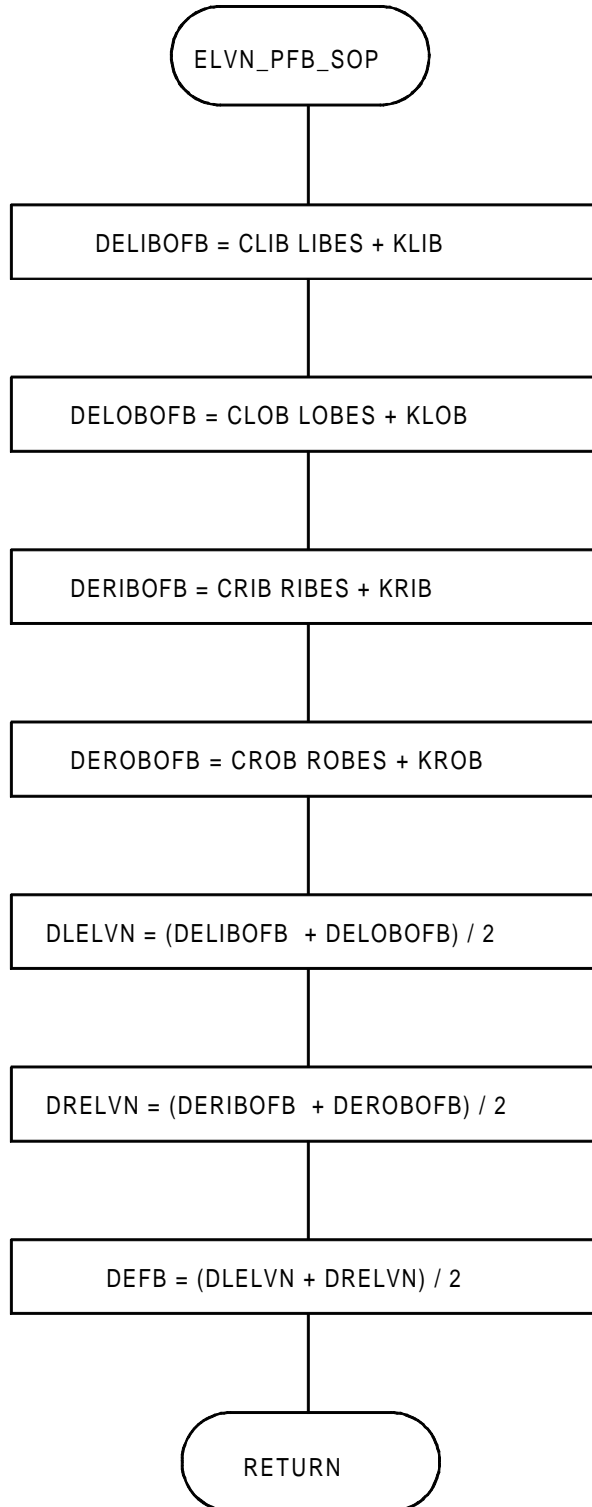


FIGURE 5.46-1. ELVN_PFB_SOP Functional Module

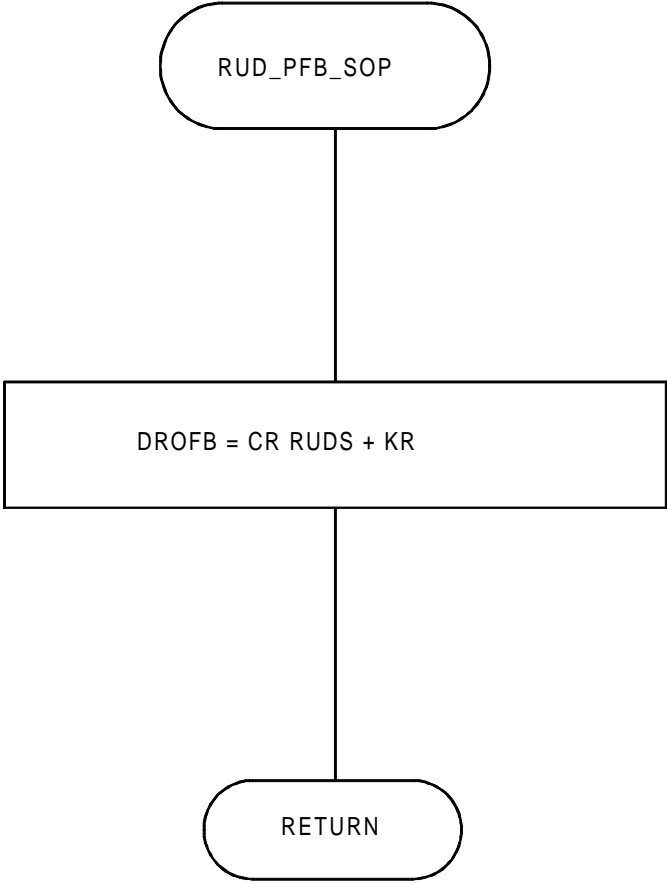


FIGURE 5.47-1. RUD_PFB_SOP Functional Module

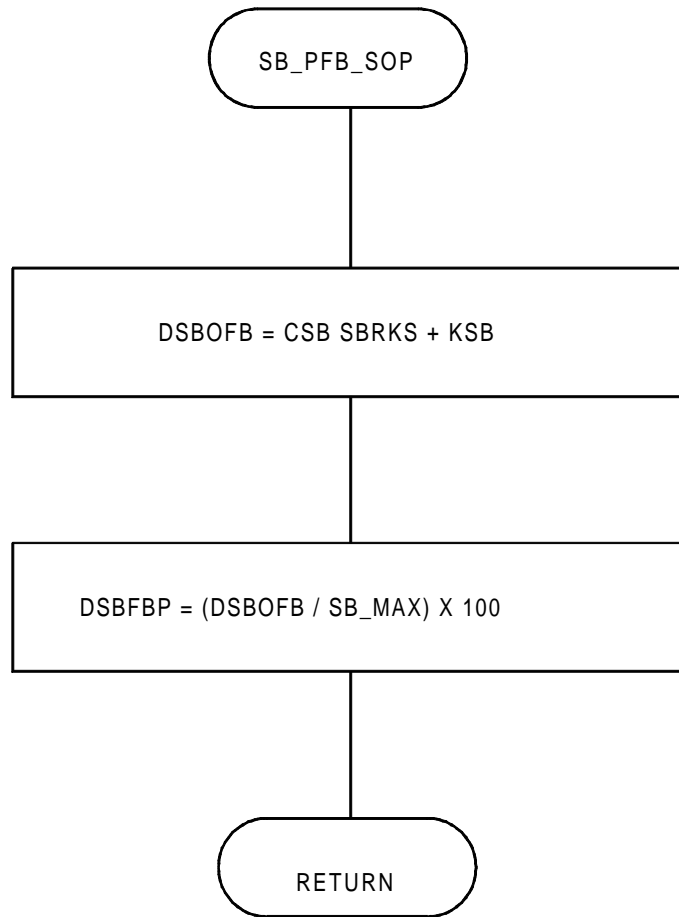


FIGURE 5.48-1. SB_PFB_SOP Functional Module

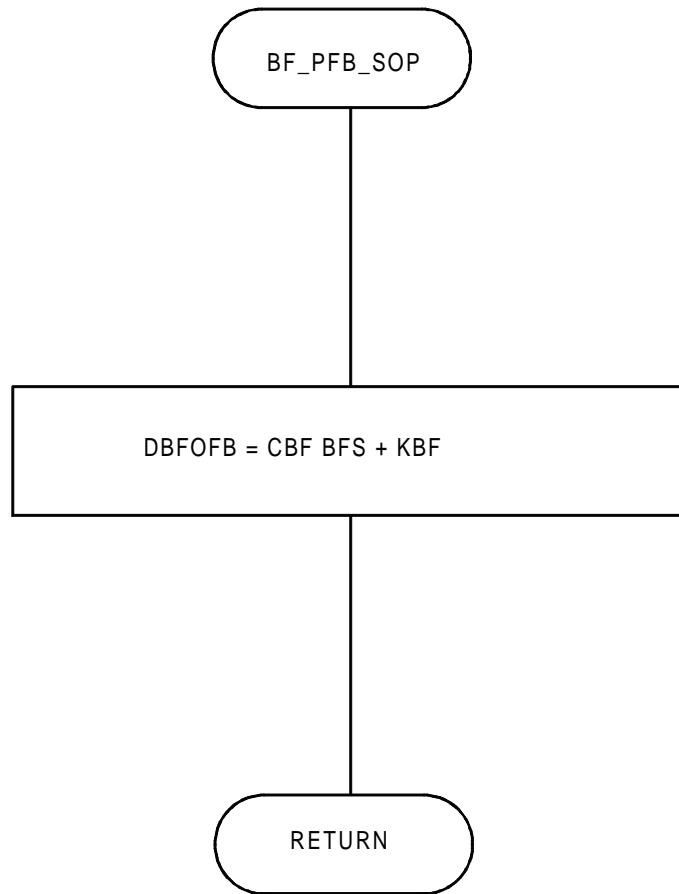


FIGURE 5.49-1. BF_PFB_SOP Functional Module

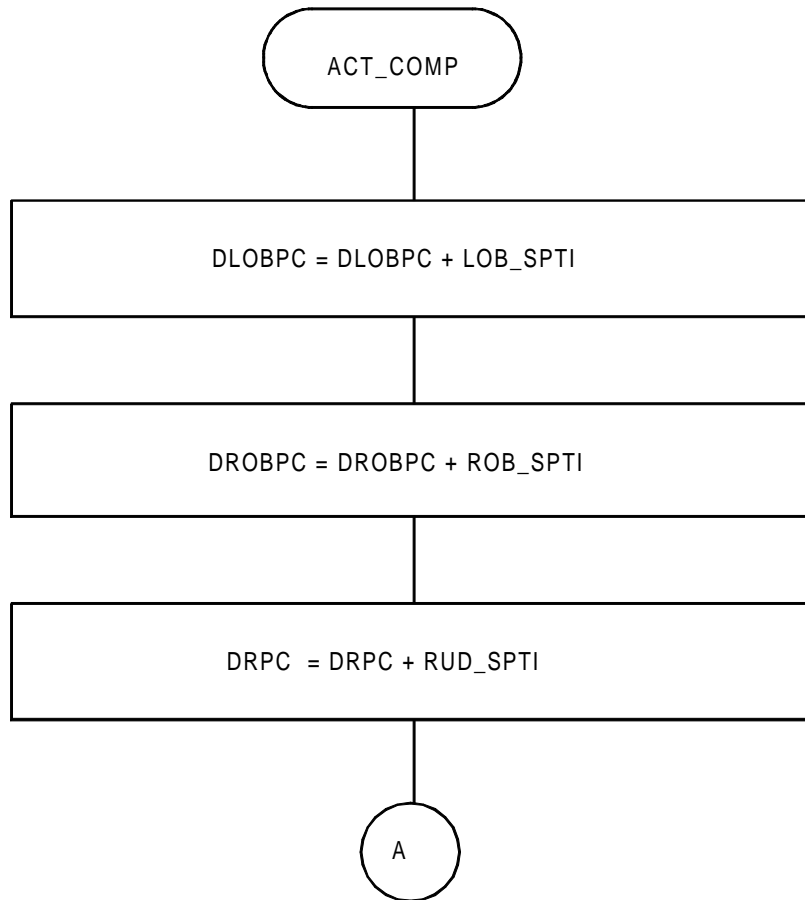


FIGURE 5.50-1.(1) ACT_COMP Functional Module (Sheet 1 of 2)

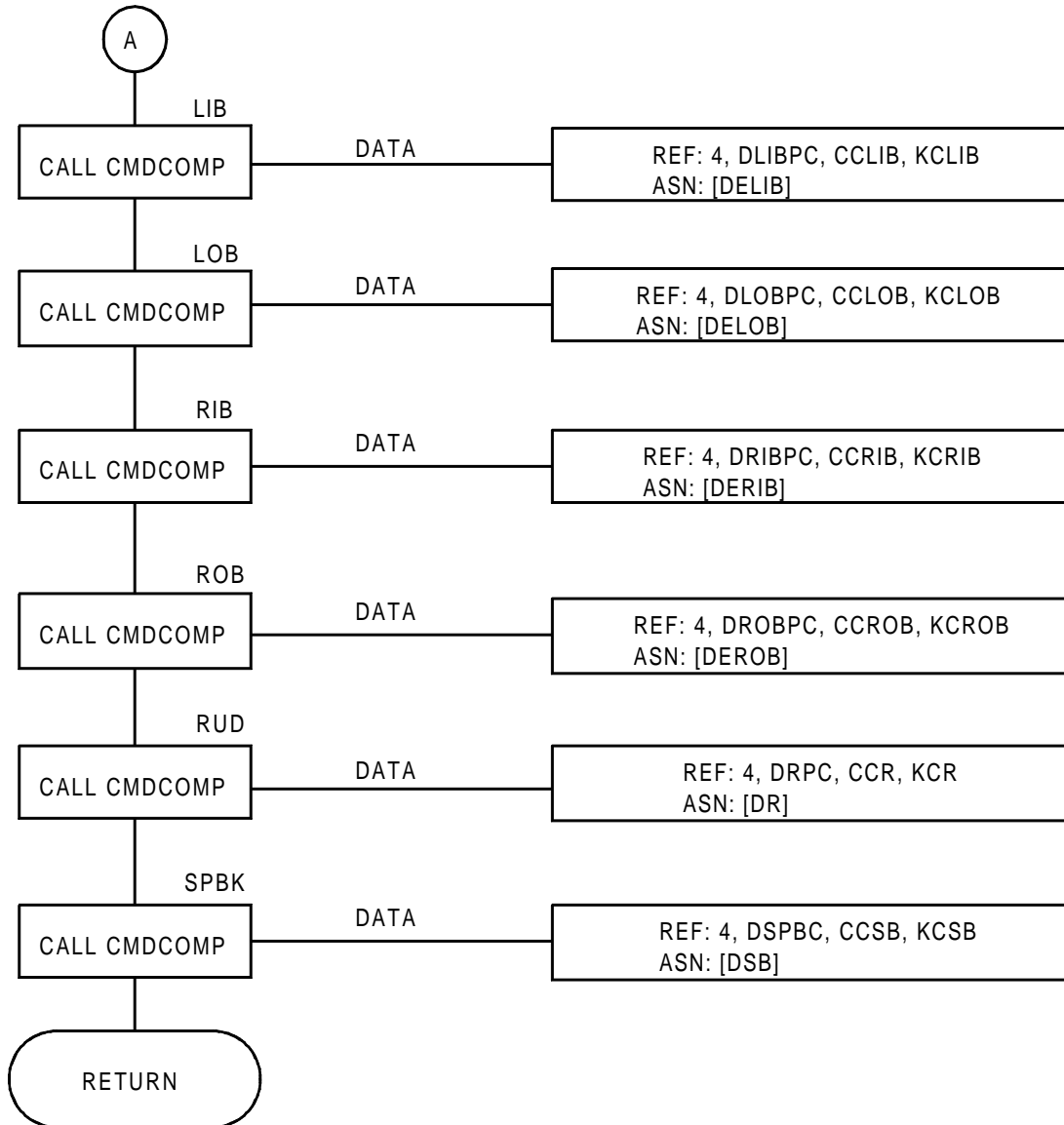


FIGURE 5.50-1.(2) ACT_COMP Functional Module (Sheet 2 of 2)

