

Space Program Operations Contract

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

SEQUENCE REQUIREMENTS

**Prepared by The Boeing Company
Space Exploration**

Under Subcontract 6000132079, PDRD P1433q

December 14, 2007

DRD 1.4.3.3-q

Contract NNJ06VA01C



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**The Boeing Company
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G4.69 MPS ENTRY DUMP
G4.70 MPS DUMP SEQ
G4.114 R/S LCH SEQ
G4.115 SRB SEP SEQ
G4.116 ET SEP SEQ
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G4.165 SSME OPS
G4.181 SSME SOP
G4.203 SRB DATA ACQ
G4.215 LDG GEAR VLV CNTL
G4.222 MPS D/D SEQ
G4.228 MEC SOP

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G4.184 ABT OMS/RCS CONN

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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 |
| | 93160B | 32 | Year End Roll Over (YERO) Reset |
| | 93167A | 33 | Bearing Displays Documentation Clean-up |
| | 93175 | 32 | Expand Effectivity of SCR 93160B |

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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 | SCR No. | OI | SCR Title |
| N/A | 93175 | 32 | Expand Effectivity of SCR 93160B |
| 4.1.1.4-1. (T) | 93160B | 32 | Year End Roll Over (YERO) Reset |
| | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.1.1.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.1.3.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.2.1.4-1. (T) | 93160B | 32 | Year End Roll Over (YERO) Reset |
| | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| | 93167A | 33 | Bearing Displays Documentation Clean-up |
| 4.2.1.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.2.2.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.2.2.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.2.3.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| | 93167A | 33 | Bearing Displays Documentation Clean-up |
| 4.2.3.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| | 93167A | 33 | Bearing Displays Documentation Clean-up |
| 4.2.4.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| | 93167A | 33 | Bearing Displays Documentation Clean-up |
| 4.3.1.4-1. (T) | 93160B | 32 | Year End Roll Over (YERO) Reset |
| | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| | 93167A | 33 | Bearing Displays Documentation Clean-up |
| 4.3.1.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
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| 4.5.1.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.6.1.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
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| | 93167A | 33 | Bearing Displays Documentation Clean-up |
| 4.6.4.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |

| CHANGE REQUEST SUMMARY | | | |
|-------------------------------|----------------|-----------|--|
| Paragraph | SCR No. | OI | SCR Title |
| 4.7.2.1 | 92816D | 34 | Remove Software Related to FICS |
| 4.7.2.2 | 92816D | 34 | Remove Software Related to FICS |
| 4.7.2.3 | 92816D | 34 | Remove Software Related to FICS |
| 4.7.2.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| | 92816D | 34 | Remove Software Related to FICS |
| 4.7.2.4-2. (T) | 92816D | 34 | Remove Software Related to FICS |
| 4.7.6.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.7.6.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.7.9.1 | 92816D | 34 | Remove Software Related to FICS |
| 4.7.9.2 | 92816D | 34 | Remove Software Related to FICS |
| 4.7.9.3 | 92816D | 34 | Remove Software Related to FICS |
| 4.7.9.4-1. (T) | 92816D | 34 | Remove Software Related to FICS |
| 4.7.9.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.7.9.4-3. (T) | 92816D | 34 | Remove Software Related to FICS |
| 4.8.2.4-1. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.8.2.4-2. (T) | 93017G | 33 | Baseline RSS99D0100 with Expanded Downlist |
| 4.101. (F) | 92816D | 34 | Remove Software Related to FICS |
| 4.212.(1)(F) | 92816D | 34 | Remove Software Related to FICS |
| 4.212.(2)(F) | 92816D | 34 | Remove Software Related to FICS |
| 4.212.(4)(F) | 92816D | 34 | Remove Software Related to FICS |

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to specify the requirement details and formulations of Sequence Level B functional requirements for orbiter GN&C flight software.

1.2 SCOPE

This document contains requirement details and formulations for sequencing functions that are operative during operational flight. The sequences described in this document are processed by the redundant computer set. They can be classified into the following two categories:

1. Mission events that are nonrepeating, but predictable occurrences and require software to initiate and/or control the subsystem hardware functions. The requirement to use software for this process can be the result of time- or mission-critical events, hardware mechanization complexity, or effective reduction of the crew's workload.
2. Special computations, such as consumables monitoring (quantity gaging).

1.3 ORGANIZATION

This document is organized into the following sections:

1. Introduction
2. Applicable Documents
3. Overview
4. Detail Level Requirements

Section 1 defines the purpose, scope, and organization of this document. Section 2 lists applicable documents. Section 3 describes the contents of Section 4. Section 4 specifies the requirement details for each sequence. 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.

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 Constants 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 Systems 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 – 02
- SS-P-0002-580 Shuttle Functional Level Requirements, System 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 | GPC/DEU ICD |
| ICD 2-1S001 | Orbiter Primary Flight Software System and Backup Flight System Software Interface |

In the event of a conflict between the documents referenced herein and the contents of this specification, the precedence shall be determined as defined in paragraph 1.3 of CPDS SS-P-0002-170, Volume 1, System Level Requirements, Software.

3.0 OVERVIEW

3.1 DEFINITION

Subsystem sequencing is defined to be application processing in the avionics GPC's that is not a standard or self-contained portion of GN&C or SM application programs. Examples: IMU sequencing is a standard portion of GN&C; fault detection and annunciation (FDA) is a standard portion of SM; master timing unit (MTU) time management is contained in system software and, therefore, is not an application program. None of the examples is included in subsystem sequencing. Subsystem sequences are detailed in Section 4.

3.2 DOCUMENT DESCRIPTION

The detailed requirements described in Section 4 are organized according to subsystem disciplines; however, certain large sequences, e.g., launch, do not lend themselves to an individual subsystem approach and are defined as integrated sequences.

Each sequence contains the following five elements:

1. Introduction
2. Overview
3. Detailed requirements
4. Logic flow diagrams
5. Parameter tables

3.2.1 Introduction

This paragraph (4.X.X.1) contains a brief description of the sequence, when it is used, and how it interfaces with the crew, subsystem, and/or integrated mission event or events.

3.2.2 Overview

This paragraph (4.X.X.2) scopes the software requirements for the sequence. It expands the introduction to state when and how the sequence is initiated, how the sequence is controlled, and how it interfaces with the subsystem and mission events.

3.2.3 Detailed Requirements

This paragraph (4.X.X.3) contains the detailed step-by-step requirements for each principal function.

3.2.4 Logic Flow Diagrams

The logic diagrams show the logic flow of each principal function (4.XXX) and are included for information only.

3.2.5 Parameter Tables

This section contains the following tables:

Input/output functional parameters (4.X.X.4-1 and -2)

These tables contain a list of all input and output parameters from the GN&C Interface Definition Document (IDD) for each principal function. The tables are in alphabetical order by FSSR parameter name.

I-Load Table (4.X.X.4-3)

This table contains a list of all I-load parameters from JSC-19350, STS Flight Software Initialization Load, for each principal function. The table is in alphabetical order by FSSR parameter name.

K-Load Table (4.X.X.4-4)

This table contains a list of all K-load parameters for each principal function. The table is in alphabetical order by FSSR name.

Constants (4.X.X.4-5)

This table contains a list of all constants for each principal function. The table is in alphabetical order by FSSR name.

3.3 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.

3.4 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 DETAIL LEVEL REQUIREMENTS

4.0.1 TRACEABILITY

Table 4.0.1-1 shows the traceability of the software paragraphs in this FSSR with respect to the corresponding Sections of the Level B CPDS' documentation. In addition, Table 4.0.1-2 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 4.0.1-1. Sequencing Requirements Traceability | | |
|---|---|-----------------------------|
| Level B PF Number | Level B PF Name (Acronym) | Level C FSSR Section No. |
| 4.69 | MPS Entry Dump Sequence (MPS ENT DUMP) | 4.3.3 |
| 4.70 | MPS Dump Sequence (MPS DUMP) | 4.2.4 |
| 4.101 | OMS to RCS Gaging (OMS/RCS GAUGING) | 4.7.9 |
| 4.102 | RCS Quantity Monitor (RCS QTY MON) | 4.6.3 |
| 4.114 | Redundant Set Launch Sequence (R/S LCH SEQ) | 4.1.1 |
| 4.115 | SRB Separation Sequence (SRB SEP SEQ) | 4.2.2 |
| 4.116 | ET Separation Sequence (ET SEP SEQ) | 4.2.3 |
| 4.161 | Vent Doors (VENT CNTL SEQ) | 4.4.1 |
| 4.165 | SSME Operations Sequence (SSME OPS) | 4.2.1 |
| 4.181 | Space Shuttle Main Engine SOP (SSME SOP) | 4.8.2 |
| 4.182 | OMS Fire Sequence (OMS FIRE SEQ) | 4.7.6 |
| 4.184 | Abort OMS/RCS Interconnect (ABT OMS/RCS CONN) | 4.3.2 |
| 4.185 | RCS/RCS Crossfeed and Reconfiguration (RCS/RCS XFEED) | 4.6.1 |
| 4.189 | RCS Helium Regulator Failure Protection Sequence (RCS REG SEQ) | 4.6.4 |
| 4.192 | Abort Control Sequence (ABT CNTL SEQ) | 4.3.1 |

| Table 4.0.1-1. Sequencing Requirements Traceability | | |
|---|--|--------------------------|
| Level B PF Number | Level B PF Name (Acronym) | Level C FSSR Section No. |
| 4.203 | SRB MDM Data Acquisition (SRB DATA ACQ) | 4.1.3 |
| 4.212 | Orbit OMS/RCS Interconnect (ORB OMS/RCS CONN) | 4.7.2 |
| 4.215 | LDG VLV CNTL (LDG GEAR VLV CNT) | 4.5.1 |
| 4.222 | MPS Dedicated Display Drive Sequence (MPS D/D SEQ) | 4.1.2 |
| 4.228 | Master Events Controller SOP (MEC SOP) | 4.8.1 |

| Table 4.0.1-2. Sequencing FSSR/PRD Correlation | | | | | |
|--|----------------|-------------------------------|----------|---------------|--------------------------------------|
| Principal Function | FSSR Paragraph | FSSR Title | BFS PRD | PRD Paragraph | BFS Title |
| G4.69 | 4.3.3 | MPS Entry Dump Sequence | MG038120 | 3.3.1.6 | Entry MPS Dump |
| G4.70 | 4.2.4 | MPS Dump Sequence | MG038120 | 3.3.1.6 | MPS Dump Sequence |
| G4.101 | 4.7.9 | OMS to RCS Gaging | N/A | N/A | N/A |
| G4.102 | 4.6.3 | RCS Quantity Monitor | MG038120 | 3.3.1.10 | RCS Quantity Gauging Sequence |
| G4.114 | 4.1.1 | Redundant Set Launch Sequence | N/A | N/A | N/A |
| G4.115 | 4.2.2 | SRB Separation Sequence | MG038120 | 3.3.1.1 | SRB Separation Sequence Scheduler |
| G4.116 | 4.2.3 | ET Separation Sequence | MG038120 | 3.3.1.2 | SRB Separation Sequence |
| | | | MG038120 | 3.3.1.4 | ET Separation Sequence Scheduler |
| G4.161 | 4.4.1 | Vent Doors | MG038120 | 3.3.1.5 | ET Separation Sequence |
| | | | MG038120 | 3.3.1.11 | Vent Doors Sequence |
| G4.165 | 4.2.1 | SSME Operations Sequence | MG038120 | 3.3.1.3 | SSME Operations Sequence |
| G4.181 | 4.8.2 | Space Shuttle Main Engine SOP | MG038120 | 3.3.1.14 | SSME HIP |
| G4.182 | 4.7.6 | OMS Fire Sequence | MG038120 | 3.3.1.7 | OMS Engine Firing Sequence Scheduler |
| | | | MG038120 | 3.3.1.8 | OMS Engine Firing Sequence |
| G4.184 | 4.3.2 | Abort OMS/RCS Interconnect | MG038120 | 3.3.1.13 | Abort OMS/RCS Interconnect Sequence |

| Table 4.0.1-2. Sequencing FSSR/PRD Correlation | | | | | |
|--|----------------|--|----------|---------------|---|
| Principal Function | FSSR Paragraph | FSSR Title | BFS PRD | PRD Paragraph | BFS Title |
| G4.185 | 4.6.1 | RCS/RCS Crossfeed and Reconfiguration | N/A | N/A | N/A |
| G4.189 | 4.6.4 | RCS Helium Regulator Failure Protection Sequence | N/A | N/A | N/A |
| G4.192 | 4.3.1 | Abort Control Sequence | MG038120 | 3.3.1.9 | Abort Control Sequence |
| G4.203 | 4.1.3 | SRB MDM Data Acquisition | MG038120 | 3.3.1.1 | SRB Separation Sequence Scheduler |
| G4.212 | 4.7.2 | Orbit OMS/RCS Conn | N/A | N/A | N/A |
| G4.215 | 4.5.1 | LDG VLV CNTL | MG038120 | 3.3.1.12 | Landing Gear ISO Valve Control Sequence |
| G4.222 | 4.1.2 | MPS Dedicated Drive Sequence | MG038120 | 3.3.3.2 | Sequencing - User Interface |
| G4.228 | 4.8.1 | Master Events Controller SOP | N/A | N/A | N/A |
| | | | MG038120 | 3.3.1.15 | Backup Events Controller (BEC) |
| | | | MG038120 | 3.3.1.16 | MPS Helium Supply Pressure Monitor Sequence |

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4.1 PRELAUNCH

4.1.1 Redundant Set Launch Sequence (4.114)

4.1.1.1 Introduction

The redundant set (RS) launch sequence is used during the launch countdown in conjunction with the launch processing system (LPS) to perform the on-board automatic functions required in the last 28 seconds before SRB ignition. In addition, the RS launch sequence controls the on-board countdown clock from flight software initiation at the transition to OPS 1 until SRB ignition. The ability is also provided to call countdown holds; accept “hold” requests from LPS; and accept “resume count” or “recycle” commands from LPS. The SSME ignition commands are issued; and, after the required thrust level is reached and the required time delay has elapsed, the SRB’s are ignited. Failure of the SSME’s to reach the required thrust level will result in an inhibit of SRB ignition and a controlled SSME shutdown. The RS launch sequence terminates immediately after issuing SRB ignition and related commands.