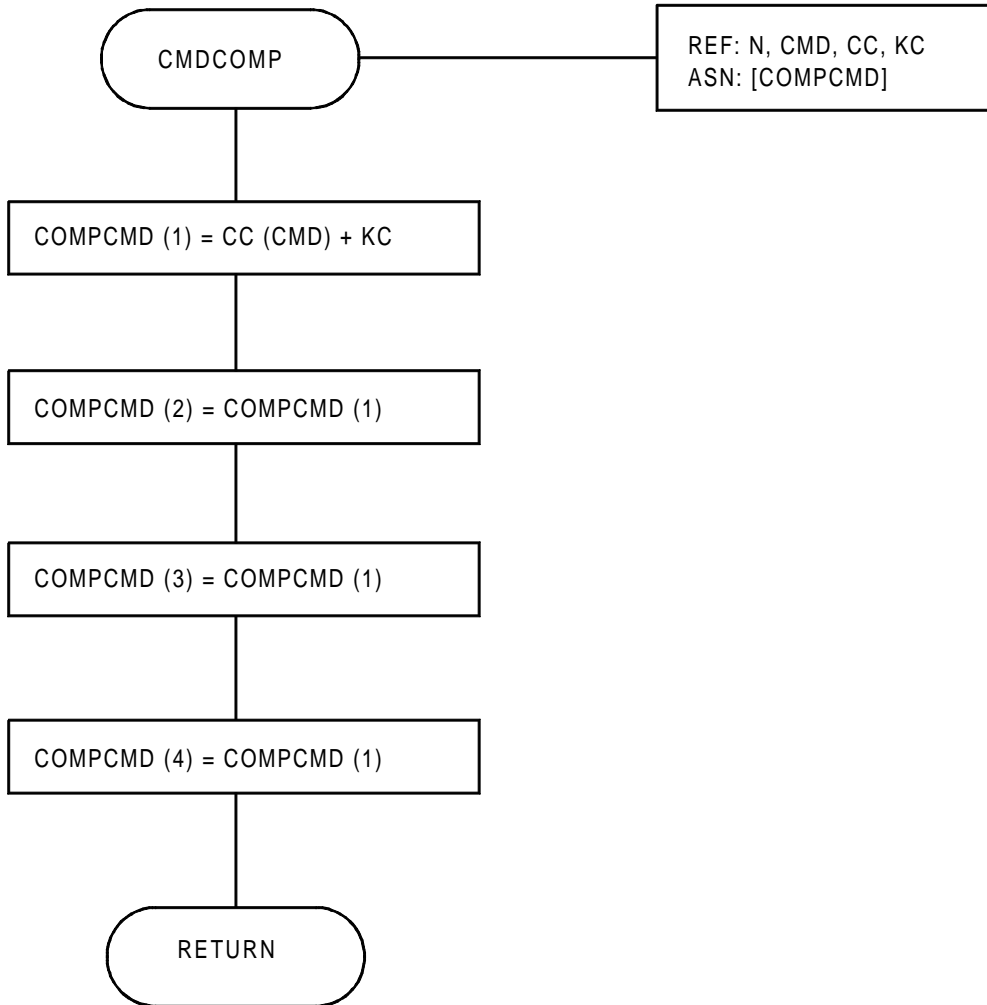


FIGURE 5.50-2. CMDCOMP Common Module

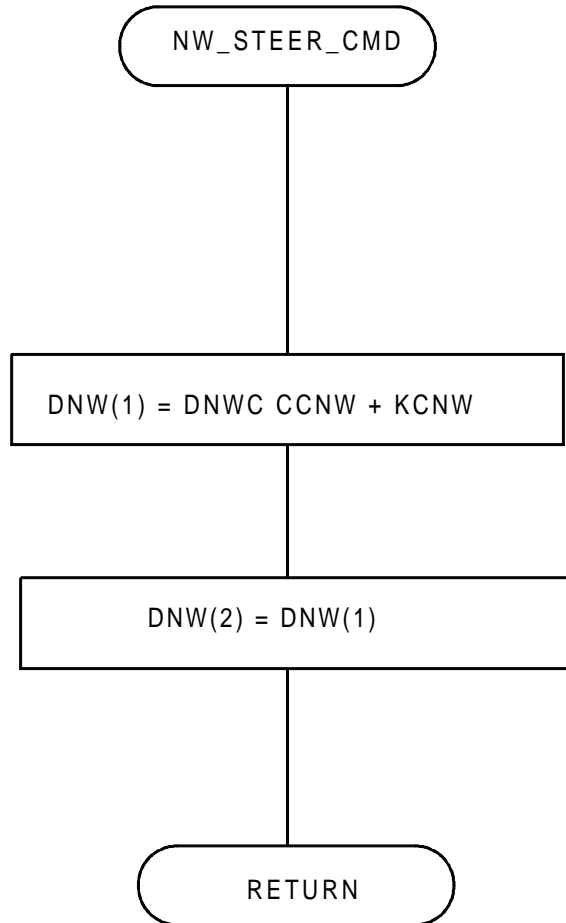


FIGURE 5.50-3. NW_STEER_CMD Functional Module

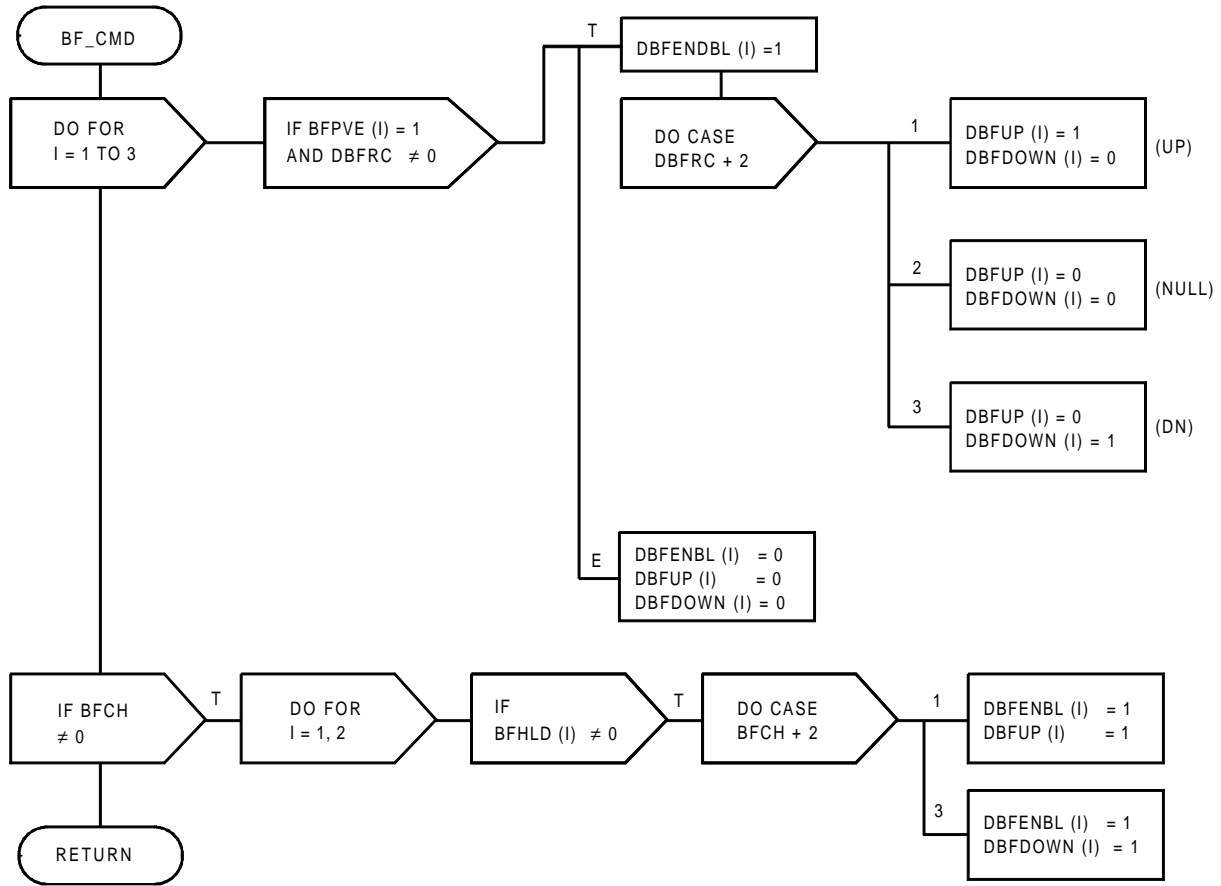


FIGURE 5.50-4. BF_CMD Functional Module

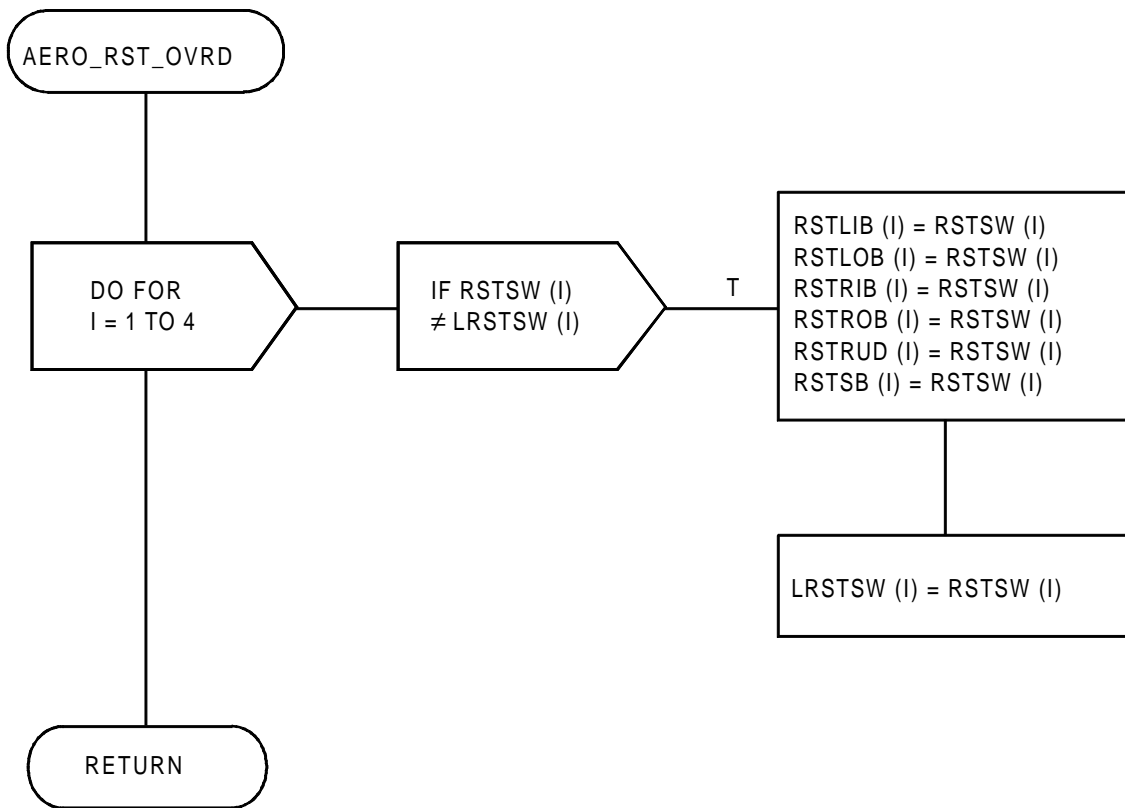


FIGURE 5.50-5. AERO_RST_OVRD Functional Module

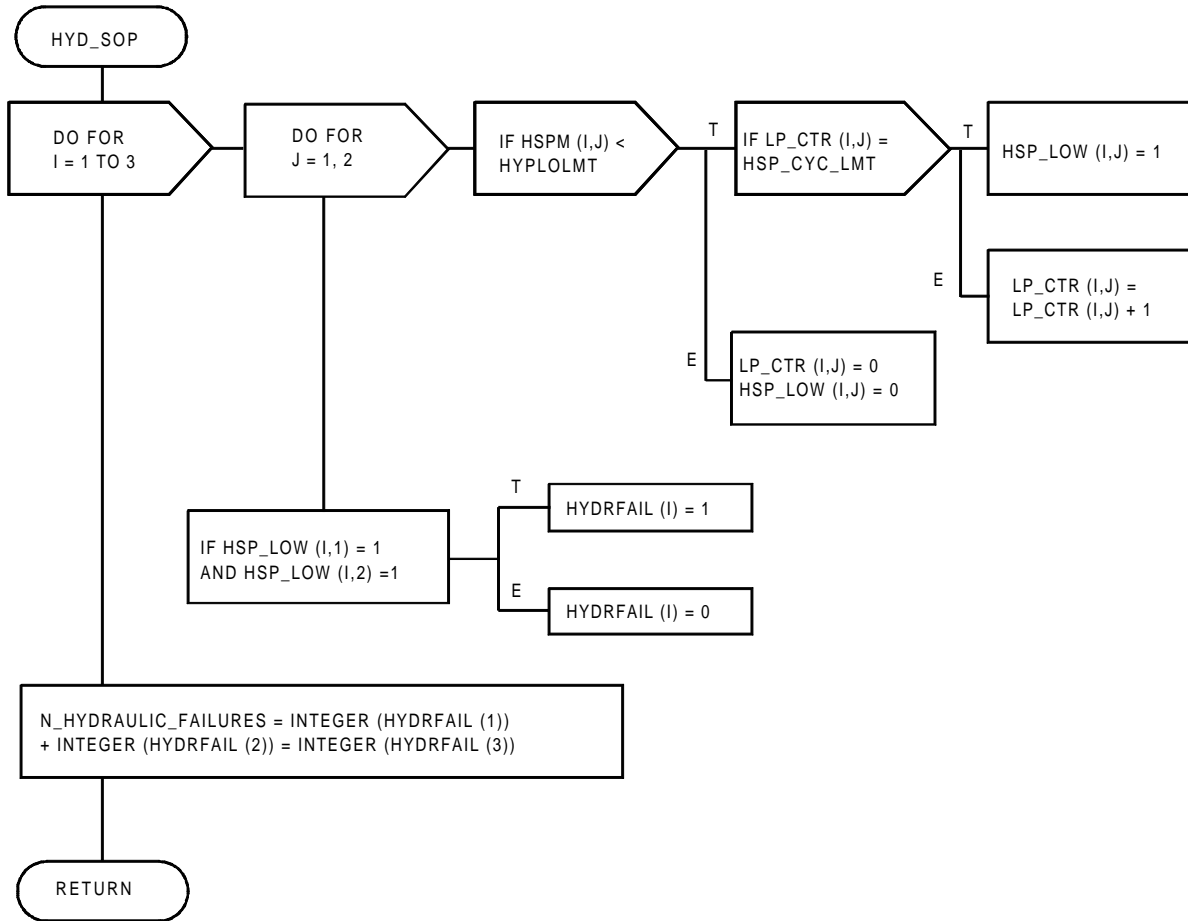


FIGURE 5.52-1. HYD_SOP Functional Module

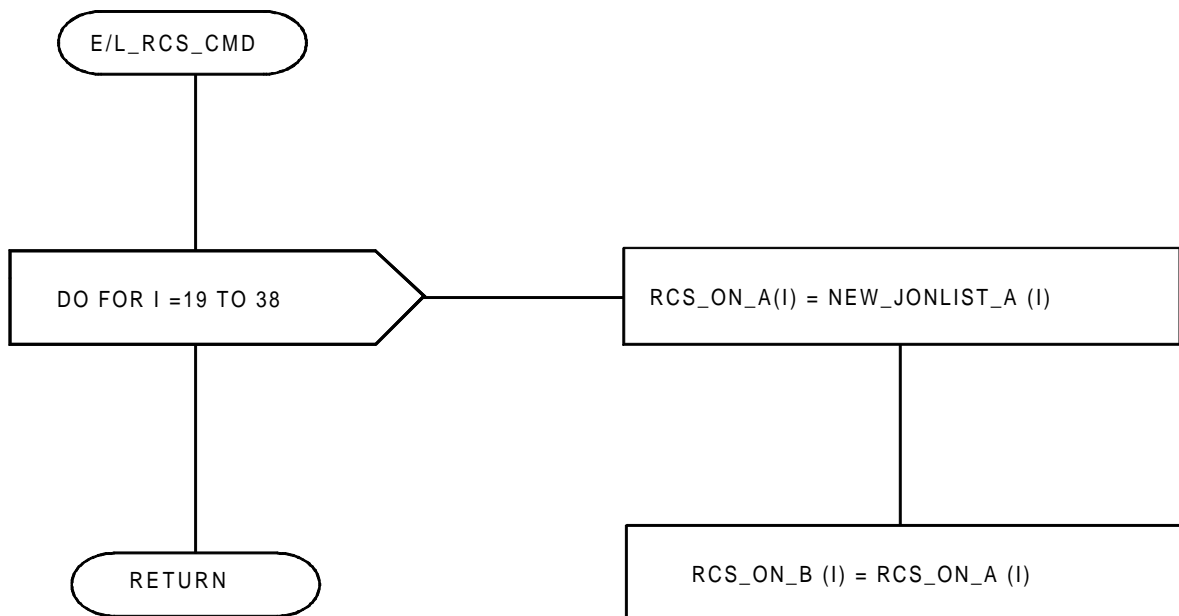


FIGURE 5.58-1. E/L_RCS_CMD SOP Functional Module

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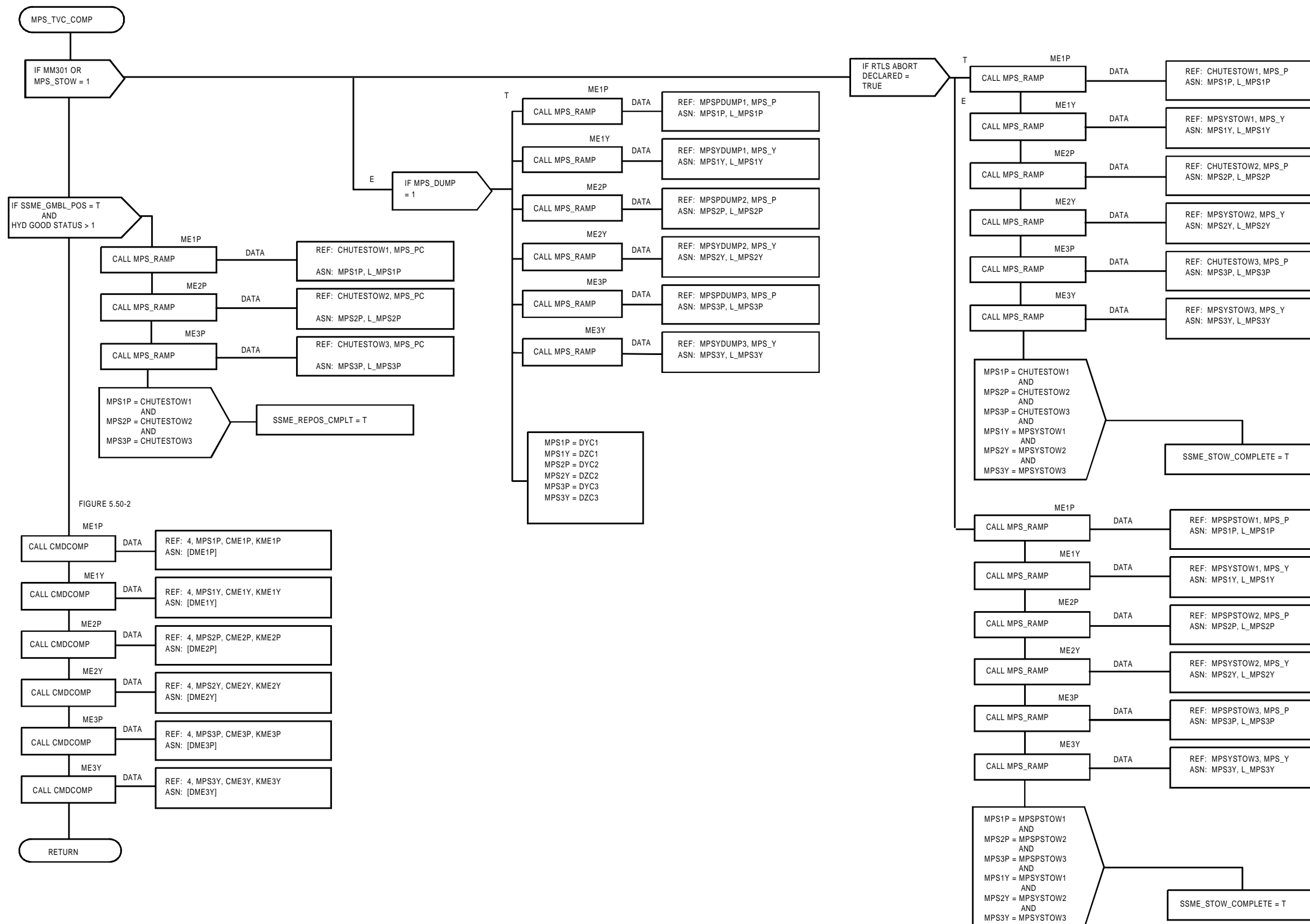


FIGURE 5.60-1. MPS_TVC CMDCOMP Functional Module

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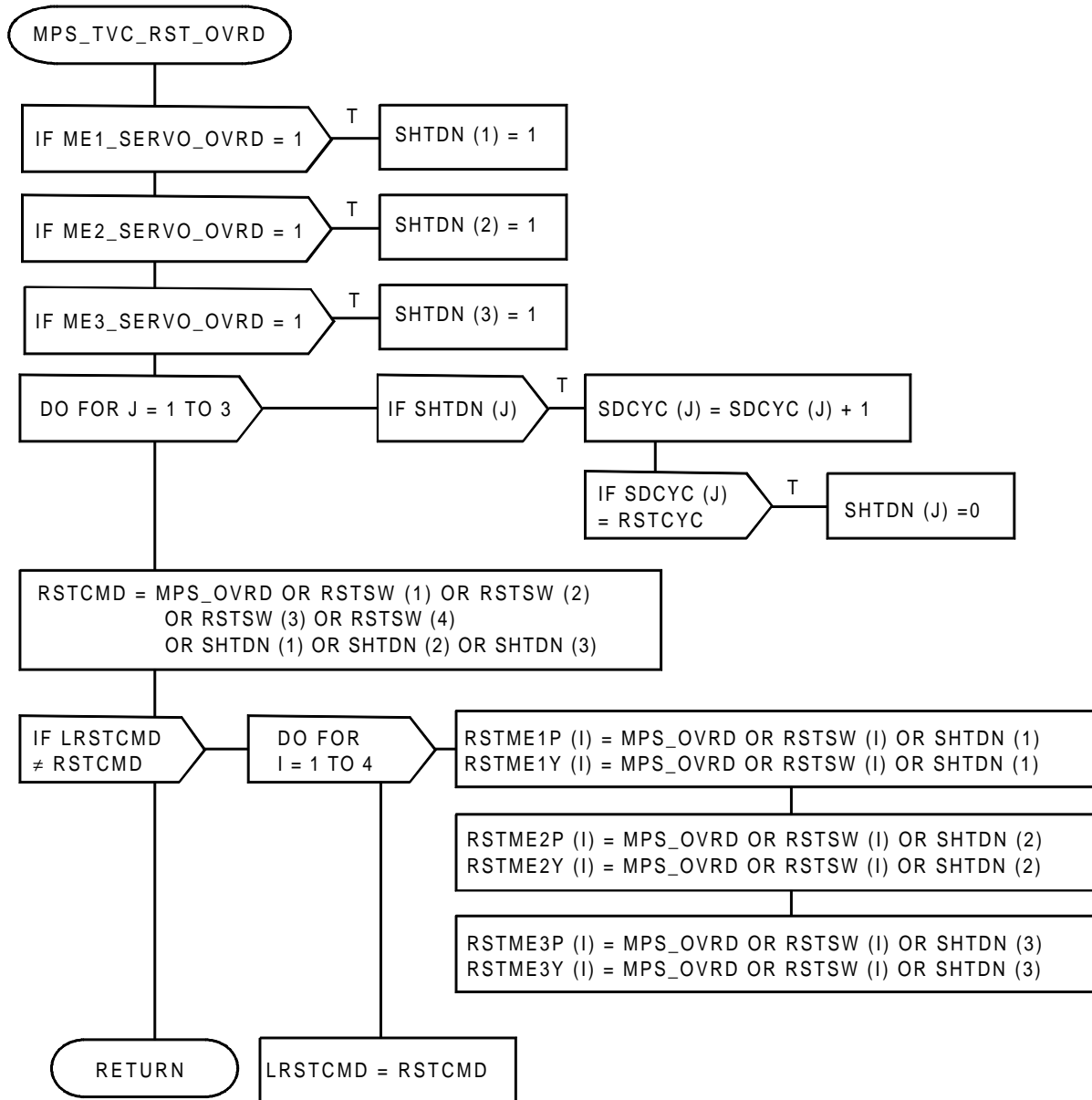