4.1.1.2 Overview

The launch countdown is controlled by the LPS until 28 seconds before launch, at which time the on-board automatic RS launch sequence is enabled by LPS command. From this point, the on-board computer will perform functions by the on-board clock, but will honor “hold,” “resume count,” and “recycle” commands from LPS within the constraints of the auto recycle time.

The RS launch sequence sets flags to command the arming of the SRB ignition and hold-down release system PIC’s and the T0 umbilical release PIC’s. After a time delay, the SRB ignition PIC voltages are monitored for acceptable levels. The hold-down release system PIC’s and the T0 umbilical release system PIC’s are monitored by the LPS. The RS launch sequence logic provides for initiating a countdown “hold” if the SRB ignition PIC voltages fall below an acceptable level at any time prior to issuance of the SSME start commands. After the SSME start commands are issued, if the SRB ignition PIC voltages are not acceptable, the SSME’s are shut down.

The RS launch sequence also controls certain critical main propulsion system valves and monitors the engine ready indications from the SSME’s. After the main engine start commands are issued, the sequence monitors the thrust buildup of each engine; and unless all engines reach the required level within the required time, an orderly shutdown is commanded, and safing functions are initiated.

Normal thrust buildup to the required level will result in the SSME’s being commanded to the lift-off position, the SRB ignition and hold-down release commands being issued, termination of LPS polling, reset of the master timing unit, commanding of T0 umbilical release, and start of the event timer.

4.1.1.3 Detailed Requirements

Step A – LPS Processing. This step addresses the LPS processing that is performed every minor cycle by the RS Launch Sequencer. It ensures that the LPS GMTLO, RECYCLE, and RESUME commands are accepted only during countdown holds. During a countdown hold prior to SSME start the LO₂ bleed flow path is re-established for MPS LO₂ Geyser Prevention.

Monitor the following:

- (a) LPS Countdown Hold Flag

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- | | | |
|-----|---------------------------------|------------|
| (b) | RS Countdown Hold Flag | V90X8667X |
| (c) | GMTLO SET COMMAND | V99X8827X |
| (d) | LO2 POGO RECRC VLVS CMD'D OP FL | (INTERNAL) |
| (e) | ENG START CMD | (INTERNAL) |

If (a) and (b) are false, do not accept (1), (2), (3), proceed to step 1.

If (a) or (b) is true monitor (c). If (c) has not been accepted since it last became true, do not accept (3), then monitor (d) and (e), otherwise monitor (d) and (e).

If (d) is true and (e) is false, on the first pass issue (4) through (7), and (11) through (13), and terminate (8) through (10) then proceed to step 1. On the subsequent pass issue (14) through (16) and set (17) false, then proceed to step 1. Otherwise, proceed to step 1.

- | | | |
|------|--|-----------|
| (1) | GMTLO SET COMMAND | V99X8827X |
| (2) | RECYCLE COUNT CMD FLAG | V99X8830X |
| (3) | RESUME COUNT CMD FLAG | V99X8828X |
| (4) | MPS LO2 POGO RECRC 1 (PV20) CL CMD A | V41K1815X |
| (5) | MPS LO2 POGO RECRC 1 (PV20) CL CMD B | V41K1816X |
| (6) | MPS LO2 POGO RECRC 2 (PV21) CL CMD A | V41K1825X |
| (7) | MPS LO2 POGO RECRC 2 (PV21) CL CMD B | V41K1826X |
| (8) | MPS LO2 OVBD B/V (PV19) CL CMD A | V41K1584X |
| (9) | MPS LO2 OVBD B/V (PV19) CL CMD B | V41K1585X |
| (10) | MPS LO2 OVBD B/V (PV19) CL CMD C | V41K1586X |
| (11) | MPS E1 SHUTDOWN ENABLE CMD | V90X8367X |
| (12) | MPS E2 SHUTDOWN ENABLE CMD | V90X8368X |
| (13) | MPS E3 SHUTDOWN ENABLE CMD | V90X8369X |
| (14) | MPS E1 SHUTDOWN CMD | V90X8370X |
| (15) | MPS E2 SHUTDOWN CMD | V90X8371X |
| (16) | MPS E3 SHUTDOWN CMD | V90X8372X |
| (17) | LO2 POGO RECRC VLVS CMD'D OP FL (INTERNAL) | |

Step 1 – First Pass Check. This step provides a means of deactivating the FDI for MPS TVC CMD SOP and initializing the countdown clock on the first pass through the logic. The sequence is first called with OPS 101 PRO at T0–20 minutes in the count. The GMT of lift-off (GMTLO) is defined by the GMTLO_SET_COMMAND from LPS.

On the first pass through the logic issue (1) and (2) below, proceed to Step 9.

- | | | |
|-----|------------------------|-----------|
| (1) | RS COUNTDOWN HOLD FLAG | V90X8667X |
| (2) | MPS TVC SERVO OVRD CMD | V90X8374X |

On subsequent passes, if the countdown clock is being incremented, proceed to Step 1A, otherwise proceed to Step 9.

Step 1A – Termination of MEC Command Flags. This step issues the MEC master reset flag, resets the event timer and terminates the RS launch sequence.

Monitor the following:

- (a) T0 UMBILICAL RELEASED FLAG (INTERNAL)

If (a) = false, proceed to Step 1B.

If (a) = true, terminate the following output:

- (1) EVENT TIMER START FLAG V90X8403X

and issue the following output:

- (2) MEC 1 & 2 MASTER RESET FLAG V90X8258X

and then terminate the RS launch sequence.

Step 1B – Initiation of T0 Umbilical Release. This step provides for the issuance of the T0 umbilical release fire 1 and fire 2/3 commands on the next pass through the logic after the SRB ignition commands are sent.

Monitor the following:

- (a) SRB IGNITION CMD FLAG V90X8377X

If (a) = false, proceed to Step 1C.

If (a) = true, issue the following outputs:

- (1) T-0 UMB RELEASE FIRE 1 FLAG V90X8408X
(2) T-0 UMB RELEASE FIRE 2/3 FLAG V90X8698X
(3) T-0 UMBILICAL RELEASED FLAG (INTERNAL)

and then return to Step A.

Step 1C – Launch Sequence Abort Check. This step monitors the LAUNCH SEQUENCE ABORT FLAG, which is set, by (1) any engine failing to achieve the required percent chamber pressure within the required number of seconds after the start commands are issued, (2) any engine going into auto shutdown, (3) loss of data path or command path to any engine, (4) hydraulic or electronic lockup of any engine, or (5) an LPS countdown hold flag being set prior to issuance of SRB ignition commands. If the LAUNCH SEQUENCE ABORT FLAG is set, this step closes the LH2 4IN Disc valve, issues the MEC Master Reset flag, and invokes the engine shutdown logic.

Monitor the following:

- (a) LAUNCH SEQUENCE ABORT FLAG V90X8382X

If (a) = true, issue (1) one time only:

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(1) MEC 1 & 2 MASTER RESET FLAG V90X8258X

issue the following:

(2) MPS LH2 4IN DISC VLV (PD3) CL CMD V41K1422X

and terminate the following output:

(3) MPS LH2 4IN DISC VLV (PD3) OP CMD V41K1421X

then proceed to Step 1D. On subsequent passes proceed to Step 1D.

If (a) = false, proceed to Step 2.

Step 1D – Main Engine 1 Shutdown. This step controls pad abort helium interconnect and shutdown command toggling for ME-1.

Monitor the following:

(a) ENG 1 SHUTDOWN FLAG C (INTERNAL)
(b) ENG 1 SHUTDOWN TOGGLE FLAG (INTERNAL)

If (a) is false, proceed to Step 1E.

If (a) is true, issue output (1) and monitor (b).

If (b) is false, issue outputs (2) and (4), and proceed to Step 1E.

If (b) is true, issue output (3), terminate output (4), and proceed to Step 1E.

(1) MPS E1 HE INTCN OUT (LV 60) OP CMD A V41K1168X
(2) MPS E1 SHUTDOWN ENABLE CMD V90X8367X
(3) MPS E1 SHUTDOWN CMD V90X8370X
(4) ENG 1 SHUTDOWN TOGGLE FLAG (INTERNAL)

Step 1E – Main Engine 2 Shutdown. This step controls pad abort helium interconnect and shutdown command toggling for ME-2.

Monitor the following:

(a) ENG 2 SHUTDOWN FLAG B (INTERNAL)
(b) ENG 2 SHUTDOWN TOGGLE FLAG (INTERNAL)

If (a) is false, proceed to Step 1F.

If (a) is true, issue outputs (1) through (3) and monitor (b).

If (b) is false, issue outputs (4), and (6), and proceed to Step 1F.

If (b) is true, issue output (5), terminate output (6), and proceed to Step 1F.

- | | | |
|-----|-------------------------------------|------------|
| (1) | MPS E2 HE INTCN IN (LV 61) OP CMD A | V41K1262X |
| (2) | MPS E2 HE INTCN IN (LV 61) OP CMD B | V41K1263X |
| (3) | MPS REG HE XOVER VLV (LV 10) OP CMD | V41K1613X |
| (4) | MPS E2 SHUTDOWN ENABLE CMD | V90X8368X |
| (5) | MPS E2 SHUTDOWN CMD | V90X8371X |
| (6) | ENG 2 SHUTDOWN TOGGLE FLAG | (INTERNAL) |

Step 1F – Main Engine 3 Shutdown. This step controls pad abort helium interconnect and shutdown command toggling for ME-3.

Monitor the following:

- | | | |
|-----|----------------------------|------------|
| (a) | ENG 3 SHUTDOWN FLAG D | (INTERNAL) |
| (b) | MPS 3 SHUTDOWN TOGGLE FLAG | (INTERNAL) |

If (a) is false, proceed to Step 1G.

If (a) is true, issue output (1) and monitor (b).

If (b) is false, issue outputs (2), and (4), and proceed to Step 1G.

If (b) is true, issue output (3), terminate output (4) and proceed to Step 1G.

- | | | |
|-----|--------------------------------------|------------|
| (1) | MPS E3 HE INTCN OUT (LV 64) OP CMD A | V41K1368X |
| (2) | MPS E3 SHUTDOWN ENABLE CMD | V90X8369X |
| (3) | MPS E3 SHUTDOWN CMD | V90X8372X |
| (4) | ENG 3 SHUTDOWN TOGGLE FLAG | (INTERNAL) |

Step 1G – Increment Previous Value of CRT Timer Base Time. This step increments the previous value of the CRT timer base time stored in User Interface compool to cause the displayed time-to-go to become static.

Add 0.04 second to the previous value of the CRT timer base time stored in User Interface compool.

Proceed to Step 30.

Step 2 – ME-1 Pad Data Path Fail Check. This step monitors for a flag from the SSME SOP indicating invalid data from either the primary or secondary channel of the EIU. If the ME-1 PAD DATA PATH FAIL FLAG is set, the RS launch sequence will either call a countdown hold or initiate shutdown for ME-1.