FIGURE 5.60-2. MPS_TVC_RST_OVRD Functional Module

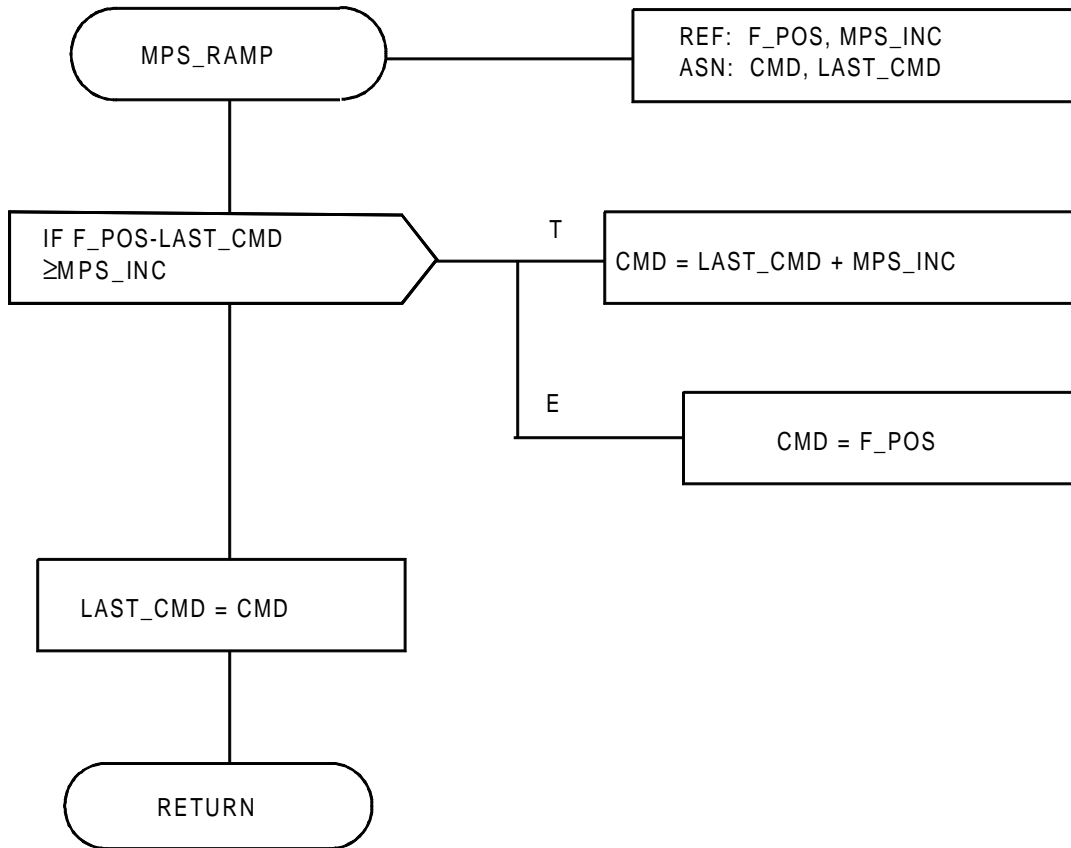


FIGURE 5.60-3. MPS_RAMP Common Module

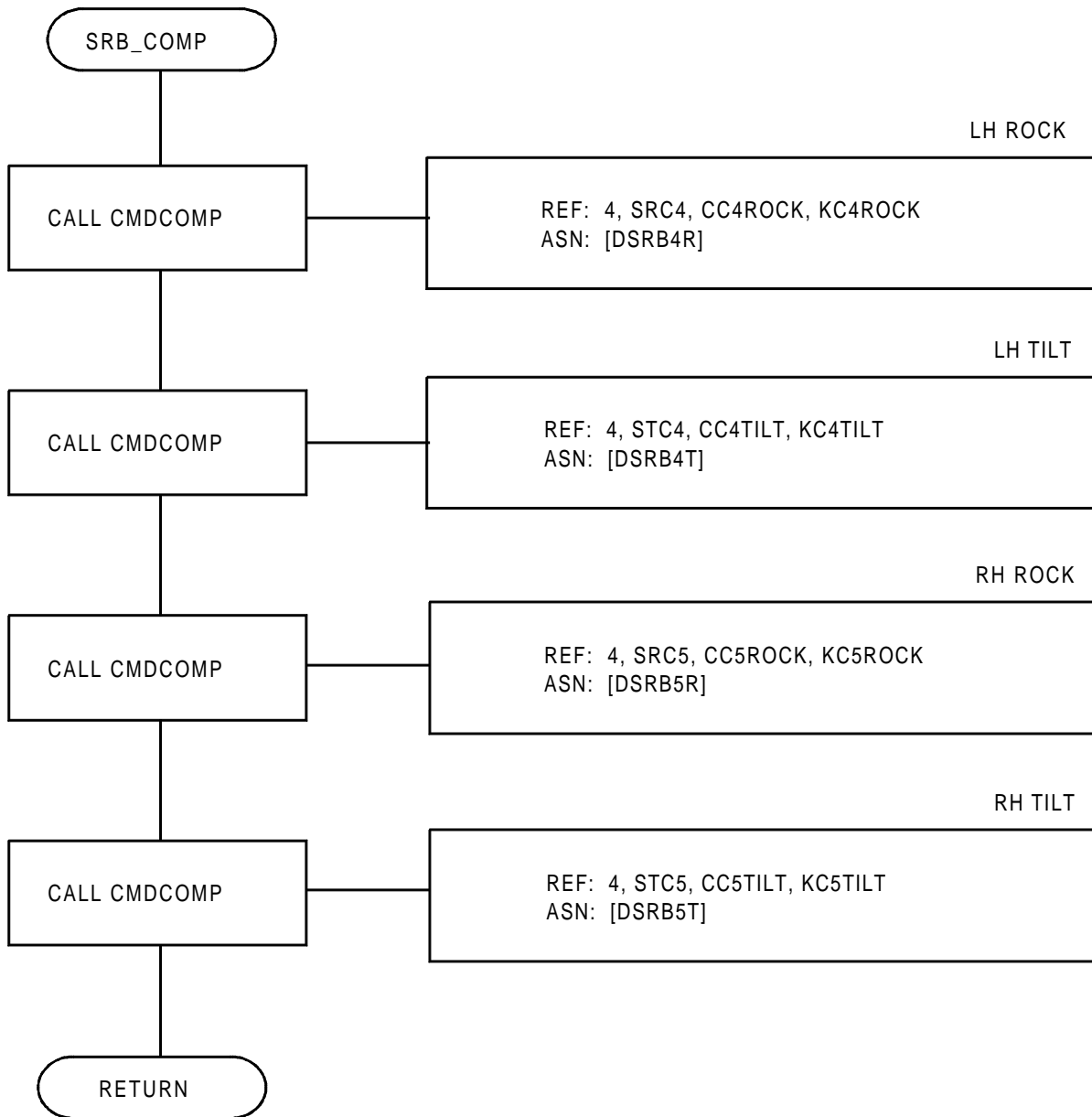


FIGURE 5.62-1. SRB_COMP Functional Module

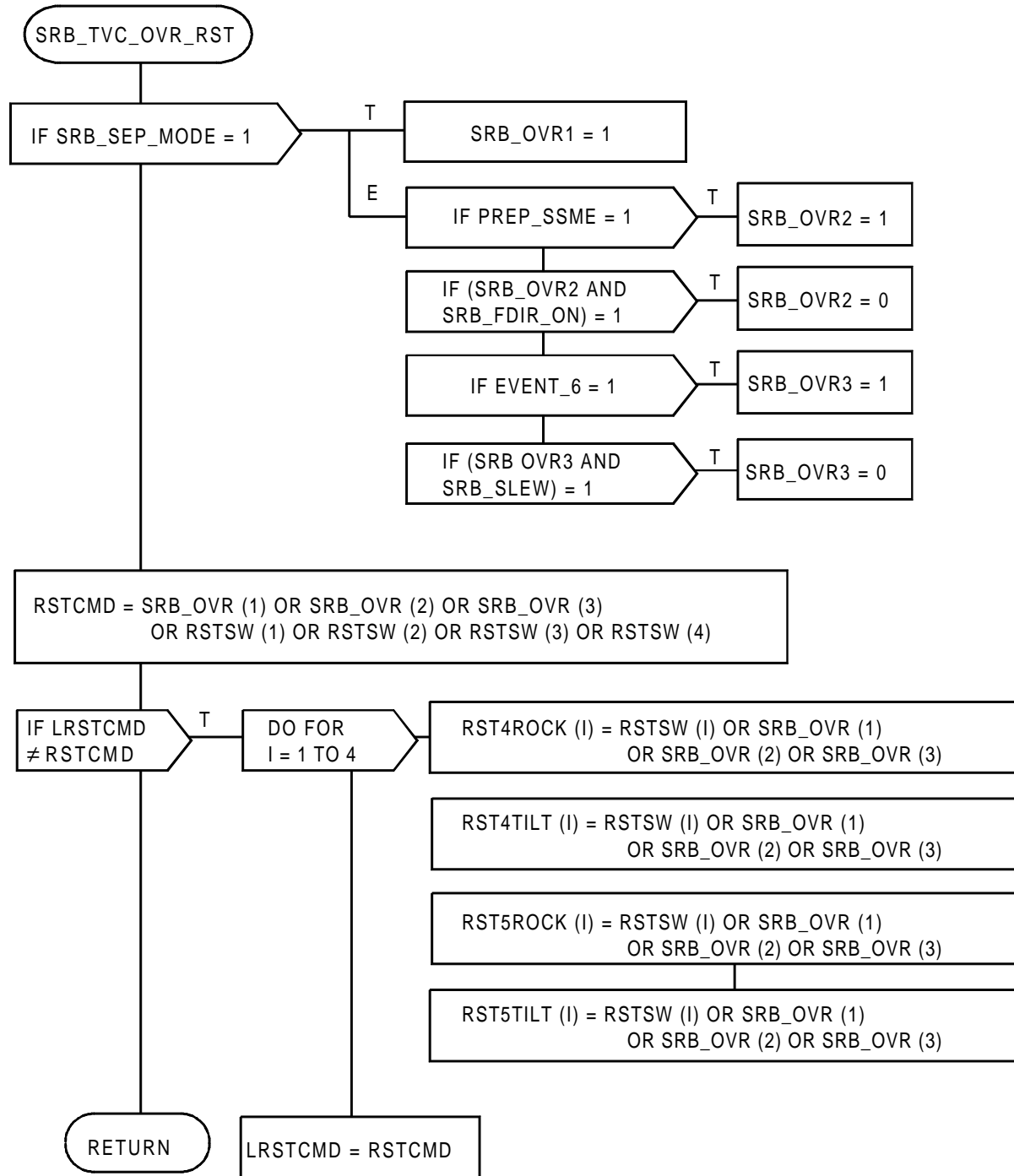


FIGURE 5.62-2. SRB_TVC_OVR_RST Functional Module

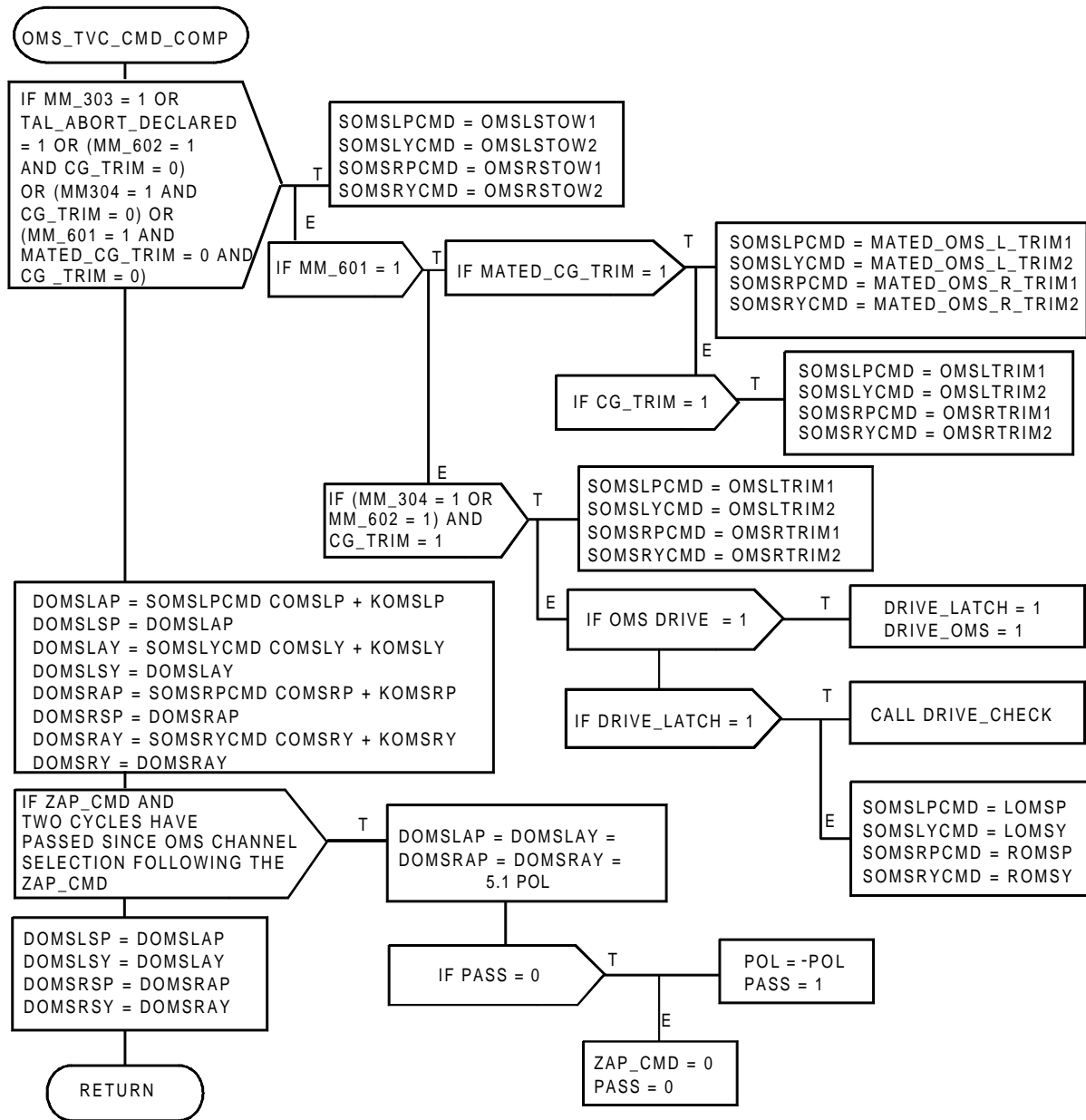


FIGURE 5.64-1. OMS_TVC_CMD_COMP Functional Module

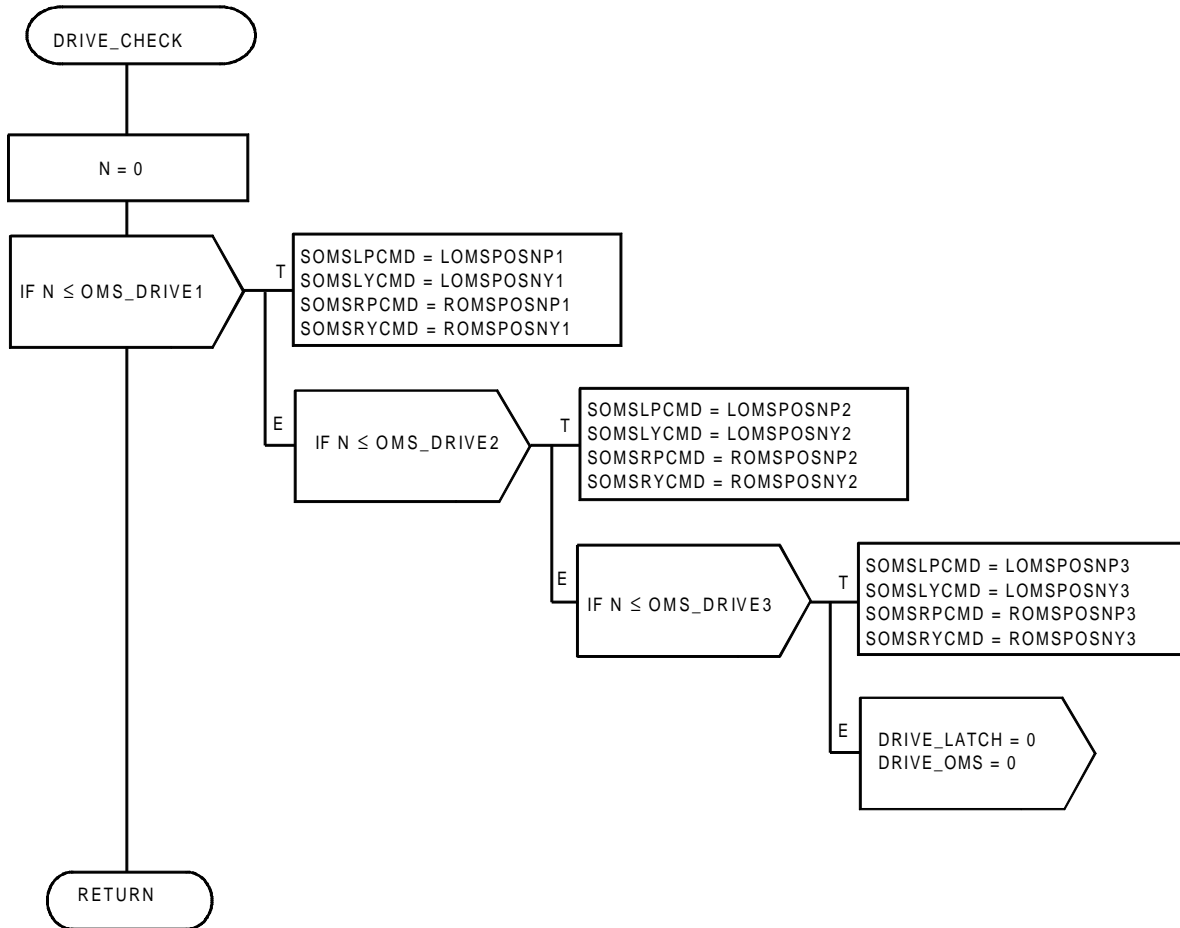


FIGURE 5.64-2. DRIVE_CHECK Functional Module

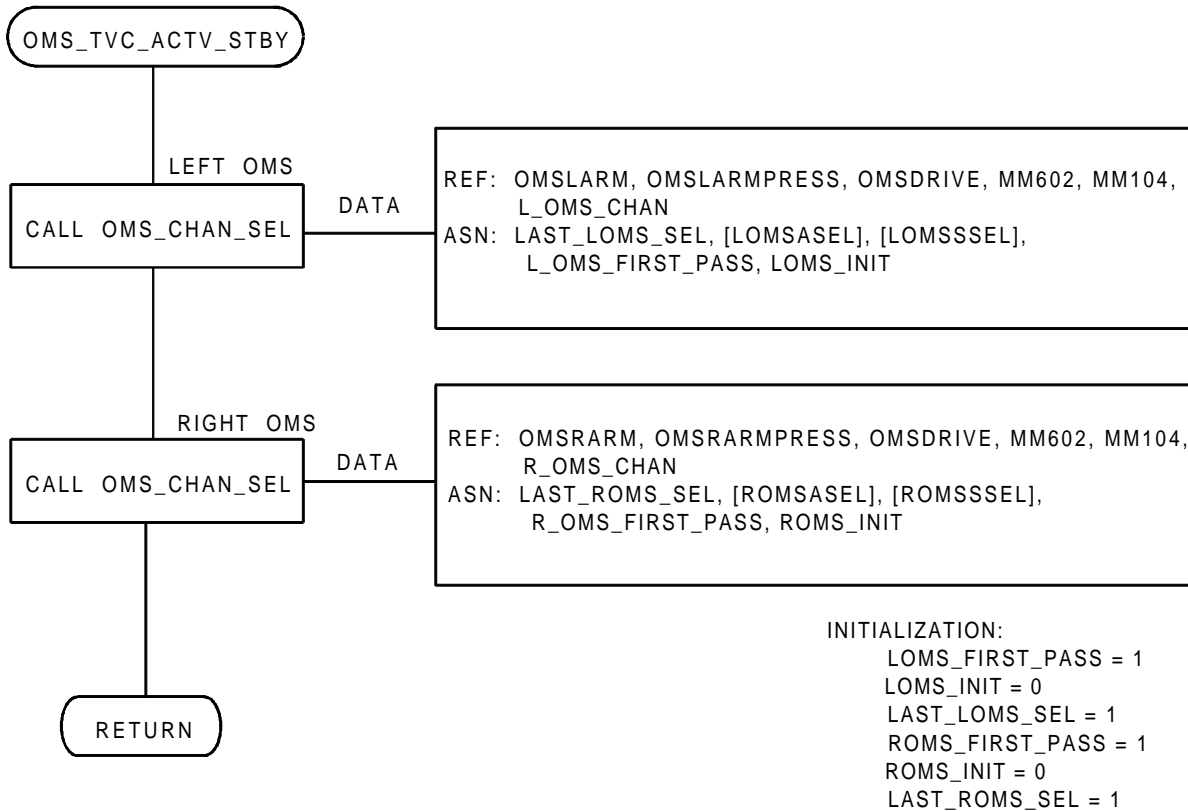


FIGURE 5.64-3. OMS_TVC_ACTV_STBY Functional Module

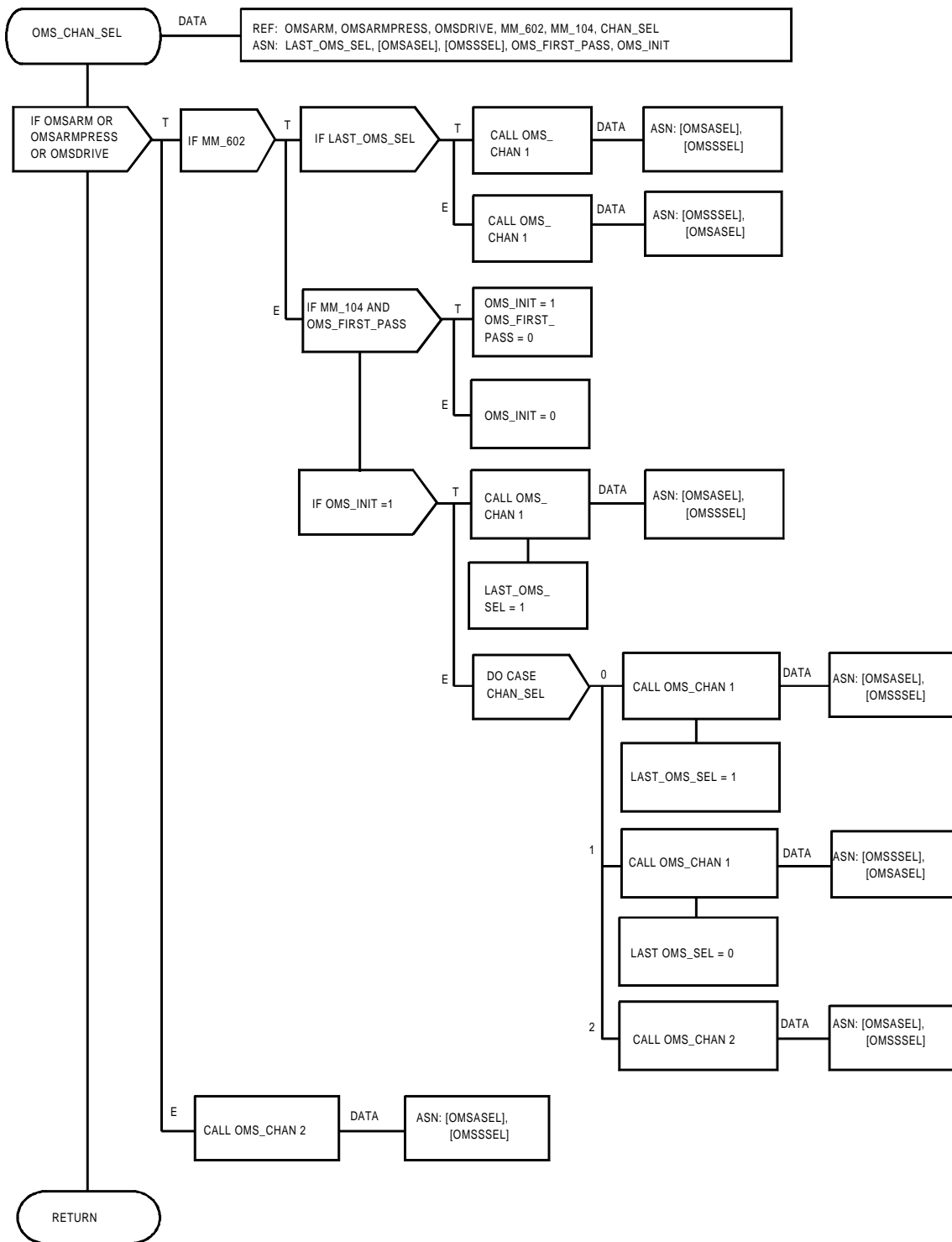


FIGURE 5.64-4. OMS_CHAN_SEL Common Module

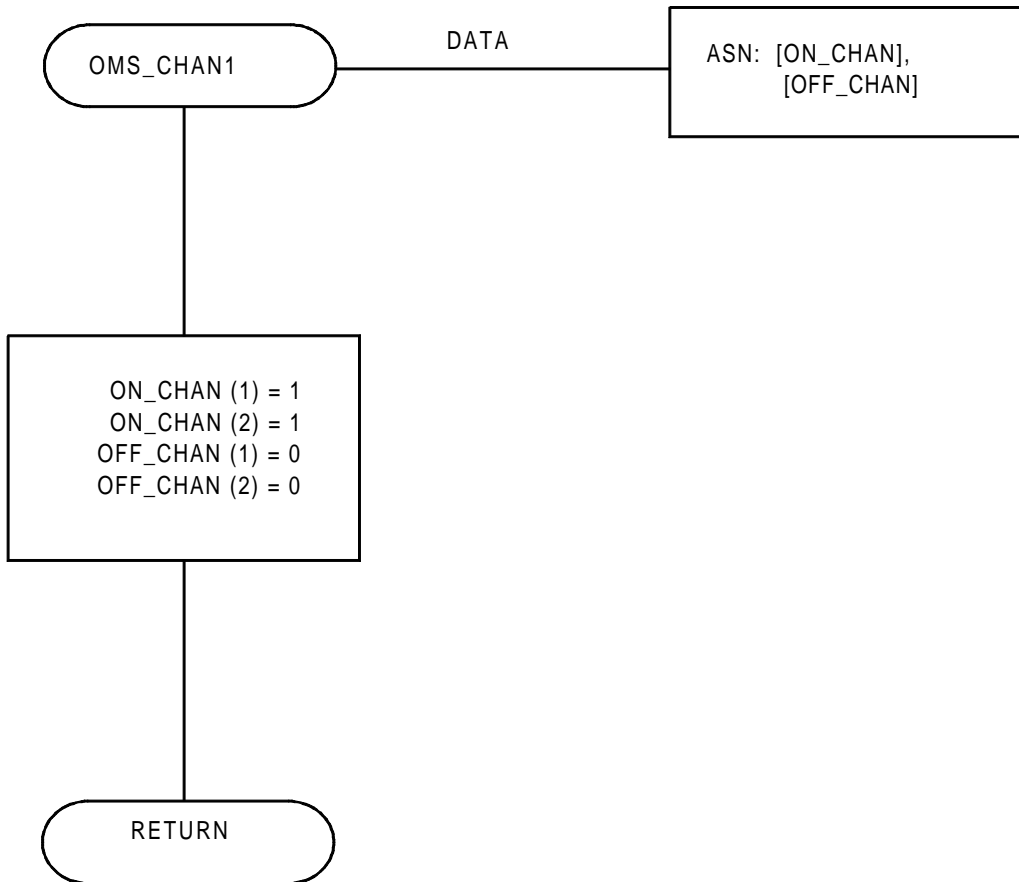


FIGURE 5.64-5. OMS_CHAN1 Common Module

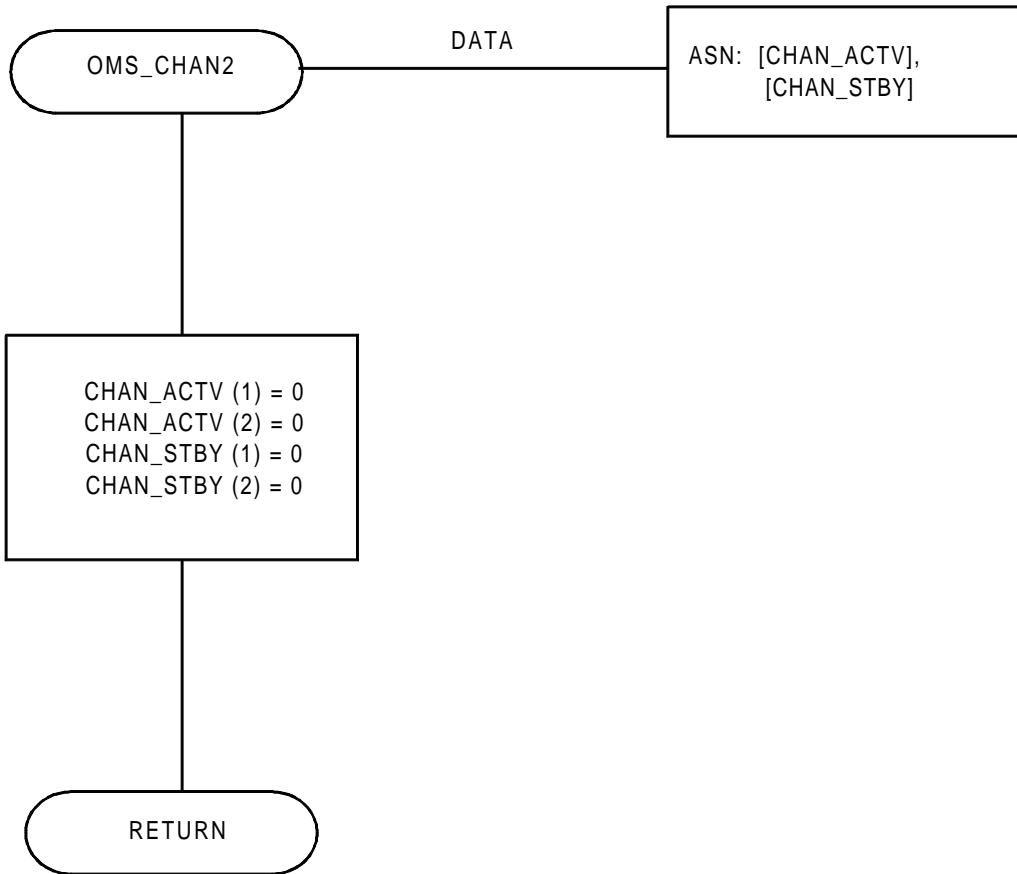


FIGURE 5.64-6. OMS_CHAN2 Common Module

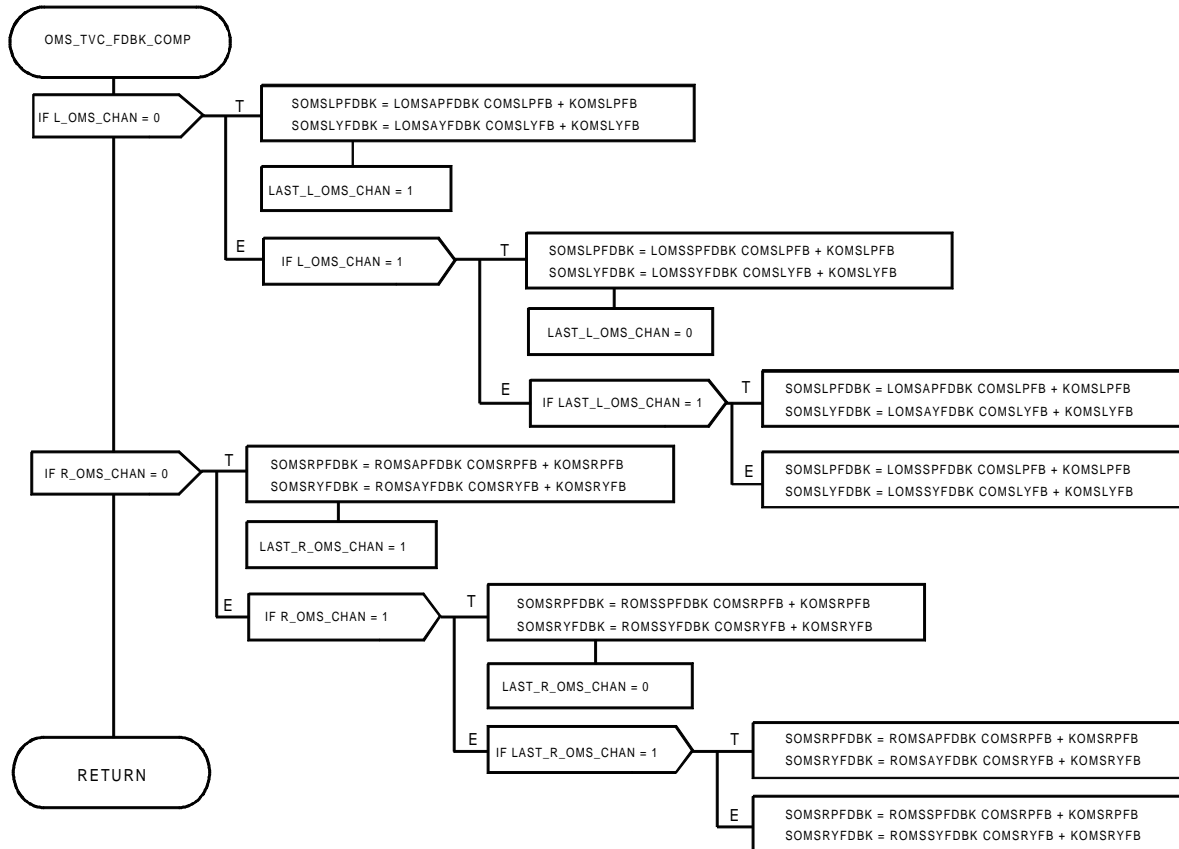


FIGURE 5.65-1. OMS_TVC_FDBK_COMP Functional Module

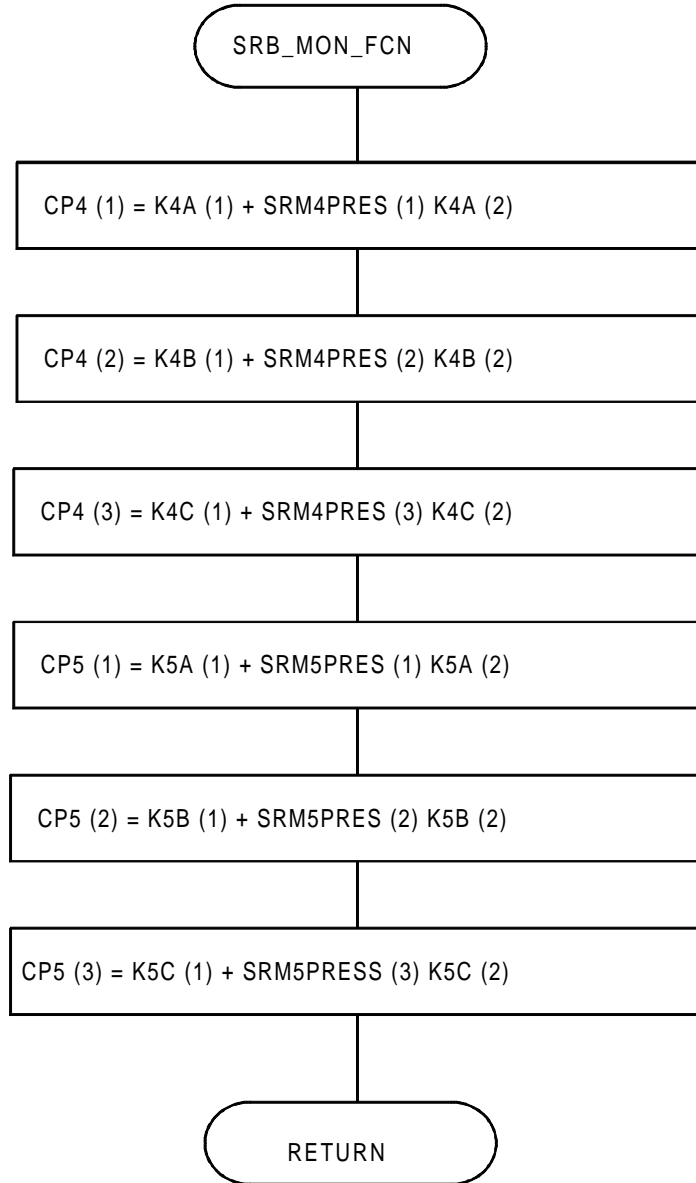


FIGURE 5.120-1. SRB_MON_FCN Functional Module

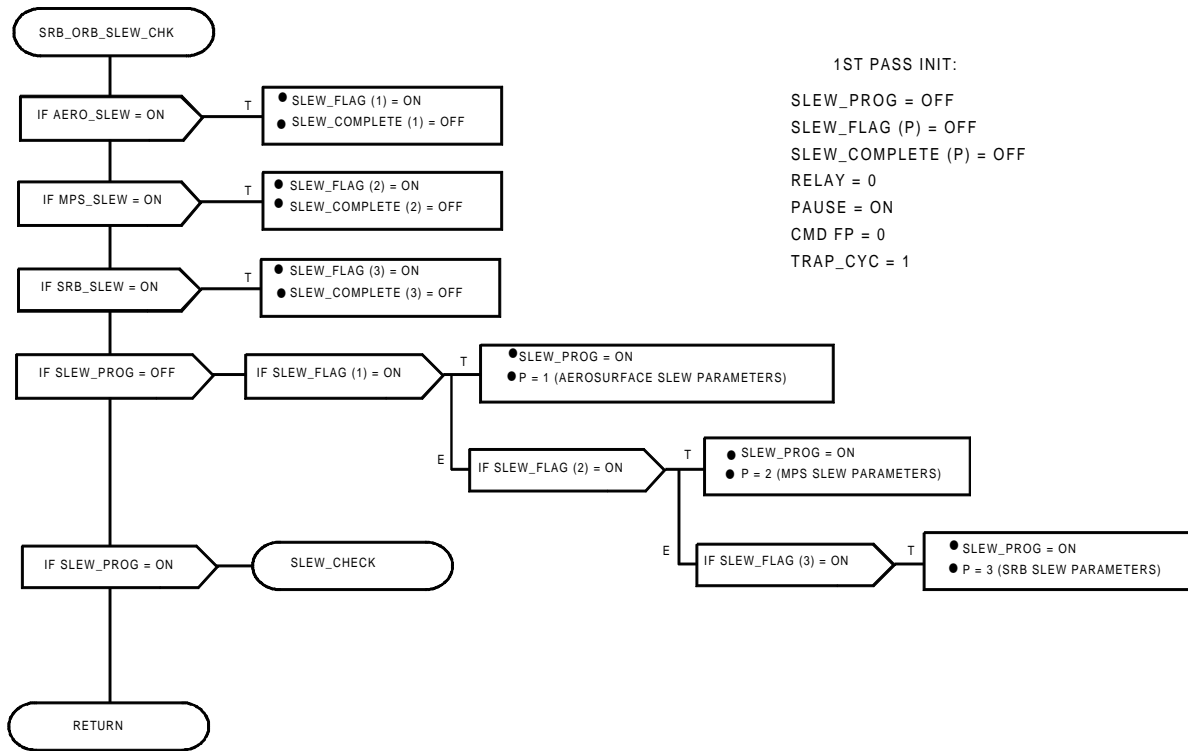


FIGURE 5.187-1. SRB_ORB_SLEW_CHK Functional Module

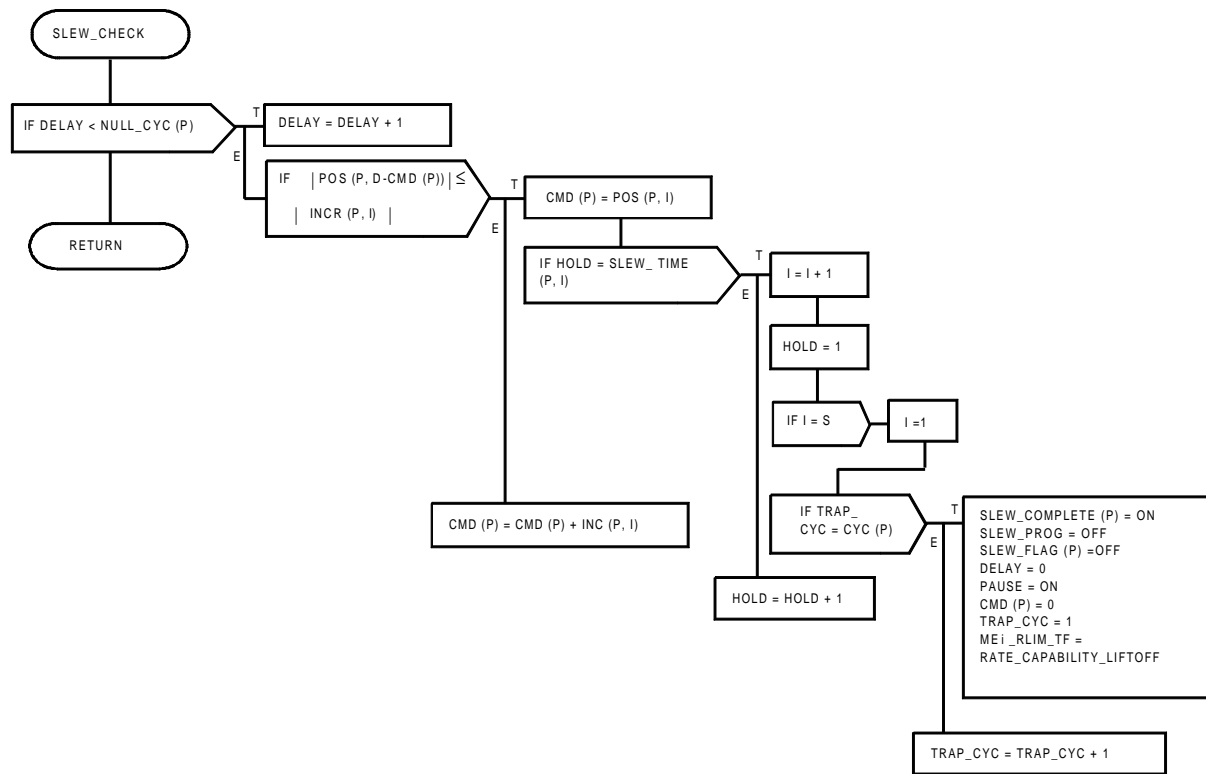


FIGURE 5.187-2. SLEW_CHK Functional Module

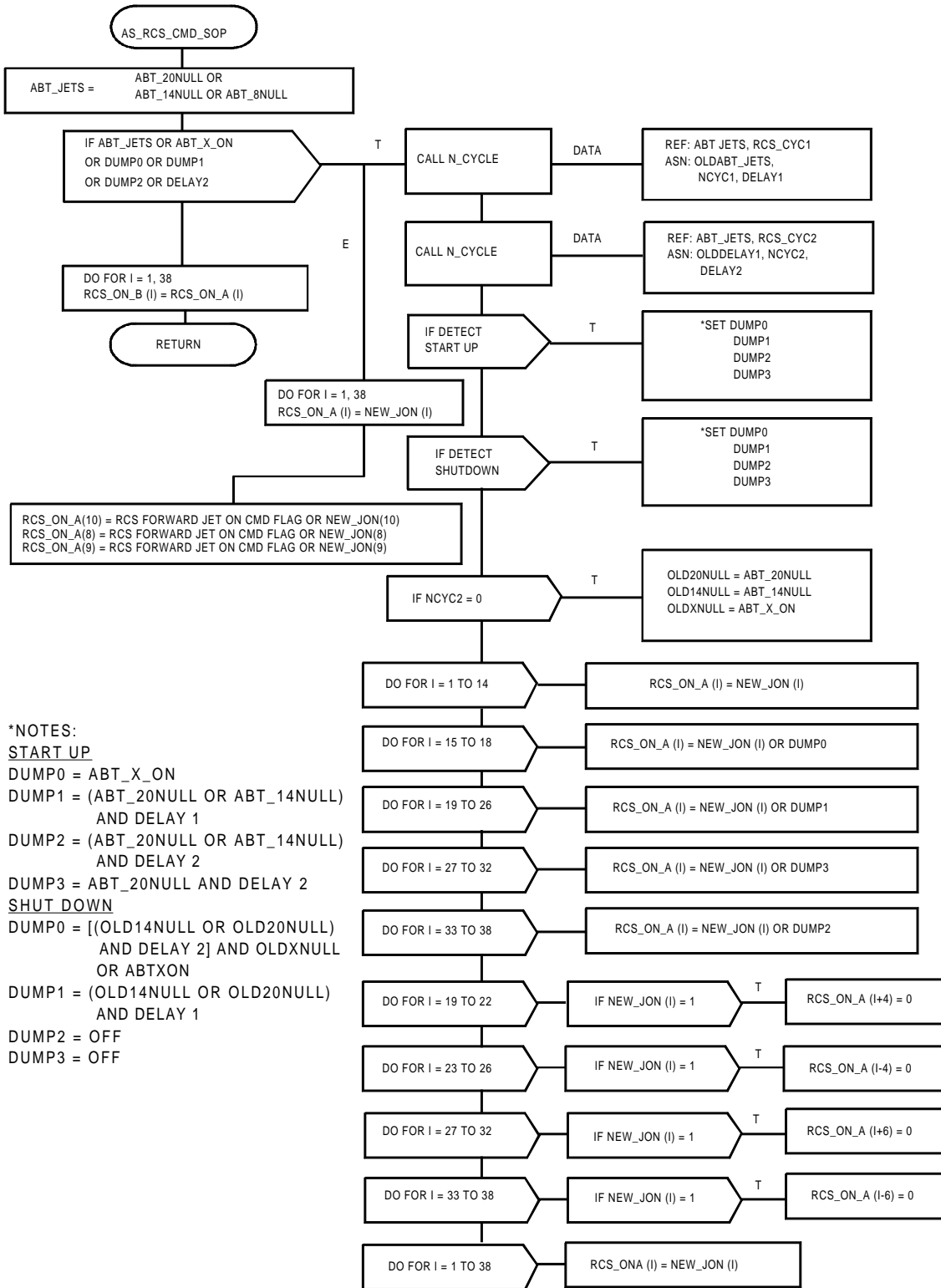


FIGURE 5.190-1. AS_RCS_CMD_SOP Functional Module

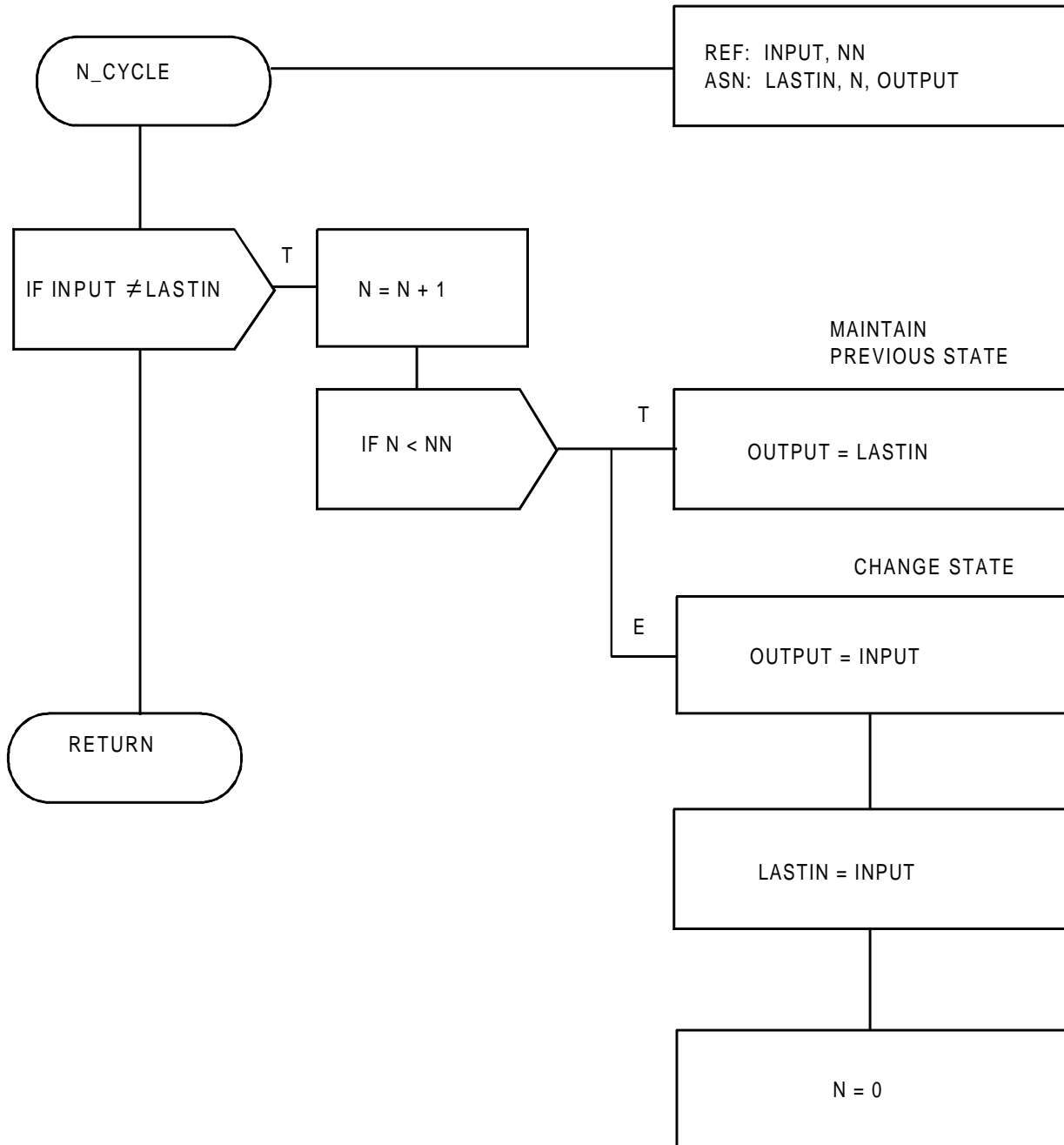


FIGURE 5.190-2. N_CYCLE Common Module

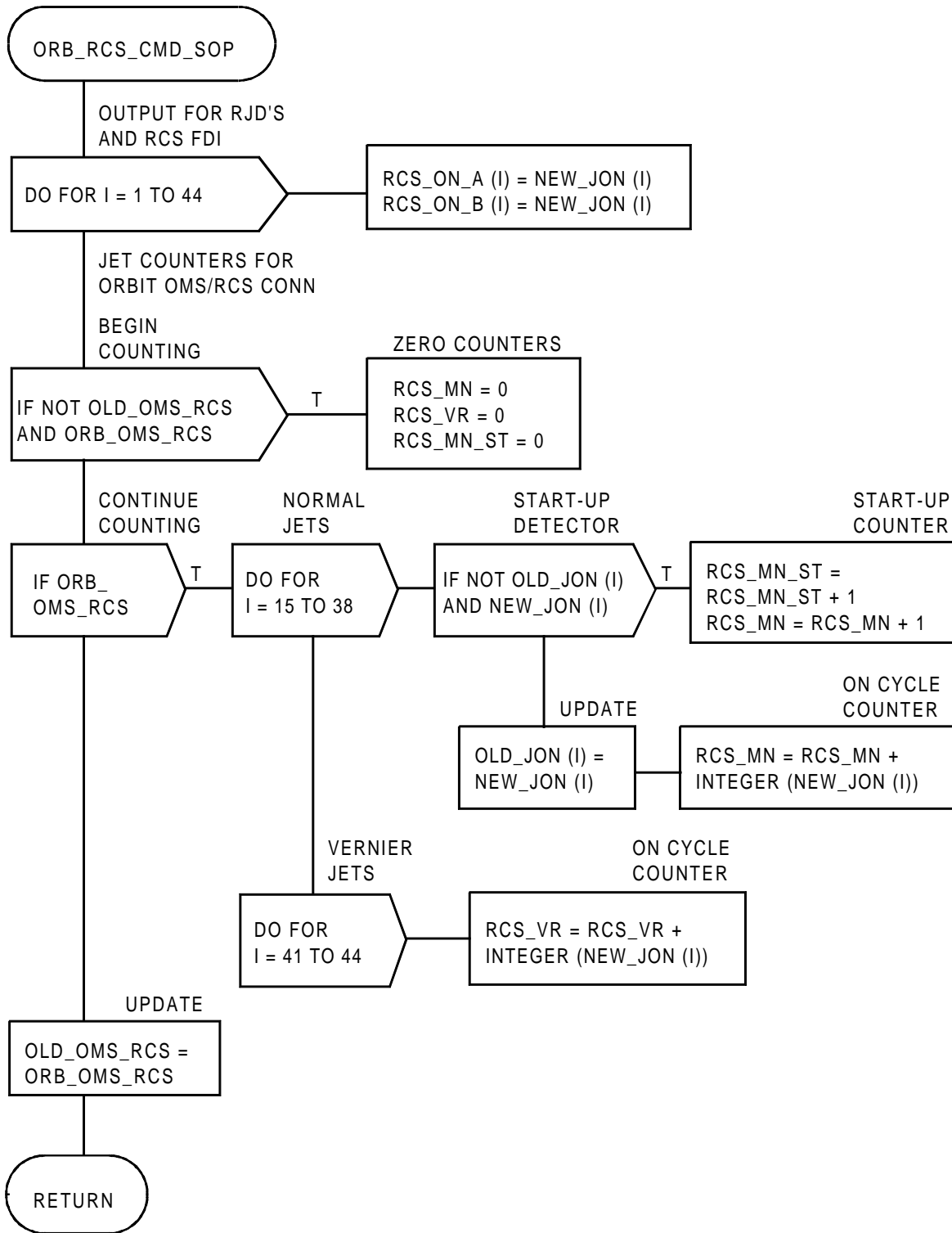


FIGURE 5.191-1. ORB RCS CMD SOP Functional Module

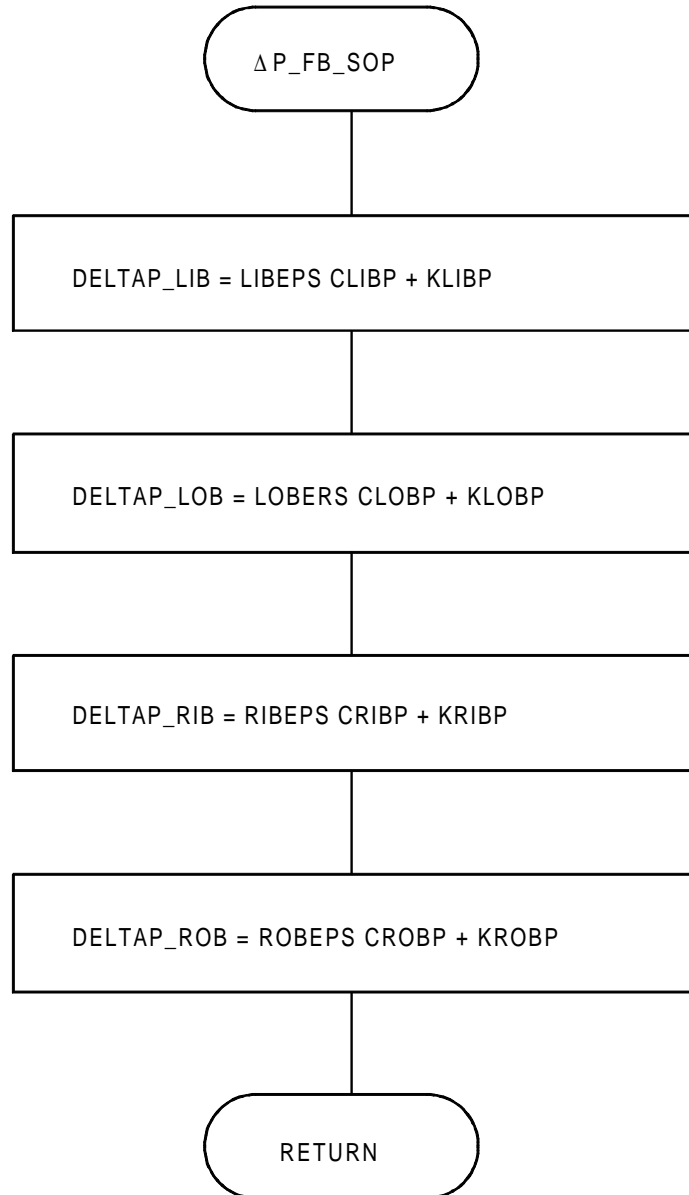


FIGURE 5.193-1. $\Delta P_{F/B_SOP}$ Functional Module

TBD

FIGURE 5.232-1. HYD_THERM_COND Functional Module

TBD

FIGURE 5.250-1. SPTI SOP Functional Module

6.0 GLOSSARY

6.1 LIST OF DEFINITIONS

AEROSURFACES – Those control surfaces that use the atmosphere through which the vehicle is moving to effect a change in the dynamic state of the vehicle.

AILERON – A specific control function of the elevon that produces vehicle motion about the body roll axis through differential deflection of the elevons.

AIR DENSITY – The ratio of the mass of local air to a unit of volume.

ALPHA/MACH INDICATOR – The panel instrument which displays equivalent airspeed, Mach, vehicle acceleration, and angle of attack.

ALPHA PRESSURE – Alpha pressures are those pressures used to compute the angle of attack. The alpha pressures are measured by the air data probes by pressure ports in the X-Z plane of the orbiter.

ALTITUDE/VERTICAL VELOCITY INDICATOR – The panel instrument which displays radar altitude, barometric altitude, altitude rate, and altitude acceleration.

ANGLE OF ATTACK – The angle of attack is the angle between the mean chord of the wing and the wind vector.

APPLICATION PROGRAM – The software which actually performs the mission-related functions in the areas of guidance, navigation and control, system management, and payload handling. The FCOS and FCOS-related support software are not included.

AREA NAVIGATION – Navaid navigation using derived range and bearing from a waypoint. The waypoint is offset from the ground station. The range and bearing from the ground station to the waypoint and from the ground station to the vehicle are combined to generate range and bearing from the waypoint to the vehicle.

ASSIGN – ASSIGN refers to a category of interface parameters for data modules. The ASSIGN category contains those parameters which are either (a) required as input to the common module and are assigned new values, or (b) generated by the common module and supplied as output data.

ATTITUDE DIRECTOR INDICATOR – The panel instrument which displays vehicle attitude, attitude rates, and attitude errors.

BAROMETRIC ALTITUDE INDICATOR – An altitude indicator sensitive to local air pressure and calibrated to read in height above mean sea level.

BAROSET – Baroset is a method of correcting for barometric deviations from standard day conditions at the landing site. The correct barometric reading is input by the crew via the keyboard.

BETA – The angle that the vehicle's velocity vector makes with the body X axis (side slip angle).

BREAKOUT – The boundaries that surround a deadband zone which, when exceeded, allow signals to be processed.

BUILT-IN TEST EQUIPMENT (BITE) – Hardware circuitry within a unit that provides internal detected fault indications. In general, a combination of BITE and additional software checking functions are used to incorporate the FDI techniques for the systems.

CALL – The process of scheduling or transferring control from one module to another that is inserted in the sequence of operations to perform a secondary purpose.

CASTER – Allowing the nosewheel to rotate freely about its Z axis within its mechanical limits.

COMMON MODULE – A common module consists of a set of related functions which, when called by other modules, performs a specific common task.

COMPOOL – This is the HAL/S mechanization for a common data pool which is available for use by all software functions that have access rights.

CORRECTED STATIC PRESSURE – Corrected static pressure is the measured static pressure corrected for probe errors due to angle of attack and Mach variations.

CORRECTED TOTAL PRESSURE – Corrected total pressure is the measured total pressure corrected for probe errors due to angle of attack variations.

COUNTS – Counts are defined as the integer decimal equivalent of a binary number.

CYCLIC FUNCTION – A function which regularly and predictably recurs at specific points during a defined time interval. (See also PERIODIC.)

CYCLIC I/O – Inputs and outputs regularly submitted to or sent from the IOP.

DATA MODULE – A data module specifies the interface parameters for common modules. The interface parameters are categorized as either ASSIGN or REFERENCE parameters.

DATA PROCESSING SUBSYSTEM – The collection of data transfer, storage, and processing equipment which includes the following: (1) general-purpose computers, (2) multifunction CRT display systems, (3) mass memory units, (4) MDM's, (5) EIU, (6) associated bus network out to BTU, and (7) intercomputer discrete lines.

DEADBAND – A zone within which the outputs are nulled.

DEPLOYED – In an extended or using position.

DETENT – The mechanical equilibrium point in hand controllers where all controller outputs are zero.

DIFFERENTIAL – Equivalent movement in opposite directions.

DISCRETE – A two-state variable generated by or for the GN&C LRU's.