Monitor the following:

- | | | |
|-----|------------------------------|-----------|
| (a) | ME-1 PAD DATA PATH FAIL FLAG | V95X1217X |
|-----|------------------------------|-----------|

If (a) = false, proceed to Step 2A.

If (a) = true, issue the following output:

- | | | |
|-----|------------------------------|-----------|
| (1) | ME-1 PAD DATA PATH FAIL HOLD | V90X8670X |
|-----|------------------------------|-----------|

and proceed to Step 2D.

Step 2A – ME–1 Control Failure Check. This step monitors for the ME–1 controller indicating either an electronic lockup, a hydraulic lockup, a major component failure, or engine limit exceeded. If any of these indicators are present and the engine start flag has not been issued, then a countdown hold is called. If the engine start flag has been issued, then shutdown commands for ME–1 are initiated.

Monitor the following:

- | | | |
|-----|----------------------------------|-----------|
| (a) | ME–1 ELECTRONIC LOCKUP MODE FLAG | V95X1194X |
| (b) | ME–1 HYDRAULIC LOCKUP MODE FLAG | V95X1198X |
| (c) | ME–1 MAJOR COMPONENT FAIL FLAG | V95X1230X |
| (d) | ME–1 ENGINE LIMIT EXCEEDED FLAG | V95X1190X |

If (a), (b), (c), and (d) all = false, proceed to Step 2C.

If either (a), (b), (c), or (d) = true, issue the following output:

- | | | |
|-----|------------------------|-----------|
| (1) | ME–1 CONTROL FAIL HOLD | V90X8679X |
|-----|------------------------|-----------|

and then proceed to Step 2D.

Step 2B – Deleted.

Step 2C – ME–1 Channel Fail Check. This step monitors for a flag from the SSME SOP indicating that the engine controller has declared a failure in one or more of the three command channels. If the fail flag is true, a countdown hold or engine shutdown is initiated. This step prevents lift–off with one channel failed on the pad.

Monitor the following:

- | | | |
|-----|------------------------|-----------|
| (a) | ME–1 CHANNEL FAIL FLAG | V95X1236X |
|-----|------------------------|-----------|

If (a) = false, proceed to Step 3.

If (a) = true, issue the following output:

- | | | |
|-----|------------------------|-----------|
| (1) | ME–1 CONTROL FAIL HOLD | V90X8679X |
|-----|------------------------|-----------|

and then proceed to Step 3D.

Step 2D – Initiation of Countdown Hold/ME–1 Shutdown. This step monitors the start flag for the main engines, and if the engines have not been started, it will call a countdown hold. If they have been started, it will initiate ME–1 shutdown.

Monitor the following:

- | | | |
|-----|---------------------------|------------|
| (a) | ENG START CMD ISSUED FLAG | (INTERNAL) |
|-----|---------------------------|------------|

If (a) = false, then issue the following output and proceed to Step 9:

(1) RS COUNTDOWN HOLD FLAG V90X8667X

If (a) = true, then issue the following outputs:

(2) ENG 1 SHUTDOWN FLAG C (INTERNAL)
(3) MPS E1 SHUTDOWN ENABLE CMD V90X8367X

and then proceed to Step 45.

Step 3 – ME–2 Pad Data Path Fail Check. This step monitors for a flag from the SSME SOP indicating invalid data from either the primary or secondary channel of the EIU. If the ME–2 PAD DATA PATH FAIL FLAG is set, the RS launch sequence will either call a countdown hold or initiate shutdown for ME–2.

Monitor the following:

(a) ME–2 PAD DATA PATH FAIL FLAG V95X1218X

If (a) = false, proceed to Step 3A.

If (a) = true, issue the following output:

(1) ME–2 PAD DATA PATH FAIL HOLD V90X8671X

and proceed to Step 3D.

Step 3A – ME–2 Control Failure Check. This step monitors for the ME–2 controller indicating either an electronic lockup, a hydraulic lockup, a major component failure, or engine limit exceeded. If any of these indicators are present and the engine start flag has not been issued, then a countdown hold is called. If the engine start flag has been issued, then shutdown commands for ME–2 are initiated.

Monitor the following:

(a) ME–2 ELECTRONIC LOCKUP MODE FLAG V95X1195X
(b) ME–2 HYDRAULIC LOCKUP MODE FLAG V95X1199X
(c) ME–2 MAJOR COMPONENT FAIL FLAG V95X1231X
(d) ME–2 ENGINE LIMIT EXCEEDED FLAG V95X1191X

If (a), (b), (c), and (d) all = false, proceed to Step 3C.

If either (a), (b), (c), or (d) = true, issue the following output:

(1) ME–2 CONTROL FAIL HOLD V90X8680X

and then proceed to Step 3D.

Step 3B – Deleted.

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Step 3C – ME–2 Channel Fail Check. This step monitors for a flag from the SSME SOP indicating that the engine controller has declared a failure in one or more of the three command channels. If the fail flag is true, a countdown hold or engine shutdown is initiated. This step prevents lift–off with one channel failed on the pad.

Monitor the following:

- (a) ME–2 CHANNEL FAIL FLAG V95X1237X

If (a) = false, proceed to Step 4.

If (a) = true, issue the following output:

- (1) ME–2 CONTROL FAIL HOLD V90X8680X

and then proceed to Step 2D.

Step 3D – Initiation of Countdown Hold/ME–2 Shutdown. This step monitors the start flag for the main engines, and if the engines have not been started, it will call a countdown hold. If they have been started, it will initiate ME–2 shutdown.

Monitor the following:

- (a) ENG START CMD ISSUED FLAG (INTERNAL)

If (a) = false, then issue the following output and proceed to Step 9.

- (1) RS COUNTDOWN HOLD FLAG V90X8667X

If (a) = true, then issue the following outputs:

- (2) ENG 2 SHUTDOWN FLAG B (INTERNAL)
(3) MPS E2 SHUTDOWN ENABLE CMD V90X8368X

and then proceed to Step 45.

Step 4 – ME–3 Pad Data Path Fail Check. This step monitors for a flag from the SSME SOP indicating invalid data from either the primary or secondary channel of the EIU. If the ME–3 PAD DATA PATH FAIL FLAG is set, the RS launch sequence will either call a countdown hold or initiate shutdown for ME–3.

Monitor the following:

- (a) ME–3 PAD DATA PATH FAIL FLAG V95X1219X

If (a) = false, proceed to Step 4A.

If (a) = true, issue the following output:

- (1) ME–3 PAD DATA PATH FAIL HOLD V90X8672X

and proceed to Step 4D.

Step 4A – ME–3 Control Failure Check. This step monitors for the ME–3 controller indicating either an electronic lockup, a hydraulic lockup, a major component failure, or engine limit exceeded. If any of these indicators are present and the engine start flag has not been issued, then a countdown hold is called. If the engine start flag has been issued, then shutdown commands for ME–3 are initiated.

Monitor the following:

- | | | |
|-----|----------------------------------|-----------|
| (a) | ME–3 ELECTRONIC LOCKUP MODE FLAG | V95X1196X |
| (b) | ME–3 HYDRAULIC LOCKUP MODE FLAG | V95X1200X |
| (c) | ME–3 MAJOR COMPONENT FAIL FLAG | V95X1232X |
| (d) | ME–3 ENGINE LIMIT EXCEEDED FLAG | V95X1192X |

If (a), (b), (c), and (d) all = false, proceed to Step 4C.

If either (a), (b), (c), or (d) = true, issue the following output:

- | | | |
|-----|------------------------|-----------|
| (1) | ME–3 CONTROL FAIL HOLD | V90X8681X |
|-----|------------------------|-----------|

and then proceed to Step 4D.

Step 4B – Deleted.

Step 4C – ME–3 Channel Fail Check. This step monitors for a flag from the SSME SOP indicating that the engine controller has declared a failure in one or more of the three command channels. If the fail flag is true, a countdown hold or engine shutdown is initiated. This step prevents lift–off with one channel failed on the pad.

Monitor the following:

- | | | |
|-----|------------------------|-----------|
| (a) | ME–3 CHANNEL FAIL FLAG | V95X1238X |
|-----|------------------------|-----------|

If (a) = false, proceed to Step 5.

If (a) = true, issue the following output:

- | | | |
|-----|------------------------|-----------|
| (1) | ME–3 CONTROL FAIL HOLD | V90X8681X |
|-----|------------------------|-----------|

and then proceed to Step 2D.

Step 4D – Initiation of Countdown Hold/ME–3 Shutdown. This step monitors the start flag for the main engines, and if the engines have not been started, it will call a countdown hold. If they have been started, it will initiate ME–3 shutdown.

Monitor the following:

- | | | |
|-----|---------------------------|------------|
| (a) | ENG START CMD ISSUED FLAG | (INTERNAL) |
|-----|---------------------------|------------|

If (a) = false, then issue the following output and proceed to Step 9.

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(1) RS COUNTDOWN HOLD FLAG V90X8667X

If (a) = true, then issue the following outputs:

(2) ENG 3 SHUTDOWN FLAG D (INTERNAL)
(3) MPS E3 SHUTDOWN ENABLE CMD V90X8369X

and then proceed to Step 45.

Step 5 – Time for Arming PIC’s for SRB Ignition. This step monitors the countdown clock; and at the proper time before SRB ignition, sets flags for the MEC SOP to initiate arming of the SRM ignition PIC’s, hold-down release PIC’s, and the T-0 umbilical-release PIC’s. The arm commands to the PIC’s will continuously be issued until (1) SRB ignition, (2) the LAUNCH SEQUENCE ABORT FLAG is set, (3) a main engine control problem develops, or (4) a recycle is initiated.

Monitor the following:

(a) COUNTDOWN TIME V90W8380C
(b) SRB_IGN_ARM_T V97U9701C

If (a) is less than (b) seconds, proceed to Step 9.

If (a) is greater than or equal to (b) seconds, one time only issue the following output flags and proceed to Step 6. Otherwise proceed to Step 6.

(1) SRM IGN ARM FLAG V90X8404X
(2) T0 UMB RELEASE ARM FLAG V90X8407X

Step 6 – SRM Ignition Arm Voltage Check. This step monitors the countdown clock, and at the selected time before SRB ignition, starts checking the ignition PIC voltages and their associated commfaults. The logic requires two successive passes wherein either one or more of the ignition PIC voltages are low or a commfault exists before a countdown hold is called. If a low voltage or a commfault occurs on the last pass through the logic leading to the issuance of the SRB ignition commands, then a launch sequence abort (SSME shutdown and launch scrub) will not be initiated.

Monitor the following:

(a) COUNTDOWN TIME V90W8380C
(b) SRB_PIC_VOLTS_CHK_T V97U9702C
(c) LH VOLTAGE IGN PIC CAP A B55V1603C
(d) LH VOLTAGE IGN PIC CAP B B55V1604C
(e) RH VOLTAGE IGN PIC CAP A B55V2603C
(f) RH VOLTAGE IGN PIC CAP B B55V2604C
(g) FA 1 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2845X
(h) FA 2 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2846X
(i) IGN CHECK FIRST PASS FLAG “D” (INTERNAL)
(j) SRB_IGN_PIC_LEVEL V97U9853C

If (a) is less than (b) seconds, proceed to Step 9.

If (a) is greater than or equal to (b) seconds and (c), (d), (e), and (f) all equal or exceed (j) counts (normal level of 35.7 volts equals 438 counts), and (g) and (h) both are false, then set (i) true and proceed to Step 6A.

If (a) is greater than or equal to (b) seconds and (i) is true and either (c), (d), (e), or (f) is less than (j) counts, or if either (g) or (h) is true, then set (i) = false and proceed to Step 6A.

If $(a) \geq (b)$ seconds and (i) = false and either $(c) < (j)$ counts or (g) is true, then issue the following output for downlist:

(1) LH IGN PIC CAP A HOLD V90X8383X

If $(a) \geq (b)$ seconds and (i) = false and either $(d) < (j)$ counts or (h) is true, then issue the following output for downlist:

(2) LH IGN PIC CAP B HOLD V90X8384X

If $(a) \geq (b)$ seconds and (i) = false and either $(e) < (j)$ counts or (g) is true, then issue the following output for downlist:

(3) RH IGN PIC CAP A HOLD V90X8385X

If $(a) \geq (b)$ seconds and (i) = false and either $(f) < (j)$ counts or (h) is true, then issue the following output for downlist:

(4) RH IGN PIC CAP B HOLD V90X8386X

Proceed to Step 7.

Step 6A – Critical Systems Parameter Check. This step monitors parameters related to flight-critical MDM's. Upon detection of a failure, a launch hold or a pad shutdown will be called.