DISPLAY DRIVER UNIT – The electronic unit for driving the Alpha/Mach Indicator, the Altitude/Vertical Velocity Indicator, the Altitude Director Indicator, and the Horizontal Situation Indicator.

DOWNLINK – Data formatted on the PCM Master Unit and RF transmitted from the vehicle to the ground.

DYNAMIC DATA – Data values contained in the GPC memory that change or can be changed as a result of system inputs or software processing.

DYNAMIC PRESSURE – Dynamic pressure is the pressure to the forward motion of the vehicle.

DYNAMICS – A condition of the vehicle resulting from its stability and motion and those conditions which reflect vehicle disturbances created when changes in its equilibrium are induced.

ELEVATOR – A specific control function of the elevon that produces vehicle motion about the body pitch axis through symmetric deflection of the elevons.

ELEVON – A dual-purpose aerosurface that combines the pitching effect of elevators with the rolling effect of ailerons in a single control panel mounted on each wing.

EQUIVALENT AIRSPEED – Equivalent airspeed is the speed of the vehicle relative to the local air mass as referenced to standard sea-level air density. At sea level in a standard atmosphere, equivalent airspeed is equal to true airspeed.

EVENT LAMPS – A series of lamps mounted on the glare shield and used to signal to the pilot the occurrence of certain events during mission operations.

EXECUTE – To perform or to carry out into effect a given function or process.

FAULT DETECTION AND ANNUNCIATION (FDA) – This function provides fault detection and crew notification of a fault with no identification of the fault cause.

FAULT DETECTION AND IDENTIFICATION (FDI) – The redundancy management function providing system fault detection, annunciation and identification of the cause of a fault.

FAULT DETECTION, IDENTIFICATION, AND RECOVERY (FDIR) – This is the same function as FDI with the addition of automatic reconfiguration.

FEEDBACK – A closed-loop process of introducing into the software computations the system reaction resulting from a software-generated stimulus.

FIXED POINT – A signed binary number in which the fixed location of the binary point is assumed.

FLARED RUDDER – A dual-purpose aerosurface that combines the yawing effect of a rudder with the aerodynamic braking effect of a speed brake in a tailmounted split-panel.

FLOATING POINT – A signed decimal number in which provisions are made for varying the location of the decimal point by means of exponent notation.

FORCE EFFECTOR – The vehicle elements that interact directly with the environment to alter the dynamic state of the vehicle.

FORMULATION – Formulation indicates a method of implementing a given set of requirements. The formulations are provided in HAL/S structured flow chart form.

FUNCTION – A task to be performed by software (see principal and specialist functions).

FUNCTIONAL MODULE – A functional module is defined as a set of related subfunctions grouped together which performs a specific task.

GEODETIC LOCAL VERTICAL – Presumes a reference ellipsoid of revolution which approximates the figure of the earth; then the local vertical at any point is along the unique line that is normal to the ellipsoid surface and contains the point of interest.