Monitor the following:

| | | |
|-----|-----------------------------------|-----------|
| (a) | FF 1 MDM RETURN WORD BYPASS (HFE) | V91X2904X |
| (b) | FF 2 MDM RETURN WORD BYPASS (HFE) | V91X2905X |
| (c) | FF 3 MDM RETURN WORD BYPASS (HFE) | V91X2906X |
| (d) | FF 4 MDM RETURN WORD BYPASS (HFE) | V91X2907X |
| (e) | FA 1 MDM RETURN WORD BYPASS (HFE) | V91X2920X |
| (f) | FA 2 MDM RETURN WORD BYPASS (HFE) | V91X2921X |
| (g) | FA 3 MDM RETURN WORD BYPASS (HFE) | V91X2922X |
| (h) | FA 4 MDM RETURN WORD BYPASS (HFE) | V91X2923X |

If (a) through (h) are all false, proceed to Step 8.

If any failure indication in (a) through (h) is true, then issue the outputs below and proceed to Step 7.

(1) RS COUNTDOWN HOLD FLAG V90X8667X

(2) FLIGHT –CRITICAL MDM HOLD/ABORT

V90X8767X

Step 7 – Initiation of Hold/ME–1 Shutdown. This step is entered if one or more of the ignition PIC voltages are low or any flight critical MDM is bypassed. This step monitors the start flag for the main engines and, if the engines have not been started, will call a countdown hold. If they have been started, it will initiate ME–1 shutdown.

Monitor the following:

- (a) ENG START CMD ISSUED FLAG (INTERNAL)

If (a) = false, issue the following output and proceed to Step 9:

- (1) RS COUNTDOWN HOLD FLAG V90X8667X

If (a) = true, issue the following outputs and proceed to Step 45:

- (2) ENG 1 SHUTDOWN FLAG C (INTERNAL)
(3) MPS E1 SHUTDOWN ENABLE CMD V90X8367X

Step 8 – Main Engines Started Check. This step provides a bypass of the logic of Steps 8A through 28 inclusive, after the Main Engine 3 start command flag is issued in Step 28. After Engine 2 and Engine 1 start command flags are set true in Step 28A, this step also provides a bypass of Step 28A.

Monitor the following:

- (a) ENG START CMD ISSUED FLAG (INTERNAL)
(b) E1 START CMD ISSUED FLAG (INTERNAL)

If (a) = false, proceed to Step 8A.

If (a) = true and (b) = false, proceed to Step 28A.

If (a) = true and (b) = true, proceed to Step 29.

Step 8A – LO2 Overboard Bleed Valve Closure Check. This step monitors MPS LO2 Overboard Bleed Valve Close indicators, their bypass flags and their associated commfault flags to verify the valve is in close position before liftoff. Fail to verify LO2 Overboard Bleed Closure in two consecutive passes will result in countdown hold.

Monitor the following:

- (a) COUNTDOWN TIME V90W8380C
(b) CHK_PREVLVS_OPN_T V97U9711C
(c) LPS BYPASS LO2 OVBD B/V A FL V99X8835X
(d) LPS BYPASS LO2 OVBD B/V B FL V99X8837X
(e) MPS LO2 OVBD B/V (PV 19) CL IND A V41X1580X
(f) MPS LO2 OVBD B/V (PV 19) CL IND B V41X1581X
(g) FA2 INPUT PROM SEG 3, 10 STATUS(HFE) V91X2846X
(h) FA3 INPUT PROM SEG 3, 10 STATUS(HFE) V91X2847X

- (i) LO2 OVBD B/V FIRST PASS FL 'I' (INTERNAL)

If (a) ≤ (b) seconds or [(c) and (d) are true], then proceed to Step 9.

Otherwise, continue.

If (a) > (b) seconds, and (c) or (d) is false, on first pass, set (i)=true and proceed to monitor (c) through (h). On subsequent passes, proceed to monitor (c) through (h).

If ((e) is true, and both (c) and (h) are false) or ((f) is true, and both (d) and (g) are false) then set (i)=true and proceed to Step 9. Otherwise, proceed to monitor (i).

If (i) is true, then set (i)=false and proceed to Step 9.

If (i) is false, then set outputs (1) and (2) = true and proceed to Step 9.

- | | |
|---------------------------------|-----------|
| (1) MPS LO2 OVBD B/V CLOSE HOLD | V90X8399X |
| (2) RS COUNTDOWN HOLD FLAG | V90X8667X |

Step 9 – Monitor for Countdown Hold Requests. This step monitors for countdown hold requests from the launch processing system (LPS) as well as for countdown holds generated within the RS launch sequence. This provides a means of stopping the countdown clock and permits further checks for a resume count command or a recycle count command from the LPS. If a hold occurs later than the selected point in the count, an automatic recycle will occur.

Monitor the following:

- | | |
|-----------------------------|-----------|
| (a) LPS COUNTDOWN HOLD FLAG | V99X8829X |
| (b) RS COUNTDOWN HOLD FLAG | V90X8667X |
| (c) COUNTDOWN TIME | V90W8380C |
| (d) AUTO_RECYCLE_T | V97U9705C |

If both (a) and (b) = false, proceed to Step 12.

If (a) is true, issue output (3) and proceed to next "if" statement.

If either (a) or (b) = true and (c) is ≤ (d) seconds, stop the countdown clock and proceed to Step 10.

If either (a) or (b) = true and (c) is > (d) seconds, issue outputs (1) and (2).

- | | |
|---------------------------------|-----------|
| (1) MEC 1 & 2 MASTER RESET FLAG | V90X8258X |
| (2) ASC DAP RECYCLE FLAG | V90X8669X |
| (3) LPS COUNTDOWN HOLD | V90X8768X |

and perform the following functions:

- (4) Reset the countdown clock to T0–540 seconds, and stop the clock.
- (5) Re-initialize the RS launch sequence, except LO2 POGO RECRC VLVS CMD'D OP FL.

Proceed to Step 11A.

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Step 10 – Monitor LPS Resume Count Command Flag. This step is made after a countdown hold has been called. The LPS has the sole authority to initiate resumption of the countdown. A resume count command will (1) cause a reset of the LPS and RS countdown hold flags of Step 9, (2) reset all downlist items generated by the RS LAUNCH SEQUENCE, (3) issue the SSME SOP recycle flag, and (4) cause the count to proceed.

Monitor the following:

- (a) RESUME COUNT CMD FLAG V99X8828X

If (a) = false, proceed to Step 11.

If (a) = true, clear all RS launch sequence downlist items; set (1), (2), and (3) below = false; and set (4) true.

- (1) LPS COUNTDOWN HOLD FLAG V99X8829X
(2) RS COUNTDOWN HOLD FLAG V90X8667X
(3) RESUME COUNT CMD FLAG V99X8828X
(4) SSME SOP RECYCLE FLAG V90X8668X

Proceed to Step 12.

Step 11 – LPS Recycle Count Check. This step monitors for a recycle count command from the LPS after a countdown hold has been called.

Monitor the following:

- (a) RECYCLE COUNT CMD FLAG V99X8830X

If (a) = false, add 0.04 second to previous value of CRT timer base time in user interface compool and return to Step A.

If (a) = true, issue outputs (1) and (2).

- (1) MEC 1 & 2 MASTER RESET FLAG V90X8258X
(2) ASC DAP RECYCLE FLAG V90X8669X

and perform the following functions:

- (3) Reset the countdown clock to T0–540 seconds, and stop the clock.
(4) Re-initialize the RS launch sequence, except LO2 POGO RECRC VLVS CMD'D OP FL.

Proceed to Step 11A.

Step 11A – Provide New CRT Timer Base Time for a Count Recycle.

Monitor the following:

- (a) CLOCK-COMPUTER (GMT) V91W5000C
(b) SRB_IGN_TIME_DELAY V97U9726C

(c) START_SSMES_T

V97U9712C

Store [(a) + 540 + (b) + (c)], where (c) < 0, into CRT timer base time location in User Interface compool.

Return to Step A.

Step 12 – Monitor Countdown Clock Control. This step monitors for a flag from LPS to read the new GMT of lift-off data and reset the countdown clock.

Monitor the following:

| | | |
|-----|---------------------------|-----------|
| (a) | GMTLO SET COMMAND | V99X8827X |
| (b) | PREDICTED GMT OF LIFT-OFF | V99W8801C |
| (c) | CLOCK-COMPUTER (GMT) | V91W5000C |

If (a) = false, subtract (b) from (c), convert to seconds. Set this value in the countdown clock and proceed to Step 15.

If (a) = true, subtract (b) from (c), and convert to seconds. Set this value in the countdown clock and start counting. Reset the GMTLO SET COMMAND V99X8827X and output COUNTDOWN TIME V90W8380C and PREDICTED GMT OF LIFT-OFF V99W8801C for downlist.

Proceed to Step 15.

Step 13 – LPS Go for Auto Sequence Start. This step monitors the countdown clock and at the proper time looks for a flag from LPS to start the automatic on-board functions. If this flag is not received, a countdown hold is called.

Monitor the following:

| | | |
|-----|--------------------------------|-----------|
| (a) | COUNTDOWN TIME | V90W8380C |
| (b) | LPS GO FOR AUTO SEQUENCE START | V99X8803X |
| (c) | LPS_GO_FOR_AUTO_SEQ_T | V97U9700C |

If (a) is \leq (c) seconds, return to Step A.

If (a) is $>$ (c) seconds and (b) = false, then set outputs (1) and (2) true, and return to Step A.

On the first pass that (a) is $>$ (c) seconds and (b) = true, set output (3) = true and output (4) = false; then proceed to Step 16. On subsequent passes, proceed to Step 16.

| | | |
|-----|----------------------------------|-----------|
| (1) | LPS GO FOR AUTO SEQ START HOLD | V90X8393X |
| (2) | RS COUNTDOWN HOLD FLAG | V90X8667X |
| (3) | INDICATOR EVENT 6 AUTO SEQ START | V90X8683X |
| (4) | MPS TVC SERVO OVRD CMD | V90X8374X |

Step 14 – Deleted.

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Step 15 – Command IMU to Inertial. This step monitors the countdown clock and, at the proper time, sets a flag to deactivate IMU GC ALIGN (V4.11).

Monitor the following:

- | | | |
|-----|-------------------|-----------|
| (a) | COUNTDOWN TIME | V90W8380C |
| (b) | IMU_TO_INERTIAL_T | V97U9704C |

If $(a) \leq (b)$ seconds, proceed to Step 16B.

On the first path that $(a) > (b)$ seconds, issue the following output and proceed to Step 16B. On subsequent passes, proceed to Step 16B.

- | | | |
|-----|--------------------------|-----------|
| (1) | IMU PLATFORM RELEASE CMD | V90X8411X |
|-----|--------------------------|-----------|

Step 16 – Time to Open LO2 POGO Recirculation Valves. This step monitors the countdown clock and, at the proper time, terminates the LO2 POGO recirculation valve close commands, which permits the springloaded valves to open.

Monitor the following:

- | | | |
|-----|--------------------------|-----------|
| (a) | COUNTDOWN TIME | V90W8380C |
| (b) | OPN_LO2_POGO_RECRC_VLV_T | V97U9706C |

If $(a) \leq (b)$ seconds, proceed to Step 16A

If $(a) > (b)$ seconds, terminate (1) through (4), set output (5) true, and proceed to Step 16A.

- | | | |
|-----|---------------------------------------|------------|
| (1) | MPS LO2 POGO RECRC 1 (PV 20) CL CMD A | V41K1815X |
| (2) | MPS LO2 POGO RECRC 1 (PV 20) CL CMD B | V41K1816X |
| (3) | MPS LO2 POGO RECRC 2 (PV 21) CL CMD A | V41K1825X |
| (4) | MPS LO2 POGO RECRC 2 (PV 21) CL CMD B | V41K1826X |
| (5) | LO2 POGO RECRC VLVS CMD'D OP FL | (INTERNAL) |

Step 16A – Initialize the Navigation System. This step monitors the countdown clock and, at the proper time, sets a flag for the Ascent Nav Sequencer and the Ascent User Parameter Process Sequencer, and initializes the SSME throttle command.

Monitor the following:

- | | | |
|-----|----------------|-----------|
| (a) | COUNTDOWN TIME | V90W8380C |
| (b) | NAV_INIT_T | V97U9707C |

If $(a) \leq (b)$ seconds, proceed to Step 17.

If $(a) > (b)$ seconds and it is first pass, issue the following outputs and proceed to Step 17. Otherwise, proceed to Step 17.

- | | | |
|-----|--|-----------|
| (1) | NAV INIT FLAG | V90X8414X |
| (2) | COMMANDED SSME THROTTLE SETTING (K_CMD = 100%) | V90U1948C |

Step 16B – Update the CRT Timer Base Time and Configure Vent Doors for Launch. This step updates the CRT timer base time and then monitors the countdown clock and, at the proper time, sets a flag for the vent door sequence.

Monitor the following:

| | | |
|-----|--------------------------|-----------|
| (a) | COUNTDOWN TIME | V90W8380C |
| (b) | CONFIG_VNT_DRS_FOR_LCH_T | V97U9708C |
| (c) | CLOCK-COMPUTER (GMT) | V91W5000C |
| (d) | SRB_IGN_TIME_DELAY | V97U9726C |
| (e) | START_SSMES_T | V97U9712C |

Store [(c) – (a) + (d) + (e)], where (a) and (e) < 0, into the CRT timer base time location in User Interface compool. Then,

If (a) ≤ (b) seconds, proceed to Step 13.

If (a) > (b) seconds, issue the following output and proceed to Step 13.

| | | |
|-----|----------------------------------|-----------|
| (1) | CONFIG VENT DOORS FOR LAUNCH CMD | V90X8375X |
|-----|----------------------------------|-----------|

Step 17 – Time to Verify MPS Ready. This step monitors the countdown clock and, at the proper time, checks for any commfault indications for the LO₂ accumulator recirculation valve inputs. If any commfaults are present, an internal counter is incremented; and, if the counter reaches a count of two, a countdown hold is called.

Monitor the following:

| | | |
|-----|---------------------------------------|------------|
| (a) | COUNTDOWN TIME | V90W8380C |
| (b) | FLAG A | (INTERNAL) |
| (c) | DELETED | |
| (d) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (e) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |
| (f) | CHK_MPS_VLVS_POS_T | V97U9709C |

If (a) < (f) seconds, proceed to Step 20.

If (a) ≥ (f) seconds, and (b) is true, proceed to Step 20.

If (a) ≥ (f) seconds and (b), (d), and (e) are all false, then proceed to Step 19.

If (a) ≥ (f) seconds and (b) is false, and either (d), or (e) is true, then increment internal counter A by one count. If counter A is less than 2 counts, return to Step A. If counter A is equal to 2 counts, then issue the following outputs and return to Step A.

| | | |
|-----|------------------------------|-----------|
| (1) | RS COUNTDOWN HOLD FLAG | V90X8667X |
| (2) | MPS VALVE POS COMMFAULT HOLD | V90X8769X |

Step 17A – Deleted.

Step 18 – Deleted.

Step 19 – Check for Pogo Recirculation Valves Open. This step checks the two LO₂ POGO Recirc Valve positions and the appropriate LPS bypass flag. If either of the valves is not in the OPEN position and the LPS bypass flag is not set, then internal counter A is incremented by one count. If counter A is equal to 2 counts, a countdown hold is called.

Monitor the following:

- | | | |
|-----|--------------------------------------|-----------|
| (a) | MPS LO2 POGO RECIRC 1 (PV 20) OP IND | V41X1811X |
| (b) | MPS LO2 POGO RECIRC 2 (PV 21) OP IND | V41X1821X |
| (c) | LPS BYPASS OF LO2 POGO RECIRC VLV OP | V99X8833X |

If (a) and (b) are true or if (c) is true, then proceed to Step 19A.

If either (a) or (b) is false and (c) is false, then increment internal counter A by one count. If counter A is less than 2 counts, return to Step A. If counter A is equal to 2 counts, then issue the following outputs and return to Step A.

- | | | |
|-----|------------------------------|-----------|
| (1) | MPS LOX POGO RECIRC VLV HOLD | V90X8392X |
| (2) | RS COUNTDOWN HOLD FLAG | V90X8667X |

Step 19A – Check SSME's READY INDICATION. This step checks for the engine ready mode of the start preparation phase for each main engine as determined by flags from the SSME SOP. If all engine controllers indicate engine ready in the status words, the MPS start enable flag is issued, and the LH₂ prevalves are opened; if not, a countdown hold will be called.

Monitor the following:

- | | | |
|-----|-----------------------|-----------|
| (a) | MPS E-1 ENG READY IND | V95X1182X |
| (b) | MPS E-2 ENG READY IND | V95X1183X |
| (c) | MPS E-3 ENG READY IND | V95X1184X |

If either (a), (b), or (c) is false, issue the following outputs and return to Step A.

- | | | |
|-----|---------------------------------|-----------|
| (1) | R/S SEQ SSME GO FOR LAUNCH HOLD | V90X8395X |
| (2) | R/S COUNTDOWN HOLD FLAG | V90X8667X |

If (a), (b), and (c) are all true, then issue the following outputs:

- | | | |
|------|-------------------------------------|-----------|
| (3) | MPS E-1 LH2 PREVLEV (PV 4) OP CMD A | V41K1119X |
| (4) | MPS E-1 LH2 PREVLEV (PV 4) OP CMD B | V41K1120X |
| (5) | MPS E-1 LH2 PREVLEV (PV 4) OP CMD C | V41K1121X |
| (6) | MPS E-2 LH2 PREVLEV (PV 5) OP CMD A | V41K1219X |
| (7) | MPS E-2 LH2 PREVLEV (PV 5) OP CMD B | V41K1220X |
| (8) | MPS E-2 LH2 PREVLEV (PV 5) OP CMD C | V41K1221X |
| (9) | MPS E-3 LH2 PREVLEV (PV 6) OP CMD A | V41K1319X |
| (10) | MPS E-3 LH2 PREVLEV (PV 6) OP CMD B | V41K1320X |
| (11) | MPS E-3 LH2 PREVLEV (PV 6) OP CMD C | V41K1321X |

and issue, one time only

(12) MPS START ENABLE CMD FLAG V90X8361X

and terminate the following:

| | |
|---|-----------|
| (13) MPS E-1 LH2 PREVLV (PV 4) CL CMD A | V41K1122X |
| (14) MPS E-1 LH2 PREVLV (PV 4) CL CMD B | V41K1123X |
| (15) MPS E-1 LH2 PREVLV (PV 4) CL CMD C | V41K1124X |
| (16) MPS E-2 LH2 PREVLV (PV 5) CL CMD A | V41K1222X |
| (17) MPS E-2 LH2 PREVLV (PV 5) CL CMD B | V41K1223X |
| (18) MPS E-2 LH2 PREVLV (PV 5) CL CMD C | V41K1224X |
| (19) MPS E-3 LH2 PREVLV (PV 6) CL CMD A | V41K1322X |
| (20) MPS E-3 LH2 PREVLV (PV 6) CL CMD B | V41K1323X |
| (21) MPS E-3 LH2 PREVLV (PV 6) CL CMD C | V41K1324X |

and set internal flag A true.

Proceed to Step 20.

Step 20 – Time to Close LO₂ Overboard Bleed Valve. This step monitors the countdown clock and, at the proper time, commands the LO₂ overboard bleed valve closed.

Monitor the following:

| | |
|------------------------|-----------|
| (a) COUNTDOWN TIME | V90W8380C |
| (b) CLSE_LO2_OVBD_BV_T | V97U9710C |

If (a) ≤ (b) seconds, proceed to Step 21.

If (a) > (b) seconds, issue the following outputs on each successive pass through Step 20:

| | |
|---------------------------------------|-----------|
| (1) MPS LO2 OVBD B/V (PV 19) CL CMD A | V41K1584X |
| (2) MPS LO2 OVBD B/V (PV 19) CL CMD B | V41K1585X |
| (3) MPS LO2 OVBD B/V (PV 19) CL CMD C | V41K1586X |

Proceed to Step 21.

Step 21 – Time To Check LH₂ Prevalves. This step monitors the countdown clock, and at the proper time, proceeds to Step 22.

Monitor the following:

| | |
|----------------------|-----------|
| (a) COUNTDOWN TIME | V90W8380C |
| (b) CHK_PREVLVS_OP_T | V97U9711C |

If (a) ≤ (b) seconds, return to Step A.

If (a) > (b) seconds, then proceed to Step 22.

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Step 22 – ME–1 LH₂ Prevalve Check. This step monitors the ME–1 LH₂ prevalve position sensors and their associated commfaults. If either sensor indicates OPEN and is not commfaulted, then the sequence proceeds. If a valid OPEN indication is not obtained, then a countdown hold is called.

Monitor the following:

- | | | |
|-----|---------------------------------------|-----------|
| (a) | MPS E1 LH2 PREVLV (PV 4) OP IND A | V41X1104X |
| (b) | MPS E1 LH2 PREVLV (PV 4) OP IND B | V41X1106X |
| (c) | FA1 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2845X |
| (d) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |

If (a) is true and (c) is false, or if (b) is true and (d) is false, then proceed to Step 23; otherwise issue the following outputs and return to Step A.

- | | | |
|-----|--|-----------|
| (1) | MPS E–1 LH ₂ PREVLV OPEN HOLD | V90X8396X |
| (2) | RS COUNTDOWN HOLD FLAG | V90X8667X |

Step 23 – ME–2 LH₂ Prevalve Check. This step monitors the ME–2 LH₂ prevalve position sensors and their associated commfaults. If either sensor indicates OPEN and is not commfaulted, then the sequence proceeds. If a valid OPEN indication is not obtained, then a countdown hold is called.

Monitor the following:

- | | | |
|-----|---------------------------------------|-----------|
| (a) | MPS E2 LH2 PREVLV (PV 5) OP IND A | V41X1204X |
| (b) | MPS E2 LH2 PREVLV (PV 5) OP IND B | V41X1206X |
| (c) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (d) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |

If (a) is true and (c) is false, or if (b) is true and (d) is false, then proceed to Step 24; otherwise issue the following outputs and return to Step A.

- | | | |
|-----|--|-----------|
| (1) | MPS E–2 LH ₂ PREVLV OPEN HOLD | V90X8397X |
| (2) | RS COUNTDOWN HOLD FLAG | V90X8667X |

Step 24 – ME–3 LH₂ Prevalve Check. This step monitors the ME–3 LH₂ prevalve position sensors and their associated commfaults. If either sensor indicates OPEN and is not commfaulted, then the sequence proceeds. If a valid OPEN indication is not obtained, then a countdown hold is called.

Monitor the following:

- | | | |
|-----|---------------------------------------|-----------|
| (a) | MPS E3 LH2 PREVLV (PV 6) OP IND A | V41X1304X |
| (b) | MPS E3 LH2 PREVLV (PV 6) OP IND B | V41X1306X |
| (c) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |
| (d) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |

If (a) is true and (c) is false, or if (b) is true and (d) is false, then proceed to Step 25; otherwise issue the following outputs and return to Step A.

- | | | |
|-----|--|-----------|
| (1) | MPS E–3 LH ₂ PREVLV OPEN HOLD | V90X8398X |
|-----|--|-----------|

(2) RS COUNTDOWN HOLD FLAG

V90X8667X

Step 25 – Orbiter Vent Doors Check. This step monitors for all vent doors achieving the desired position for launch within the required time period. The vent door sequence provides an indication of the status for each of the doors. If a door failure exists and an LPS override for that door has been previously set, then the RS launch sequence will proceed with the count. If an LPS override has not been previously set, then the RS launch sequence will call a countdown hold.

Monitor the following:

- | | | |
|-----|----------------------------------|-----------|
| (a) | ORBITER VENT DOORS STATUS WORD | V90J8201C |
| (b) | LPS ORBITER VENT DOORS OVRD WORD | V99J8836C |

If all the indicators of (a) (Table 4.1–1) = true (no failures of any doors), then proceed to Step 26.

If any indicator(s) of (a) (Table 4.1–1) = false (one or more door failures), then read (b) (Table 4.1–2). If the corresponding override indicator in (b) = true for each specific door failure of (a), then proceed to Step 26.

If any indicator of (a) (Table 4.1–1) = false (door failure) and the corresponding override indicator in (b) (Table 4.1–2) = false, then issue the following outputs and return to Step A.

- | | | |
|-----|-------------------------|-----------|
| (1) | RS COUNTDOWN HOLD FLAG | V90X8667X |
| (2) | VENT DOOR POSITION HOLD | V90X8770X |

Step 26 – SSME’s Ready for Start. This step monitors the engine ready mode of the start preparation phase for each main engine as determined by flags from the SSME SOP. If all engine controllers provide engine ready indications in the status words, then the sequence will proceed; if not, a countdown hold will be called.

Monitor the following conditions:

- | | | |
|-----|-------------------|-----------|
| (a) | MPS E–1 READY IND | V95X1182X |
| (b) | MPS E–2 READY IND | V95X1183X |
| (c) | MPS E–3 READY IND | V95X1184X |

If (a) and (b) and (c) all = true, proceed to Step 27.