GN&C MAJOR FUNCTION – Guidance, Navigation, Flight Control, Redundancy Management/Moding, Sequencing and Control, Subsystem Operating Programs, or Displays and Control.

GPC DOWNLIST – A table of values compiled within a GPC and sent to the PCM Master Unit for downlink telemetry.

GROUND SPEED – Root sum square of X–component of velocity (downrange) and Y–component of velocity (crossrange) relative to touchdown point.

HAL/S – The programming language for the Space Shuttle software.

HORIZONTAL SITUATION INDICATOR – The panel instrument which displays Navaid information to the operator in the form of range and elevation and course and glide slope deviations with respect to some Navaid ground station or waypoint.

INBOARD ELEVON – The elevon located nearest to the body of the vehicle.

INTEGER – A signed whole number.

INTERFACE UNITS – A term which describes any device physically connected to the GPC via a serial digital data bus or discrete interfaces.

ISSUE – Transmission of a command or data word from the general–purpose computer to an interface unit.

LANDING – Flight state of the vehicle which extends from main wheel touchdown to the point where the vehicle comes to a complete stop.

LANDING GEAR – The undercarriage of an aircraft that consists of the main wheels under each wing and the nosewheel in the forward portion of the vehicle.

LANDING GEAR STATUS – A discrete indication that the main and nose landing gear are either retracted or extended.

LATERAL – Vehicle translational movement along the Y axis in body coordinates.

LOGICAL – A two–state variable generated by and for application program usage.

LONGITUDINAL – Vehicle translational movement along the X axis in body coordinates.

MACH NUMBER – Mach number is the ratio of the vehicle’s true airspeed to the local speed of sound.

MAJOR CYCLE – The time interval defined by the lowest frequency periodic function execution rate.

MAJOR FUNCTION – GN&C, SM, or payload.

MAJOR MODE – A collection of functions that may be scheduled by the software or that may be called by the crew.

MINOR CYCLE – The time interval defined by the highest periodic function execution rate.

MODULE – A functional module or a common module.

MOTION SENSORS – Those instrumented sensors that monitor vehicle dynamics.

NORMAL – Vehicle translational movement along the Z axis in body coordinates.

NOSEWHEEL STEERING ENABLE – A discrete indication generated when the vehicle decelerates to a velocity which is considered safe to initiate nosewheel steering.

NOSEWHEEL STEERING ROLLOUT VELOCITY – That particular speed during the rollout period after nosewheel touchdown at which ground steering with the nosewheel becomes an effective method of guiding the vehicle through the remainder of the deceleration run.

NULL – The condition of a zero input or output.

OPERATIONAL FLIGHT PROGRAM – Represents the total computer program which operates in the orbiter general-purpose flight computer subsystem.

OPERATIONAL SEQUENCE – The highest level of OFP organization. The crew selects operational sequences to initiate software processing to accomplish the mission phases. Each operational sequence consists of a collection of sequentially ordered major modes.

OUTBOARD ELEVON – The elevon located farthest from the body of the vehicle.

PERIGEE AND APOGEE – The unique points in an elliptic orbit about the earth where the object achieves minimum and maximum distances from the center of the earth respectively.

PERIODIC FUNCTION – A function whose computation and I/O processing requires cyclic execution of a code sequence to satisfy the mission objective.

PRESSURE ALTITUDE – Pressure altitude is the altitude of the vehicle (in geopotential feet) as derived from corrected static pressure and barometric correction (baroset) inputs. It is referenced to the U.S. Standard Atmospheres, 1962 model.

PRESSURE ALTITUDE RATE – Pressure altitude rate is the rate of change of the vehicle's pressure altitude.

PRINCIPAL FUNCTION – A function that can only be initiated by the software. Principal functions may be ordered sequentially, run in parallel, enabled or inhibited.

PROCESS – The software operations in which a series of actions, changes, or functions are performed to bring about a particular result.

PUSHBUTTON INDICATOR – A group of lighted panel switches for operator input to the software.

RADAR ALTITUDE – The altitude above ground level as measured by a Radar Altimeter.

REFERENCE – REFERENCE refers to a category of interface parameters for data modules. The REFERENCE category contains those parameters which are used by the common module as input reference data only. This category includes constants and variables which are required but whose values are not changed by the common module.

REQUIREMENT – That which is needed, obligatory, or demanded.

ROLLOUT – Period during landing that extends from the point of nosewheel touchdown to the point where the vehicle comes to a complete stop.

RUDDER – A specific control function of the flared rudder which produces vehicle motion about the body yaw axis through symmetric deflection of the flared rudder panels.

SELF-TEST – The software, upon keyboard request, generates a stimulus to a specified hardware LRU. The LRU responds according to design characteristics. The self-test stimulus remains until manually terminated.

SHALLOW GLIDESLOPE – Portion of the atmospheric flight that extends from flare to final flare, during which the vehicle is in equilibrium glide conditions in the final approach plane.

SLAPDOWN – Portion of approach and landing that extends from the point of main wheel touchdown to the point of nosewheel touchdown.

SPECIALIST FUNCTION – A function that can only be initiated by the crew.

SPEED BRAKE – A specific control function of the flared rudder that performs airspeed control by aerodynamic braking through differential deflection of the flared rudder panels.

STATIC AIR TEMPERATURE – Static air temperature is defined as that temperature of the air undisturbed by the presence or motion of the vehicle. Static air temperature is frequently called by such names as free air temperature, ambient air temperature, and outside air temperature.

STATIC PRESSURE – Static pressure is the pressure of the air undisturbed by the presence or motion of the vehicle as measured by the air data probes.

STEEP GLIDESLOPE – Portion of the atmospheric flight that extends from approach and landing interface to flare, during which the vehicle is executing energy management maneuvers.

STOWED – In a retracted or storage position.

SURFACE POSITION INDICATOR – The panel instrument for displaying the flight control aerosurface positions and the speed brake command.

TOTAL PRESSURE – Total pressure is the pressure measured by the air data probes and reflects the ambient pressure and the pressure due to motion of the vehicle.

TOTAL TEMPERATURE – Total temperature is the temperature measured by the air data probes and reflects the sum of the ambient air temperature and the adiabatic temperature rise due to bringing the air to rest against the surface of the probe.

TOUCHDOWN – Process of bringing the main wheels and/or the nosewheel in contact with the runway during the landing.

TRANSPORT LAG – In a closed-loop control system, it is defined to be the time interval from sampling sensor inputs to supplying the control commands.

TRIM – The ability to move a force effector with very fine control.

TRUE AIRSPEED – True airspeed is the speed of the vehicle relative to the local air mass. It is referenced to the local air density.

VALIDITY BIT – Each sensor data word will contain a bit indicating that the input to the sensor is of sufficient level to be distinguished from noise.

VECTOR – A floating point array which expresses both magnitude and direction.

WAYPOINT 1 – Shuttle point of tangency to the heading alignment cylinders for either nominal or minimum entry point.

WAYPOINT 2 – Runway touchdown point.

WEIGHT ON NOSEGEAR – A discrete indication that the nose wheel is or is not in contact with the ground.

WEIGHT ON WHEELS – A discrete indication that the main wheels are or are not in contact with the ground.

6.2 LIST OF ACRONYMS AND ABBREVIATIONS

AA	Accelerometer Assembly
ACCELN	Acceleration
ACCLRM	Accelerometer
ACTR	Actuator
A/D	Analog to Digital
ADI	Attitude Director Indicator
ADS	Air Data Subsystem
ADTA	Air Data Transducer Assembly
AERO	Aerosurface
A/L	Approach and Landing
ALT	Approach and Landing Test
AMI	Alpha/Mach Indicator
AOA	Abort Once Around
APU	Auxiliary Power Unit
AS	Ascent
ASA	Aerospace Servo Amplifier
ASC	Ascent
ASN	Assign
ATT	Attitude
ATVC	Ascent Thrust Vector Control
ATVCD	Ascent Thrust Vector Control Driver
AUTO	Automatic
AVVI	Altitude/Vertical Velocity Indicator
BF	Body Flap
BITE	Built-in-Test-Equipment
Btu	British Thermal Unit

C	Centigrade (degrees)
CAPRI	Capacitance Rate Integrator
CDR	Commander (left seat)
CHAN	Channel
CM	Centimeters
CMD	Command
CMDR	Commander
CMDS	Commands
COMP'D	Compensated
CPDS	Computer Program Development Specification
CPU	Central Processing Unit
CR	Change Request
CRT	Cathode Ray Tube
CSS	Control Stick Steering
CTL	Control
CTLR	Controller
CTR	Counter
CU	Cubic
C&W	Caution and Warning
DAP	Digital Autopilot
DC	Direct Current
D&C	Display and Control
DD	Dedicated Display
D/D	Dedicated Display
DDU	Display Driver Unit
DEG	Degree
DEST	Destination

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DEU	Display Electronics Unit
DIP	Display Interface Processor
DIR	Direct
DISENG	Disengage
DPS	Data Processing Subsystem
DSBL	Disable
E	Else
EA	Each
EGB	Electronic Gimbal Box
EIU	Engine Interface Unit
E/L	Entry through Landing
ELVN	Elevon
ENBL	Enable
EPDCS	Electrical Power Distribution and Control Subsystem
ET	External Tank
F	False
FC	Flight Control
F.C.	Flight Critical
FCOS	Flight Computer Operating System
FCS	Flight Control Subsystem
FDA	Fault Detection and Annunciation
FDBK	Feedback
FDI	Fault Detection and Identification
FDIR	Fault Detection, Identification, and Recovery
FLOAT	Floating
FLT	Flight
FOH	First-Order Hold

FSSR	Functional Subsystem Software Requirements
FT	Foot
FUNCT	Function
FWD	Forward
g	Gravity (gravitational unit of force)
G&C	Guidance and Control
GMT	Greenwich Mean Time
G&N	Guidance and Navigation
GN&C	Guidance, Navigation, and Control
GPC	General Purpose Computer
GUID	Guidance
HI	High
HSI	Horizontal Situation Indicator
HYDR	Hydraulic
Hz	Hertz
IAS	Indicated Air Speed
IMU	Inertial Measurement Unit
IN.	Inch
IN.-HG	Inches of Mercury
INBD	Inboard
I/O	Input/Output
IOP	Input/Output Processor
K	Kelvin (degrees)
KBU	Keyboard Unit
kg	Kilograms
km	Kilometers
KYBD	Keyboard

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L	Left
LAT	Lateral
LB	Pounds (force)
LBM	Pounds Mass
LCA	Load Control Assembly
LIB	Left Inboard
LNDG	Landing
LO	Low
LOB	Left Outboard
LPS	Launch Processor Subsystem
LRU	Line Replaceable Unit
LSB	Least Significant Bit
m	Meters
MAN.	Manual
MAX	Maximum
MCDS	Multifunction CRT Display System
MDM	Multiplexer/Demultiplexer
ME	Main Engine
MECO	Main Engine Cutoff
MET	Mission Elapsed Time
MHC	Manipulator Hand Controller
MHz	Megahertz
MIN	Minimum
MIN	Minute
MLG	Main Landing Gear
mm	Millimeters
M/M	Master Measurement

MML	Master Measurement List
MOL	Molecular Weight Unit
MPS	Main Propulsion System
ms	Millisecond
MSB	Most Significant Bit
MSBLS	Microwave Scan Beam Landing System
MSC	Moding, Sequencing, and Control
msec	Millisecond
MSG	Message
MSS	Mission Specialist Station
MTC	Master Thrust Controller
N	Newtons
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
NAV	Navigation
NAVDAD	Navigation Derived Air Data
ND	Non-Dimensional
NLG	Nose Landing Gear
NMI	Nautical Miles
NO.	Number
NORM	Normal
NW	Nosewheel
OFF	Operational Flight Program
OFT	Orbital Flight Test
OI	Operational Instrumentation
OMS	Orbiter Maneuvering Subsystem
OPER	Operational

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OPS	Operational Sequence
ORB	Orbiter
OUTBD	Outboard
OWD	One-Way Doppler
P	Pitch
PARM	Parameter
PBI	Pushbutton Indicator
PDR	Program Design Review
PFB	Position Feedback
PHS	Payload Handling Subsystem
PIC	Pyro Indicator Controller
PL	Payload
PLD	Payload (alternate P/L)
PLT	Pilot (right seat)
POSN	Position
PRESS	Pressure
PSI	Pounds per Square Inch
PSIA	Pounds per Square Inch Absolute
PT	Point
PWR	Power
R	Right
R	Roll
RA	Radar Altimeter
RAD	Radians
RCS	Reaction Control Subsystem
REF	Reference
RG	Rate Gyro

RG	Rate Gyro Assembly
RHC	Rotational Hand Controller
RIB	Right Inboard
RID	Review Item Disposition
RJD	Reaction Jet Driver
RJDA	Reaction Jet Driver Aft
RJDF	Reaction Jet Driver Forward
RJOD	Reaction Jet/OMS Driver
RM	Redundancy Management
ROB	Right Outboard
RPT	Rudder Pedal Transducer
RPTA	Rudder Pedal Transducer Assembly
RR	Rendezvous Radar
RREU	Rendezvous Radar Electronics Unit
RTLS	Return to Launch Site
RUD	Rudder
SB	Speed Brake
SBTC	Speed Brake Thrust Controller
SBTO	Speed Brake Takeover
SCB	Steering Control Box
SDR	System Design Review
SDS	Steering and Damping Subsystem
SEC	Second
SEL	Selected
SF	Selection Filter
SFC	Selection Filter Control
SIG	Signal

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SM	System Management
SMRD	Spin Motor Running Detector
SOP	Subsystem Operating Program
SP BK	Speed Brake
SPD BRK	Speed Brake
SPEC	Specialist Function
SPI	Surface Position Indicator
SQ	Square
SRB	Software Review Board
SRB	Solid Rocket Booster
SRM	Solid Rocket Motor
SSD	Spacecraft Software Division
SSO	Systems Software Office
SSME	Space Shuttle Main Engine
ST	Star Tracker
STIM	Stimulus
SW	Switch
S/W	Software
SYS	System
T	Then
T	Time
T	True
TACAN	Tactical Air Navigation
TAEM	Terminal Area Energy Management
TBD	To Be Determined
TBS	To Be Specified
TEMP	Temperature

THC	Translational Hand Controller
TLM	Telemetry
TVC	Thrust Vector Control
UDF	Utility and Data Flow
UI	User Interface
VDC	Volts dc
VU	Vehicle Utility
WD	Word
WONG	Weight-on-Nose-Gear
WOW	Weight-on-Wheels
XDUCER	Transducer
Y	Yaw

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APPENDIX R CHANGE AUTHORIZATION REFERENCES

R.1 CR REFERENCE SUMMARY

Table R.1-1. lists the paragraphs, tables (T), and figures (F) that have been changed as a result of approved change requests commencing with OI-26 up to the current OI. Changes incorporated prior to OI-26 are listed in the Historical Change Request Summary.

Table R.1-1. CR Reference Summary			
Paragraph	CR No.	OI	CR Title
N/A	92307	29	FSSR Format Change Documentation Only
1.3-1.(T)	92103A	26B	FSSR 16 Parameter Table Upgrade CR92103A
4.46-3.(T)	92230F	28	Display FSSR Documentation Cleanup
4.48	93015C	32	Documentation Update to Approach/Landing Guidance Functional Flow
4.48-1.(T)	93015C	32	Documentation Update to Approach/Landing Guidance Functional Flow
4.48-1.(F)	93087E	33	RTLS ET Separation Improvements
4.48-3.(T)	93087E	33	RTLS ET Separation Improvements
4.48-5.(T)	93015C	32	Documentation Update to Approach/Landing Guidance Functional Flow
4.50.4	92624	29	Clarify Conditions for Clearing Aerosurface Reset Discretes
4.50.5	93064D	32	Errata Issue Clean-Up Part II
4.50-2.(T)	92354	27	Delete Erroneous TLM Destinations
	92355B	29	GPC Major Mode to MEDS
	93064D	32	Errata Issue Clean-Up Part II
4.52	92350A	29	Fails OPS/Fail Safe SSME Repositioning for Drag Chute
	92497B	30	Clarify Hydraulic System SOP Requirements (DR 109409)
	92500	30	Documentation Changes to Close DR 109410
	93064D	32	Errata Issue Clean-Up Part II
4.52-1.(F)	92350A	29	Fails OPS/Fail Safe SSME Repositioning for Drag Chute
	93064D	32	Errata Issue Clean-Up Part II
4.52-2.(T)	91051K	26B	Streamlined Shuttle GPS Capability
	93090E	33	Bearing Displays
4.52-3.(T)	92350A	29	Fails OPS/Fail Safe SSME Repositioning for Drag Chute
4.58-2.(T)	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions
	92389C	29	Spiral HAC in TAEM Area Navigation