If either (a) or (b) or (c) = false, then issue the following outputs and return to Step A.

- | | | |
|-----|--------------------------------|-----------|
| (1) | RS SEQ SSME GO FOR LAUNCH HOLD | V90X8395X |
| (2) | RS COUNTDOWN HOLD FLAG | V90X8667X |

Step 27 – LPS Go for Main Engine Start. This step looks for a flag set by LPS indicating a positive “go” for start of the main engines. If this flag is not set, a countdown hold is called.

Monitor the following conditions:

- | | | |
|-----|------------------------------|-----------|
| (a) | LPS GO FOR ENGINE START FLAG | V99X8804X |
|-----|------------------------------|-----------|

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If (a) = true, proceed to Step 28.

If (a) = false, issue the following outputs and return to Step A.

- | | | |
|-----|------------------------------|-----------|
| (1) | LPS GO FOR ENGINE START HOLD | V90X8394X |
| (2) | RS COUNTDOWN HOLD FLAG | V90X8667X |

Step 28 – Time to Start Main Engines. This step monitors the countdown clock, and, at the proper time, issues the main engine start command flag for Engine 3 and the MPS TVC SERVO OVRD CMD flag. In addition, the timer for checking engine performance, and the start delay timers for Engine 2 and Engine 1 are started.

Monitor the following:

- | | | |
|-----|----------------|-----------|
| (a) | COUNTDOWN TIME | V90W8380C |
| (b) | START_SSMES_T | V97U9712C |

If (a) ≤ (b) seconds, return to Step A.

If (a) > (b) seconds, issue the following outputs:

- | | | |
|-----|---------------------------|------------|
| (1) | MPS TVC SERVO OVRD CMD | V90X8374X |
| (2) | ENG START CMD ISSUED FLAG | (INTERNAL) |

then issue the following output one time only:

- | | | |
|-----|-----------------------|-----------|
| (3) | MPS E3 START CMD FLAG | V90X8360X |
|-----|-----------------------|-----------|

and start timers for the following:

- | | | |
|-----|---------------------|------------|
| (4) | ENG THRUST OK TIMER | (INTERNAL) |
| (5) | SRB IGN DELAY TIMER | (INTERNAL) |

and then return to Step A.

Step 28A – Start of Engine 2 and Engine 1. This step provides for a time delay before setting the start flag for Engine 2 and a time delay before setting the start flag for Engine 1. The time delays before setting the start flags shall have an accuracy tolerance of ±1 millisecond.

If 120 ± 1 milliseconds have not elapsed since output (3) was issued in Step 28, proceed to Step 29.

If 120 ± 1 milliseconds have elapsed since output (3) was issued in Step 28, set the following output true one time only:

- | | | |
|-----|-----------------------|-----------|
| (1) | MPS E2 START CMD FLAG | V90X8359X |
|-----|-----------------------|-----------|

and set the following output true:

- | | | |
|-----|--------------------------|------------|
| (2) | E2 START CMD ISSUED FLAG | (INTERNAL) |
|-----|--------------------------|------------|

and then monitor for a 240 ± 1 millisecond time delay from issuance of output (3) in Step 28.

If 240 ± 1 milliseconds have not elapsed since output (3) in Step 28 was issued, proceed to Step 29.

If 240 ± 1 milliseconds have elapsed since output (3) in Step 28 was issued set the following output true one time only:

- | | |
|-------------------------------|------------|
| (3) MPS E1 START CMD FLAG | V90X8358X |
| (4) E-1 START CMD ISSUED FLAG | (INTERNAL) |

and then proceed to Step 29.

Step 29 – Check for any Engine in Shutdown. This step monitors the operating phase of each main engine via flags from the SSME SOP. During the start phase, one or more of the engines could go into automatic shutdown. If this occurs, it is necessary to inhibit the SRB ignition and perform an orderly shutdown of the other two engines.

Monitor the following:

- | | |
|--------------------------------|-----------|
| (a) MPS E1 SHUTDOWN PHASE | V95X1155X |
| (b) MPS E1 POST-SHUTDOWN PHASE | V95X1160X |
| (c) MPS E2 SHUTDOWN PHASE | V95X1156X |
| (d) MPS E2 POST-SHUTDOWN PHASE | V95X1161X |
| (e) MPS E3 SHUTDOWN PHASE | V95X1157X |
| (f) MPS E3 POST-SHUTDOWN PHASE | V95X1162X |

If (a), (b), (c), (d), (e), and (f) are all false, then proceed to Step 37.

If (a) or (b) = true, set output (7) true.

If (c) or (d) = true, set output (8) true.

If (e) or (f) = true, set output (9) true.

If either (a), (b), (c), (d), (e), or (f) = true, then terminate the following output:

- | | |
|------------------------------------|-----------|
| (1) PREP SSME's FOR LIFT -OFF FLAG | V90X8373X |
|------------------------------------|-----------|

and issue outputs (2) through (6)

- | | |
|---------------------------------------|------------|
| (2) LAUNCH SEQUENCE ABORT FLAG | V90X8382X |
| (3) CMD SSME's TO PRE-START POS FLAG | V90X8412X |
| (4) MPS SLEW COMPLETE FLAG | V90X8400X |
| (5) MPS TVC SERVO OVRD CMD | V90X8374X |
| (6) UNCOMMANDED ENGINE SHUTDOWN ABORT | V90X8771X |
| (7) ENG 1 SHUTDOWN FLAG C | (INTERNAL) |
| (8) ENG 2 SHUTDOWN FLAG B | (INTERNAL) |
| (9) ENG 3 SHUTDOWN FLAG D | (INTERNAL) |

Proceed to Step 30.

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Step 30 – ME–1 Status Check. This step monitors the ME–1 status word via SSME SOP flags; and when ME–1 enters shutdown, appropriate time delays are provided before closing the prevalues.

Monitor the following:

- | | | |
|-----|----------------------------|-----------|
| (a) | MPS E1 SHUTDOWN PHASE | V95X1155X |
| (b) | MPS E1 POST–SHUTDOWN PHASE | V95X1160X |

If (a) and (b) both = false, proceed to Step 30B.

If either (a) or (b) = true, monitor the following:

- | | | |
|-----|---------------------------|-----------|
| (c) | ME1_LOX_PREVLV_CLSE_DELAY | V97U9720C |
|-----|---------------------------|-----------|

If (c) seconds have not elapsed, proceed to Step 31.

If (c) seconds have elapsed, proceed to Step 30A.

Step 30A – Issuance of ME–1 Prevalve Close Commands. This step provides a time delay between issuance of the ME–1 LO₂ prevalve close commands and the ME–1 LH₂ prevalve close commands.

Issue the following outputs:

- | | | |
|-----|-----------------------------------|-----------|
| (1) | MPS E1 LO2 PREVLV (PV 1) CL CMD A | V41K1139X |
| (2) | MPS E1 LO2 PREVLV (PV 1) CL CMD B | V41K1140X |
| (3) | MPS E1 LO2 PREVLV (PV 1) CL CMD C | V41K1141X |
| (4) | MPS E1 LO2 PREVLV (PV 1) CL CMD D | V41K1142X |

and terminate the following outputs:

- | | | |
|-----|-----------------------------------|-----------|
| (5) | MPS E1 LO2 PREVLV (PV 1) OP CMD A | V41K1136X |
| (6) | MPS E1 LO2 PREVLV (PV 1) OP CMD B | V41K1137X |
| (7) | MPS E1 LO2 PREVLV (PV 1) OP CMD C | V41K1138X |
| (8) | MPS E1 LO2 PREVLV (PV 1) OP CMD D | V41K1143X |

and then monitor the following:

- | | | |
|-----|-----------------------------|-----------|
| (a) | ME1_LH2_PREVLV_CLSE_T_DELAY | V97U9727C |
|-----|-----------------------------|-----------|

If (a) seconds have not elapsed, proceed to Step 31.

If (a) seconds have elapsed, issue the following outputs:

- | | | |
|------|-----------------------------------|-----------|
| (9) | MPS E1 LH2 PREVLV (PV 4) CL CMD A | V41K1122X |
| (10) | MPS E1 LH2 PREVLV (PV 4) CL CMD B | V41K1123X |
| (11) | MPS E1 LH2 PREVLV (PV 4) CL CMD C | V41K1124X |

and terminate the following outputs:

- | | | |
|------|-----------------------------------|-----------|
| (12) | MPS E1 LH2 PREVLV (PV 4) OP CMD A | V41K1119X |
| (13) | MPS E1 LH2 PREVLV (PV 4) OP CMD B | V41K1120X |

(14) MPS E1 LH2 PREVLV (PV 4) OP CMD C V41K1121X

and then set the following flag = true:

(15) ME-1 PREVALVES CMD'D CLOSED FLAG (INTERNAL)

and proceed to Step 31.

Step 30B – Prevalve Closure for ME-1 If Unstarted During Pad Abort. If this engine has not been started prior to initiation of a pad abort, prevalve close delays are bypassed.

Monitor the following:

(a) E1 START COMMAND ISSUED FLAG (INTERNAL)

If (a) is true, proceed to Step 31.

If (a) is false, set V97U9727C ME1_LH2_PREVLV_CLSE_T_DELAY equal to zero and proceed to Step 30A.

Step 31 – ME-2 Status Check. This step monitors the ME-2 status word via SSME SOP flags, and when ME-2 enters shutdown, appropriate time delays are provided before closing the prevalves.

Monitor the following:

(a) MPS E2 SHUTDOWN PHASE V95X1156X
(b) MPS E2 POST-SHUTDOWN PHASE V95X1161X

If (a) and (b) both = false, proceed to Step 31B.

If either (a) or (b) = true, monitor the following:

(c) ME2_LOX_PREVLV_CLSE_DELAY V97U9721C

If (c) seconds have not elapsed, proceed to Step 32.

If (c) seconds have elapsed, proceed to Step 31A.

Step 31A – Issuance of ME-2 Prevalve Close Commands. This step provides a time delay between issuance of the ME-2 LO₂ prevalve close commands and the ME-2 LH₂ prevalve close commands.

Issue the following outputs:

(1) MPS E2 LO2 PREVLV (PV 2) CL CMD A V41K1239X
(2) MPS E2 LO2 PREVLV (PV 2) CL CMD B V41K1240X
(3) MPS E2 LO2 PREVLV (PV 2) CL CMD C V41K1241X
(4) MPS E2 LO2 PREVLV (PV 2) CL CMD D V41K1242X

and terminate the following outputs:

(5) MPS E2 LO2 PREVLV (PV 2) OP CMD A V41K1236X

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- | | | |
|-----|-----------------------------------|-----------|
| (6) | MPS E2 LO2 PREVLV (PV 2) OP CMD B | V41K1237X |
| (7) | MPS E2 LO2 PREVLV (PV 2) OP CMD C | V41K1238X |
| (8) | MPS E2 LO2 PREVLV (PV 2) OP CMD D | V41K1243X |

and then monitor the following:

- | | | |
|-----|-----------------------------|-----------|
| (a) | ME2_LH2_PREVLV_CLSE_T_DELAY | V97U9728C |
|-----|-----------------------------|-----------|

If (a) seconds have not elapsed, proceed to Step 32.

If (a) seconds have elapsed, issue the following outputs:

- | | | |
|------|---------------------------------|-----------|
| (9) | MPS E2 LH2 PREVALVE CLOSE CMD A | V41K1222X |
| (10) | MPS E2 LH2 PREVALVE CLOSE CMD B | V41K1223X |
| (11) | MPS E2 LH2 PREVALVE CLOSE CMD C | V41K1224X |

and terminate the following outputs:

- | | | |
|------|--------------------------------|-----------|
| (12) | MPS E2 LH2 PREVALVE OPEN CMD A | V41K1219X |
| (13) | MPS E2 LH2 PREVALVE OPEN CMD B | V41K1220X |
| (14) | MPS E2 LH2 PREVALVE OPEN CMD C | V41K1221X |

and then set the following flag = true:

- | | | |
|------|----------------------------------|------------|
| (15) | ME-2 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |
|------|----------------------------------|------------|

and proceed to Step 32.

Step 31B – Prevalve Closure for ME-2 If Unstarted During Pad Abort. If this engine has not been started prior to initiation of a pad abort, prevalve close delays are bypassed.

Monitor the following:

- | | | |
|-----|------------------------------|------------|
| (a) | E2 START COMMAND ISSUED FLAG | (INTERNAL) |
|-----|------------------------------|------------|

If (a) is true, proceed to Step 32.

If (a) is false, set V97U9728C ME2_LH2_PREVLV_CLSE_T_DELAY equal to zero and proceed to Step 31A.