Table R.1-1. CR Reference Summary			
Paragraph	CR No.	OI	CR Title
4.58-2.(F)	92392C	29	Doc-Only Corrections for OI-29 CRs 92329E, 92364D, and 92369B
	93090E	33	Bearing Displays
	91051K	26B	Streamlined Shuttle GPS Capability
4.60-2.(T)	92069B	26B	Single-String GPS Documentation Cleanup
	92354	27	Delete Erroneous TLM Destinations
	92225A	29	ET SEP Switch Default to Auto on a TAL Abort
4.64	92350A	29	Fails OPS/Fail Safe SSME Repositioning for Drag Chute
	92355B	29	GPC Major Mode to MEDS
	92578B	29	Correction for ET SEP Switch Default
	92522D	30	Overhaul MEDS Composite Flight Instrument Display
	93064D	32	Errata Issue Clean-Up Part II
	93090E	33	Bearing Displays
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions
	93075D	33	Correct OMS Zap Command Timing
	93146B	33	Minor Doc Update to FSSRs 1, 2, and 16
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions
4.64-1.(T)	93075D	33	Correct OMS Zap Command Timing
	93146B	33	Minor Doc Update to FSSRs 1, 2, and 16
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions
4.64-1.(F)	92188B	28	OMS-TVC No Back Failure Logic Changes
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions
4.64.2	92188B	28	OMS-TVC No Back Failure Logic Changes
	92251A	28	Correction CR for 92188 - OMS TVC No Back Failure Logic
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions
4.64-2.(T)	93064D	32	Errata Issue Clean-Up Part II
	90724D	28	OPS6 Entry ECAL Automation
	90914C	28	Delay MOV MPS Dump/FRCS Dump at MM602
	92188B	28	OMS-TVC No Back Failure Logic Changes
	92355B	29	GPC Major Mode to MEDS
	92404B	29	Preserve MECO Vi, Altitude, & Altitude Rate in MM104

Table R.1-1. CR Reference Summary				
Paragraph	CR No.	OI	CR Title	
4.64-4.(T)	92458A	30	ET Separation Channelization Clean-Up	
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions	
	93012D	32	PASS 6X TRAJ Display Enhancement	
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions	
4.65	92188B	28	OMS-TVC No Back Failure Logic Changes	
4.65-1.(F)	92188B	28	OMS-TVC No Back Failure Logic Changes	
4.65-2.(T)	92188B	28	OMS/TVC No Back Failure Logic Changes	
4.65-3.(T)	92188B	28	OMS/TVC No Back Failure Logic Changes	
4.190	90914C	28	Delay MOV MPS Dump/FRCS Dump at MM602	
	92306A	28	Orbiter Window Protection	
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions	
4.190-1.(F)	90914C	28	Delay MOV MPS Dump/FRCS Dump at MM602	
	92306A	28	Orbiter Window Protection	
4.190-2.(T)	92069B	26B	Single-String GPS Documentation Cleanup	
	90724D	28	OPS6 Entry ECAL Automation	
	90914C	28	Delay MOV MPS Dump/FRCS Dump at MM602	
	92157	28	IDD Clarification to Remove Blanks from FSSR Names	
	92306A	28	Orbiter Window Protection	
	92355B	29	GPC Major Mode to MEDS	
	92392C	29	Doc-Only Corrections for OI-29 CRs 92329E, 92364D, and 92369B	
	92404B	29	Preserve MECO Vi, Altitude, & Altitude Rate in MM104	
	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions	
	92522D	30	Overhaul MEDS Composite Flight Instrument Display	
	92565A	30	SE RTLS Increased Pitch Authority Using Forward RCS Jets	
	4.191	93012D	32	PASS 6X TRAJ Display Enhancement
		93087E	33	RTLS ET Separation Improvements
93090E		33	Bearing Displays	
92320D		29	Software Changes for Forward RCS Interconnect System (FICS)	
4.191-1.(F)	92320D	29	Software Changes for Forward RCS Interconnect System (FICS)	

Table R.1-1. CR Reference Summary			
Paragraph	CR No.	OI	CR Title
4.191-1.(T)	92320D	29	Software Changes for Forward RCS Interconnect System (FICS)
4.191-2.(T)	92320D	29	Software Changes for Forward RCS Interconnect System (FICS)
4.191-3.(T)	92320D	29	Software Changes for Forward RCS Interconnect System (FICS)
4.232	93064D	32	Errata Issue Clean-Up Part II
4.232-1.(T)	93064D	32	Errata Issue Clean-Up Part II
4.232-2.(T)	92354	27	Delete Erroneous TLM Destinations
	92230F	28	Display FSSR Documentation Cleanup
	92355B	29	GPC Major Mode to MEDS
	93064D	32	Errata Issue Clean-Up Part II
	93087E	33	RTLS ET Separation Improvements
4.250-2.(T)	90704F	28	DAP Hot-Stick Downmode Alert and Message
	92350A	29	Fails OPS/Fail Safe SSME Repositioning for Drag Chute
	92389C	29	Spiral HAC in TAEM Area Navigation
	92332D	30	Add Theta Limits Bracket to MEDS ADI Displays
	93012D	32	PASS 6X TRAJ Display Enhancement
	93090E	33	Bearing Displays
5.48-1.(F)	93015C	32	Documentation Update to Approach/Landing Guidance Functional Flow
5.64-1.(F)	92504G	30	Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions
	93146B	33	Minor Doc Update to FSSRs 1, 2, and 16
5.190-1.(F)	92306A	28	Orbiter Window Protection

R.2 HISTORICAL CHANGE REQUEST SUMMARY

Table R.2-1. is an historical record of approved change requests incorporated since the initial baseline up to OI-25. Change requests commencing with OI-26 are reformatted and listed in the CR Reference Summary.

Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
2166		OFT GN&C Entry Function Update
2173A		Abort Mode Reselect
2182A		Entry SOP PF Affect Ascent
2313A		SRB MON FCN/SEL Filter
2449D		Add OFT Contingency Abort
2463A		OPS 3 Recycle Initiate Transition
2468B		SRB TVC FDIR Act/Deact Seq
2494D		D/L Reqmts Level A Entry
12001		Add Pitch Att Scale
12007		Delete Individual Scale Factors and Biases
12019		Standard FSSR Principal Function IDD
12022		Body Flap Pos Conversion To Percent
12033A		Abort Control Sequence
12039		RCS Cmd SOP Update
12043		Mod FC Eff Init and I-Load Tables
12071A		MNVR Execute Display Change
12074A		ET Separation
12073A		Orb OMS/RCS Conn
12107		Elevon Prim Delta Press FDBK
12112		GAX-Annunciation Rewrite
12160A		R/S LCH Seq Revision
12185A		MPS TVC Cmd SOP Post MECO
12218C		AERO ACT Cmd SOP Ascent Rate Reduction
12219		CHECKSUM SOP Rate Reduction
12233		Trans DAP Rate Reduction
12240		MEC SOP Documentation
12241		SSME SOP Documentation
12248		GAX Rate Table Update
12250A		Delete SRB Vector Limiting
12269		MSID Corrections IDD Tables

Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
12313C		Additional TIm Reqmts
12316		Switch RM Proc Rate Reduction
12336		I-Load OFT-1 Mission and LRU Dependent
12337		I-Load OFT-1 Design Dependent Parameter
12338		I-Load OFT-1 Baseline Constants
12339		I-Load OFT-1 Baseline Removals
12359		Launch Seq Cmd Code Update
12401		Jet Select Logic Rate Reduction
12404A		Proposed FCS 9 Changes
12430		Aerosurface FDBK for Thermal Cond
12434B		SRB Chamber Press Transducer
12443		I-Load Entry FACI F/1 Delivery
12541A		ORB ACT SLEW and SRB Slew Corrections
12623		FCS Dedicated Display Changes for OFT-3
12625C		OMS Gimbal Actuator
12635B		Adaptive PRL
12636C		FO/FS Hydraulic SOP
12644C		Launch Seq Cmd Code Update
12672C		January Seq Make Work Changes
12709A		Proc Rate Reduction of Orb RCS Cmd SOP
12738		FC SOP I-Load Designations
12745		OMS/OMS Interconnect S/W
12770A		BF Cmd RM
12826C		Vent Door Control Update
12827A		Ascent Aerosurface Programmed (Ref Only)
12836A		RCS/RCS X Feed and Reconfig.
12869A		ET Separation
12935		ADTA SOP I-Load Update
12945		CHECKSUM SOP Changes
12982		ASC DAP I-Load Update
12561A		GAX and Sys Summ Display Scrub
12771A		Principal Function Deletions
12868A		I-Load Changes Mode Team Actions
12910A		PCMMU Toggle Buffer Manage
12912A		I-Load Deletions/Additions
12937		Elevon Trim Sched for OFT
12948		Add Auto Maneuver Capability SS-2

Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
12951B		Universal Function I-Load Changes
12993		I-Load Version Faci
12994		I-Load Oft-10 FACI Update
129010		I-Load MSID Assign SCB Baseline
19022		MPAD I-Load Paper Baseline 9/21
19054		Mods to 9/4 and 12/11 Baseline
19100		Interim Change Requests for PCN-1
12360D		RCS RM
12827		Ascent Aerosurface Test Input
12942A		MPS TVC Actuator Bypass
19039C		Ascent/Entry Structural PTI'S
19048		SRB TVC Reset/Override Scheduling
19057A		MPS TVC Reset/Override
19072		Comm Faults to OMS TVC FDBK SOP
19156		MPS TVC Positioning Increment
19179		Trans DAP/RCS SOP Rate Reduction
19234		RCS Abort Jet Firing Delay
19266		HYD Therm Cond Aerosurface Initialization
19277		MPS TVC Gravity Initialization
19282		Abort ASC RCS CMD SOP Rate
19300		FSSR Update PCN-2
19089		Delete Multiple MSID'S I-Load Data
19038		Resolution of I-Load Data Base Discrepancies
19376		Correct SPTI P.F. to 4.250
12920B		GRTLS Dash Lashup
19085A		APP COMFAULT Logic
19177A		Extinguish PBI Lamps
19207A		ORB RCS Cycle
19299		Mod OMS TVC
19306		I-Loads Changes for SRB
19365		OMS TVC Cmd
19366		Aero SLEW DWELL
19407		OMS Stow Correction
19339A		Remove SRB MON FCN
19340		Execution Rate
12981D		Onorb Flight Control
19333A		Mod to IDD

Table R.2-1. Historical Change Request Summary

CR No.	OI	CR Title
19500		FSSR Update PCN-3
19364		FCS 10 I-Load Ascent Flt Control First Stage and Second Stage
19376A		Correct Conflict in Principal Function Identification Number
19530		Revision of Hydraulic Thermal Cond. Aerosurface Initial Positioning
19544		A/E Structural PTI'S—Mod to CR 19039C STS-2
19550		SBTC SOP
19597A		SRB MON FCN I-Load
19628		Contradictor Statement in Hyd. Sys. SOP Reqmts.
19649		Clarification/Deletion of Effector SOP Output Initialization
19700		FSSR Update PCN-2 to Rev. B
19640A		RCS Jet Nomenclature Clean-Up
19756A		Clarification of CMS TVC Command Processing
19790A		Clarification of CR 19072A—OMS Thrust Vector Control FB SOP
19827A		Minus -Z Maneuver
19835A		Revision of OPS-3 Aero Surface Initialization
19900		FSSR Update PCN-3 to Rev. B
19934C		Rescheduling of the Hyd Sys and Scheduling of the Hyd Sys FDI (STS-2 & Subs)
19969		Clarification of Aero Actuator Command SOP (P.F. G4.50)
19983		Correct Principal Function Identification Number on CR 19544
29014		MPS TVC Command Processing – Compliance with Level B
29015		Correction to ASC RCS Cmd SOP Section of CR 19827
29040A		Actuator Initialization Review
29047		Revision of OMS TVC Cmd – I-Load Values for MM 602
29162A		I-Load Changes Resulting from “Owner’s Audit”
29246A		OMS TVC Cmd SOP I/O Table Correction
29300		FSSR Update PCN-4 to Rev. B
29333B		I-Load Changes Resulting from Owner’s Audit
29359		ClarificatiOn of SPTI Activation Criteria
29397A		Clarification of OMS TVC Active/Standby Select Processing
29404A		Initial SPTI Commands Not Required to be I-Loads
29476C		OMS Actuator Lock-Up Fix
29350A		BF Cmd RM Termination in MM 106
29506		Hyd. Thermal Conditioning SOP Corr.
29540A		Classify Hyd. Thermal Cond. SOP Req.
29563A		SRB Chamber Pressure Calibration I-Loads
29584		OMS TVC SOP Commfault Protection

Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
29585		BF Cmd RM Improvement
29632A		Remove OMS DR CK POS I/L
29679		OMS TVC CMD SOP–FDBK SOP/NM 601
28471B		HFE Overrun Definition
29149B		Add Program Interrupt Handling to Level A CPDS
29497C		OMS Actuator Lock–Up Inhibit Mod
29297		Use ASC RCS CMD SOP for Jet Processing in NM 602/603
29800		FSSR Update #8
29750A		SRB ATVC FDIR at SRB Ignition
29977B		RJD Toggle Circuit
393298		MPS Slew Check I/L (Ref Only)
39664A		SPTI SOP Correction
39665		Rudder Command – SPTI
39688A		Aerosurface Actuator SOP Timing
39722		OMS Processing Reqmt in MM 601
39730A		Rate Change – Hydraulic SOP
39087A		Head–Up Display (HUD)
39100A		CR Implement Baseline – Dec 1980
39130A		VW CROUT Display IL Change (Ref Only)
39335		Mod CR 29977B RJD–Toggle
39360A		MPS Actuator Cmd Processing
39365F		HUD Proc I/O Cleanup
39590B		Rudder/Speed Brake Hinge Interface
39612		Elimination of SRB Sep Mode Flag
39640		FSSR Update
39773I		Delete FCS Downmoding
39815A		Automated PTI
39851A		SRB TVC FDIR at ME Start
39895B		OMS Gimbal Drive Check
39862		Limit Value of Scaled Output
39897		Limit OMS Engine Movement
39950		FSSR Update #3
59004A		OMS Engine Stow in TAL
59050		FSSR Update
59026		OMS TVC Control
59126H		RCS XFEED MCA Optimization
59189A		ORB RCS CMD SOP JCT – On Cycle

Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
59223B		SRM XDUCER Scale Factor Const.
59252		Correct CR 59004A – OMS TAL Stow
59350		FSSR Update
59432A		Inhibit FDI for SSME TVC AC7
59752A		Correct Check SUM SOP
59754C		MCA Optimization MSID Change
59825		Cancel CR 39862
69125B		CR Implementation Baseline – September 1983
69315A		SRB Category Change (IL Ref Only)
69316A		SRC Category Creation (IL Ref Only)
69471		STS–13 SRM PC CAL I/L Offset (IL Ref Only)
69472A		STS–13 SRM PC IL Scale Fact (Ref Only)
69519		PRE–IMRB RI IL Ownership (Ref Only)
69550		March/April CR Implementation Baseline, 1984
69632		STS–14 SRM PC CAL I–Loads (Ref Only)
69648C		ZSO Category Update (IL Ref Only)
69700		FSSR Update #4
69764		SRC Category Update (IL Ref Only)
69997B		Entry TAL +X AFT RCS Dump
79026B		AFT RCS Dump Upgrade
79134E		OMS Burn in MM304
79149		RCS CMD SOP Initialization
79152D		Forward RCS PTI Logic
79158C		Forward RCS Dump
79190D		Override Display Update
79304B		OPS 3 Dump Cleanup
79352		Corrections to Fwd PTI Logic
79370		Scrub SPTI SOP
79406A		Override Display Cleanup
79409		Correct OMS TVC ACT/STBY Proc Doc
79562		CHECKSUM SOP Scrub
79584C		MPS DUMP-SSME in Stow Position
79589		IMRB Update to Revise SSME Slew Profile (Ref II Only)
79594A		Documentation Cleanup for Override Display
79790A		CR Implementation Baseline—November 1985
79994C		Reinstate SPTI SOP
89149B		OI-8A Version of CR 79596C

Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
89150H		Abort Control Sequence Scrub
89193D		ABT CNTL SEQ/Override Lashup
89245D		Post MECO TAL Declaration
89290B		FSSR Update #6
89423D		Gear Pitch Notch Filter
89471E		Unique AOA Navigaton Filter Covariance
89540B		I-Load Recategorization and Category Creation
89599C		Cleanup to Level B GN&C Document
89674E	22	Entry FCS I-Load / K-Load Conversion
89805		Errata Change CR 89665A Page 3 and IDD
89839B		SRB Monitor Function Const Type
89865A		Clarify Late Slew Check Requirements
89869		Delete ELV PFB SOP for MM601
89889H	20	Improved Nose Wheel Steering Software
89990E	21	Single Engine Auto Contingency Abort
89991E	21	Entry SSME Repositioning (for Drag Chute)
90023A	20	GNC Checkout Configuration (OI-20)
90109D	21	I-Load / K-Load Conversion: CAT STC, ZF0, ZF5, ZF6, ZS5
90114B	21	Abort Sequencing Redesign
90182	21	SCM Scrub Completion
90244B	21	CR 90109 K-Load Requirement Correction
90374C	20	Automated FSSR Constants
90421A	21	RCS Jet Availability Table Correction
90508B	21	Correct Minor K-Load Value Differences Between Requirements and Code
90647	23	Delete Downlist Requirement for AFT RCS Thruster Cycle Counters
90690A	24	Deletion of EQTN MSID Column from K-load FSSR Tables
90705H	25	3 Engines Out Auto Contingency
90790	24	Add Memory Configuration to the FSSR I-Load Tables
90814C	24	Add Description of Database Generated FSSR Parameter Tables
90857	25	ATVC Auto Override Removal
90894A	23	FSSR Doc Only Changes, Effector SOP
90904C	24	FSSR STS83-0026 Doc Only Changes, Sequencing
90960E	25	HAC Initiation Predictor and Position Error Displays
90964	25	Interface Clarification for 3 Engines Out – CR 90705H
90966A	24	Deletion of the Qualifier from the FSSR I-Load Tables
91066D	25	Standardize the FSSR Correlation Tables
92027B	25	TDMS-2 Required FSSR Changes

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