Step 32 – ME-3 Status Check. This step monitors the ME-3 status word via SSME SOP flags, and when ME-3 enters shutdown, appropriate time delays are provided before closing the prevalves.

Monitor the following:

- | | | |
|-----|----------------------------|-----------|
| (a) | MPS E3 SHUTDOWN PHASE | V95X1157X |
| (b) | MPS E3 POST-SHUTDOWN PHASE | V95X1162X |

If (a) and (b) both = false, proceed to Step 33.

If either (a) or (b) = true, monitor the following:

(c) ME3_LOX_PREVLV_CLSE_DELAY

V97U9722C

If (c) seconds have not elapsed, proceed to Step 33.

If (c) seconds have elapsed, proceed to Step 32A.

Step 32A – Issuance of ME–3 Prevalve Close Commands. This step provides a time delay between issuance of the ME–3 LO₂ prevalve close commands and the ME–3 LH₂ prevalve close commands.

Issue the following outputs:

| | | |
|-----|-----------------------------------|-----------|
| (1) | MPS E3 LO2 PREVLV (PV 3) CL CMD A | V41K1339X |
| (2) | MPS E3 LO2 PREVLV (PV 3) CL CMD B | V41K1340X |
| (3) | MPS E3 LO2 PREVLV (PV 3) CL CMD C | V41K1341X |
| (4) | MPS E3 LO2 PREVLV (PV 3) CL CMD D | V41K1342X |

and terminate the following outputs:

| | | |
|-----|-----------------------------------|-----------|
| (5) | MPS E3 LO2 PREVLV (PV 3) OP CMD A | V41K1336X |
| (6) | MPS E3 LO2 PREVLV (PV 3) OP CMD B | V41K1337X |
| (7) | MPS E3 LO2 PREVLV (PV 3) OP CMD C | V41K1338X |
| (8) | MPS E3 LO2 PREVLV (PV 3) OP CMD D | V41K1343X |

and then monitor the following:

(a) ME3_LH2_PREVLV_CLSE_T_DELAY

V97U9729C

If (a) seconds have not elapsed, proceed to Step 33.

If (a) seconds have elapsed, issue the following outputs:

| | | |
|------|-----------------------------------|-----------|
| (9) | MPS E3 LH2 PREVLV (PV 6) CL CMD A | V41K1322X |
| (10) | MPS E3 LH2 PREVLV (PV 6) CL CMD B | V41K1323X |
| (11) | MPS E3 LH2 PREVLV (PV 6) CL CMD C | V41K1324X |

and terminate the following outputs:

| | | |
|------|-----------------------------------|-----------|
| (12) | MPS E3 LH2 PREVLV (PV 6) OP CMD A | V41K1319X |
| (13) | MPS E3 LH2 PREVLV (PV 6) OP CMD B | V41K1320X |
| (14) | MPS E3 LH2 PREVLV (PV 6) OP CMD C | V41K1321X |

and then set the following flag = true:

(15) ME–3 PREVALVES CMD'D CLOSED FLAG

(INTERNAL)

and proceed to Step 33.

Step 33 – Second and Third Engine Staggered Shutdown Priority Selection. This step establishes a priority for the second and third engine to be shut down in a staggered sequence. The engine priority is selected after a time delay has elapsed since the first engine was detected in shutdown phase or was commanded to shutdown.

Monitor the following:

- (a) ENG 2 SHUTDOWN FLAG B (INTERNAL)
- (b) TIMER_G_SHTDN_TIME_DELAY 1.12 (-0, + 0.08 SEC) (INTERNAL)
- (c) TIMER_J_SHTDN_TIME_DELAY 2.40 (-0, + 0.08 SEC) (INTERNAL)

On the first pass through this step, start (b) Timer “G” and (c) Timer “J” and return to Step A.

On subsequent passes:

If (b) seconds have not elapsed since starting timers “G” and “J,” then return to Step A.

If (c) seconds have elapsed since Timer “J” (c) started, set (1), (2), and (3) true and proceed to Step 34.

If (c) seconds have not elapsed since Timer “J” (c) started, monitor Timer “G” (b).

If (b) seconds have elapsed since Timer “G” (b) started and (a) = true on first pass, then set (3) true and return to Step A.

If (b) seconds have elapsed since Timer “G” (b) started and (a) = false on first pass, then set (2) true and return to Step A.

- (1) ENG 1 SHUTDOWN FLAG C (INTERNAL)
- (2) ENG 2 SHUTDOWN FLAG B (INTERNAL)
- (3) ENG 3 SHUTDOWN FLAG D (INTERNAL)

Step 34 – Initiation of Engine Shutdown Verification Timer. This step initiates the timer, which is checked in Step 35 to alert the LPS that all engines have not entered shutdown within the required time period after shutdown commands were issued.

On the first pass through this step, start the following timer and return to Step A.

- (1) VERIFY_ALL_ENG_SHTDN_TIMER V97U9719C

On all successive passes proceed to Step 35.

Step 35 – All SSME’s in Shutdown. This step monitors the phase of each engine via flags from the SSME SOP, and determines when all engines have entered the shutdown phase. If this does not occur within the proper time after shutdown commands for all engines were issued in Step 33, then a countdown hold flag is set. The LO₂ safing configuration for a pad abort is established, and RS launch sequencer is terminated.

Monitor the following:

- (a) MPS E1 SHUTDOWN PHASE V95X1155X
- (b) MPS E1 POST-SHUTDOWN PHASE V95X1160X
- (c) MPS E2 SHUTDOWN PHASE V95X1156X

- | | | |
|-----|----------------------------|-----------|
| (d) | MPS E2 POST-SHUTDOWN PHASE | V95X1161X |
| (e) | MPS E3 SHUTDOWN PHASE | V95X1157X |
| (f) | MPS E3 POST-SHUTDOWN PHASE | V95X1162X |
| (g) | VERIFY_ALL_ENG_SHTDN_TIMER | V97U9719C |

If either (a) or (b) = true, and either (c) or (d) = true, and either (e) or (f) = true, then proceed to Step 36.

If both (a) and (b) = false, or both (c) and (d) = false, or both (e) and (f) = false, and (g) seconds have not elapsed, then return to Step A.

If both (a) and (b) = false, or both (c) and (d) = false, or both (e) and (f) = false, and (g) seconds have elapsed, then issue (1) and (2), terminate (3) through (5) and terminate the RS launch sequence.

- | | | |
|-----|-----------------------------------|-----------|
| (1) | ENGINE SHUTDOWN VERIFICATION HOLD | V90X8389X |
| (2) | RS COUNTDOWN HOLD FLAG | V90X8667X |
| (3) | MPS LO2 OVBD B/V (PV19) CL CMD A | V41K1584X |
| (4) | MPS LO2 OVBD B/V (PV19) CL CMD B | V41K1585X |
| (5) | MPS LO2 OVBD B/V (PV19) CL CMD C | V41K1586X |

Step 36 – Prevalves Commanded Closed Check. This step checks to see that all prevalves have been commanded closed before terminating the launch sequence. This assures that the time delays of Steps 30, 31, and 32 can occur and that all prevalves will be commanded closed, and the LO2 safing configuration for a pad abort is established before termination of the RS launch sequence.

Monitor the following:

- | | | |
|-----|----------------------------------|------------|
| (a) | ME-1 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |
| (b) | ME-2 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |
| (c) | ME-3 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |

If either (a), (b), or (c) = false, return to Step A.

If (a), (b), and (c) all = true, set output (1) true, terminate (2) through (4) and then terminate the RS launch sequence.

- | | | |
|-----|----------------------------------|-----------|
| (1) | ASCENT DAP RECYCLE FLAG | V90X8669X |
| (2) | MPS LO2 OVBD B/V (PV19) CL CMD A | V41K1584X |
| (3) | MPS LO2 OVBD B/V (PV19) CL CMD B | V41K1585X |
| (4) | MPS LO2 OVBD B/V (PV19) CL CMD C | V41K1586X |

Step 37 – LPS Countdown Hold Check. This step monitors the LPS countdown hold flag and, if set after the main engine start commands have been issued, initiates a launch pad abort and the shutdown of ME-1, which will be followed after a time delay by shutdown of ME-2 and ME-3.

Monitor the following:

- | | | |
|-----|-------------------------|-----------|
| (a) | LPS COUNTDOWN HOLD FLAG | V99X8829X |
|-----|-------------------------|-----------|

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If (a) = false, proceed to Step 37A.

If (a) = true, issue the following outputs:

- | | | |
|-----|----------------------------|------------|
| (1) | ENG 1 SHUTDOWN FLAG C | (INTERNAL) |
| (2) | MPS E1 SHUTDOWN ENABLE CMD | V90X8367X |
| (3) | LPS COUNTDOWN HOLD | V90X8768X |

and then proceed to Step 45.

Step 37A – All Engines at Required Percent Thrust. This step monitors the percent chamber pressure for all engines via the SSME SOP. When all engines reach the required chamber pressure, then flags are set for the MPS TVC CMD SOP, the SRB TVC CMD SOP, and the ASC DAP.

Monitor the following:

- | | | |
|-----|-----------------------------|-----------|
| (a) | MPS E-1 PERCENT CH PRESS | V95U1186C |
| (b) | MPS E-2 PERCENT CH PRESS | V95U1187C |
| (c) | MPS E-3 PERCENT CH PRESS | V95U1188C |
| (d) | ALL_ENG_PERCENT_CHB_PRS_CHK | V97U9713C |

If either (a) or (b) or (c) \leq (d) percent, then proceed to Step 38.

If (a), (b), and (c) all $>$ (d) percent, then terminate the following output:

- | | | |
|-----|------------------------|-----------|
| (1) | MPS TVC SERVO OVRD CMD | V90X8374X |
|-----|------------------------|-----------|

and issue the following output:

- | | | |
|-----|-------------------------------|-----------|
| (2) | PREP SSME'S FOR LIFT-OFF FLAG | V90X8373X |
|-----|-------------------------------|-----------|

and proceed to Step 37B.

Steps 37B – MPS Actuator Port Commfault Checks. This step checks for any commfault indications relative to the actuator port checks to be made in Steps 42, 43, and 44. The first time that a commfault occurs the actuator port checks in Steps 42, 43, and 44 are bypassed. If a commfault indication is present on two successive cycles, then the MPS Actuator Port Commfault Abort flag is set, a launch pad abort and ME-1 shutdown is initiated.

Monitor the following:

- | | | |
|-----|---------------------------------------|------------|
| (a) | FA1 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2845X |
| (b) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (c) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (d) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |
| (e) | COMMFAULT FIRST PASS FLAG "E" | (INTERNAL) |

If (a), (b), (c), and (d) all = false, then set (e) = true and proceed to Step 42.

If either (a), (b), (c), or (d) = true, and (e) = true, then set (e) = false and proceed to Step 38.

If either (a), (b), (c), or (d) = true and (e) = false, then issue the following outputs:

- | | | |
|-----|------------------------------|------------|
| (1) | ENG 1 SHUTDOWN FLAG C | (INTERNAL) |
| (2) | MPS E1 SHUTDOWN ENABLE CMD | V90X8367X |
| (3) | MPS ACT PORT COMMFAULT ABORT | V90X8772X |

and then proceed to Step 45.

Step 38 – ME–1 at Required Percent Thrust. This step monitors the ME–1 chamber pressure via the SSME SOP. If the chamber pressure does not reach the required level within the required number of seconds from the time the start commands were issued in Step 28, then the ME-1 Low Chamber Pressure abort flag is set, a launch pad abort and ME–1 shutdown is initiated.

Monitor the following:

- | | | |
|-----|----------------------------|------------|
| (a) | MPS E–1 PERCENT CH PRESS | V95U1186X |
| (b) | ENG_PERCENT_CHB_PRS_FOR_GO | V97U9714C |
| (c) | ENG_TIMER_FOR_THRUST_OK | V97U9716C |
| (d) | ENG THRUST OK TIMER | (INTERNAL) |

If (a) \geq (b) percent, proceed to Step 39.

If (a) < (b) percent, and (d) < (c) since (d) was started in Step 28, return to Step A.

If (a) < (b) percent, and (d) \geq (c) since (d) was started in Step 28, issue the following outputs:

- | | | |
|-----|---------------------------------|------------|
| (1) | ENG 1 SHUTDOWN FLAG C | (INTERNAL) |
| (2) | MPS E1 SHUTDOWN ENABLE CMD | V90X8367X |
| (3) | ME–1 LOW CHAMBER PRESSURE ABORT | V90X8773X |

and then proceed to Step 45.

Step 39 – ME–2 at Required Percent Thrust. This step monitors the ME–2 percent chamber pressure via the SSME SOP. If the chamber pressure does not reach the required level within the required number of seconds from the time the start commands were issued in Step 28, then the ME-2 Low Chamber Pressure abort flag is set, a launch pad abort and ME–2 shutdown is initiated.

Monitor the following:

- | | | |
|-----|----------------------------|------------|
| (a) | MPS E–2 PERCENT CH PRESS | V95U1187X |
| (b) | ENG_PERCENT_CHB_PRS_FOR_GO | V97U9714C |
| (c) | ENG_TIMER_FOR_THRUST_OK | V97U9716C |
| (d) | ENG THRUST OK TIMER | (INTERNAL) |

If (a) \geq (b) percent, proceed to Step 40.

If (a) < (b) percent, and (d) < (c) since (d) was started in Step 28, then return to Step A.

If (a) < (b) percent, and (d) \geq (c) since (d) was started in Step 28, then issue the following outputs:

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- | | | |
|-----|---------------------------------|------------|
| (1) | ENG 2 SHUTDOWN FLAG B | (INTERNAL) |
| (2) | MPS E2 SHUTDOWN ENABLE CMD | V90X8368X |
| (3) | ME-2 LOW CHAMBER PRESSURE ABORT | V90X8774X |

and then proceed to Step 45.

Step 40 – ME-3 at Required Percent Thrust. This step monitors the ME-3 percent chamber pressure via the SSME SOP. If the chamber pressure does not reach the required level within the required number of seconds from the time the start commands were issued in Step 28, then the ME-3 Low Chamber Pressure abort flag is set, a launch pad abort and ME-3 shutdown is initiated.

Monitor the following:

- | | | |
|-----|----------------------------|------------|
| (a) | MPS E-3 PERCENT CH PRESS | V95U1188X |
| (b) | ENG_PERCENT_CHB_PRS_FOR_GO | V97U9714C |
| (c) | ENG_TIMER_FOR_THRUST_OK | V97U9716C |
| (d) | ENG THRUST OK TIMER | (INTERNAL) |

If (a) \geq (b) percent, proceed to Step 41.

If (a) < (b) percent, and (d) < (c) since (d) was started in Step 28, then return to Step A.

If (a) < (b) percent, and (d) \geq (c) since (d) was started in Step 28, then issue the following outputs:

- | | | |
|-----|---------------------------------|------------|
| (1) | ENG 3 SHUTDOWN FLAG D | (INTERNAL) |
| (2) | MPS E3 SHUTDOWN ENABLE CMD | V90X8369X |
| (3) | ME-3 LOW CHAMBER PRESSURE ABORT | V90X8775X |

and then proceed to Step 45.

Step 41 – Go for SRB Ignition Check. This step provides a time delay to permit critical SSME actuator checks after all engines have reached the required thrust level for re-enabling MPS TVC FDIR. The time delay is initiated on the first pass through Step 28. If any engine actuator has a port failure after all engines have reached 90 percent thrust, that engine will be shut down first followed by the other two engines after a time delay. This step also monitors the GROUND CHECKOUT ENABLE FLAG to determine if an actual flight firing of the engines should occur, or if a ground checkout test is being performed. If a ground checkout test is being performed, SRB ignition will not be commanded.

Monitor the following:

- | | | |
|-----|----------------------------|------------|
| (a) | SRB IGN DELAY TIMER | (INTERNAL) |
| (b) | SRB_IGN_TIME_DELAY | V97U9726C |
| (c) | GNC GROUND CHECKOUT ENABLE | V93X5538X |

If (a) < (b), return to Step A

If (a) \geq (b), and (c) is false, proceed to Step 41B.

If (a) \geq (b), and (c) is true, return to Step A.

Step 41A – Deleted.

Step 41B – SRB Ignition. This step commands SRB ignition based on all previous checks having been passed.

Issue the following outputs:

- | | | |
|-----|----------------------------|-----------|
| (1) | SRM IGN FIRE 1 FLAG | V90X8405X |
| (2) | SRM IGN FIRE 2/3 FLAG | V90X8699X |
| (3) | TERMINATE LPS POLLING FLAG | V90X8378X |
| (4) | MODE CONTROL MET RESET CMD | V90X8401X |
| (5) | READ GMT & STORE FLAG | V90X8402X |
| (6) | EVENT TIMER START FLAG | V90X8403X |
| (7) | SRB IGNITION CMD FLAG | V90X8377X |

and then return to Step A.

Steps 41C Through 41E – Deleted.

Step 42 – ME-1 Actuator Port Checks. This step provides a check of the actuator ports for ME-1. If any actuator port failure is present for two successive cycles, then the ME-1 Actuator Port fail flag is set, a launch pad abort and a shutdown of ME-1 is initiated.

Monitor the following:

- | | | |
|-----|---|------------|
| (a) | MPS ENG 1 P ACTR A FAIL | V79X1170X |
| (b) | MPS ENG 1 Y ACTR A FAIL | V79X1171X |
| (c) | MPS ENG 1 P ACTR B FAIL | V79X1173X |
| (d) | MPS ENG 1 Y ACTR B FAIL | V79X1174X |
| (e) | MPS ENG 1 P ACTR C FAIL | V79X1176X |
| (f) | MPS ENG 1 Y ACTR C FAIL | V79X1177X |
| (g) | MPS ENG 1 P ACTR D FAIL | V79X1178X |
| (h) | MPS ENG 1 Y ACTR D FAIL | V79X1179X |
| (i) | ME-1 ACTR PORT FAIL FIRST PASS FLAG “F” | (INTERNAL) |

If (a), (b), (c), (d), (e), (f), (g), and (h) all = false, then set (i) = true and proceed to Step 43.

If either (a) or (b) or (c) or (d) or (e) or (f) or (g) or (h) = true and (i) = true, then set (i) = false and proceed to Step 43.

If either (a) or (b) or (c) or (d) or (e) or (f) or (g) or (h) = true and (i) = false, then issue the following outputs:

- | | | |
|-----|----------------------------|------------|
| (1) | ENG 1 SHUTDOWN FLAG C | (INTERNAL) |
| (2) | MPS E1 SHUTDOWN ENABLE CMD | V90X8367X |
| (3) | ME-1 ACT PORT FAIL ABORT | V90X8776X |

and then proceed to Step 45.

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Step 43– ME–2 Actuator Port Checks. This step provides a check of the actuator ports for ME–2. If any actuator port failure is present for two successive cycles, then the ME-2 Actuator Port Fail flag is set, a launch pad abort and a shutdown of ME–2 is initiated.

Monitor the following:

- | | | |
|-----|---|------------|
| (a) | MPS ENG 2 P ACTR A FAIL | V79X1270X |
| (b) | MPS ENG 2 Y ACTR A FAIL | V79X1271X |
| (c) | MPS ENG 2 P ACTR B FAIL | V79X1273X |
| (d) | MPS ENG 2 Y ACTR B FAIL | V79X1274X |
| (e) | MPS ENG 2 P ACTR C FAIL | V79X1276X |
| (f) | MPS ENG 2 Y ACTR C FAIL | V79X1277X |
| (g) | MPS ENG 2 P ACTR D FAIL | V79X1278X |
| (h) | MPS ENG 2 Y ACTR D FAIL | V79X1279X |
| (i) | ME–2 ACTR PORT FAIL FIRST PASS FLAG “G” | (INTERNAL) |

If (a), (b), (c), (d), (e), (f), (g), and (h) all = false, then set (i) = true and proceed to Step 44.

If either (a) or (b) or (c) or (d) or (e) or (f) or (g) or (h) = true and (i) = true, then set (i) = false and proceed to Step 44.

If either (a) or (b) or (c) or (d) or (e) or (f) or (g) or (h) = true and (i) = false, then issue the following outputs:

- | | | |
|-----|----------------------------|------------|
| (1) | ENG 2 SHUTDOWN FLAG B | (INTERNAL) |
| (2) | MPS E2 SHUTDOWN ENABLE CMD | V90X8368X |
| (3) | ME–2 ACT PORT FAIL ABORT | V90X8777X |

and then proceed to Step 45.

Step 44 – ME–3 Actuator Port Checks. This step provides a check of the actuator ports for ME–3. If any actuator port failure is present for two successive cycles, then the ME-3 Actuator Port Fail flag is set, a launch pad abort and a shutdown of ME–3 is initiated.

Monitor the following:

- | | | |
|-----|---|------------|
| (a) | MPS ENG 3 P ACTR A FAIL | V79X1370X |
| (b) | MPS ENG 3 Y ACTR A FAIL | V79X1371X |
| (c) | MPS ENG 3 P ACTR B FAIL | V79X1373X |
| (d) | MPS ENG 3 Y ACTR B FAIL | V79X1374X |
| (e) | MPS ENG 3 P ACTR C FAIL | V79X1376X |
| (f) | MPS ENG 3 Y ACTR C FAIL | V79X1377X |
| (g) | MPS ENG 3 P ACTR D FAIL | V79X1378X |
| (h) | MPS ENG 3 Y ACTR D FAIL | V79X1379X |
| (i) | ME–3 ACTR PORT FAIL FIRST PASS FLAG “H” | (INTERNAL) |

If (a), (b), (c), (d), (e), (f), (g), and (h) all = false, then set (i) = true and proceed to Step 38.

If either (a) or (b) or (c) or (d) or (e) or (f) or (g) or (h) = true and (i) = true, then set (i) = false and proceed to Step 38.

If either (a) or (b) or (c) or (d) or (e) or (f) or (g) or (h) = true and (i) = false, then issue the following outputs:

- | | | |
|-----|----------------------------|------------|
| (1) | ENG 3 SHUTDOWN FLAG D | (INTERNAL) |
| (2) | MPS E3 SHUTDOWN ENABLE CMD | V90X8369X |
| (3) | ME-3 ACT PORT FAIL ABORT | V90X8778X |

and then proceed to Step 45.

Step 45 – Launch Abort. This step declares a launch abort, overrides the TVC actuator bypass, and commands the main engines to the pre-start position in preparation for engine shutdown.

Set outputs (1) to (3) and (7) to (9) true, output (10) false and monitor the following:

- | | | |
|-----|-----------------------|----------|
| (a) | ENG 1 SHUTDOWN FLAG C | INTERNAL |
| (b) | ENG 2 SHUTDOWN FLAG B | INTERNAL |
| (c) | ENG 3 SHUTDOWN FLAG D | INTERNAL |

If (a) is true set (4) true.

If (b) is true set (5) true.

If (c) is true set (6) true.

and then return to Step A.

- | | | |
|------|----------------------------------|------------|
| (1) | LAUNCH SEQUENCE ABORT FLAG | V90X8382X |
| (2) | CMD SSME'S TO PRE-START POS FLAG | V90X8412X |
| (3) | MPS SLEW CHECK COMPLETE | V90X8400X |
| (4) | ENG 1 SHUTDOWN TOGGLE FLAG | (INTERNAL) |
| (5) | ENG 2 SHUTDOWN TOGGLE FLAG | (INTERNAL) |
| (6) | ENG 3 SHUTDOWN TOGGLE FLAG | (INTERNAL) |
| (7) | SRM IGN DISARM FLAG | V90X0448X |
| (8) | T-0 UMB RELEASE DISARM FLAG | V90X0449X |
| (9) | MPS TVC SERVO OVRD CMD | V90X8374X |
| (10) | PREP SSME'S FOR LIFTOFF FLAG | V90X8373X |

| Table 4.1-1. Orbiter Vent Doors Status Word - V90J8201C | | |
|---|------|-----------------|
| Vent Group | Item | |
| Vent group 1 | a | L FWD VENTS 1&2 |
| Left and right | b | L FWD VENTS 1&2 |
| Forward vent | c | R FWD VENTS 1&2 |
| Ports 1 and 2 | d | R FWD VENTS 1&2 |
| Vent Group 2 | a | L PB VENT 3 |
| Left and right | b | L PB VENT 3 |
| Mid fuselage vent | c | R PB VENT 3 |
| Port 3 | d | R PB VENT 3 |
| Vent group 3 | a | L PB VENT 5 |
| Left and right | b | L PB VENT 5 |
| Mid fuselage | c | R PB VENT 5 |
| Port 5 | d | R PB VENT 5 |
| Vent group 5 | a | L PB VENT 6 |
| Left and Right | b | L PB VENT 6 |
| Aft payload vent | c | R PB VENT 6 |
| Port 6 | d | R PB VENT 6 |
| Vent group 6 | a | L AFT VENTS 8&9 |
| Left and right | b | L AFT VENTS 8&9 |
| Aft vent | c | R AFT VENTS 8&9 |
| Ports 8 and 9 | d | R AFT VENTS 8&9 |

Table 4.1-2. LPS Orbiter Vent Doors Override Word -V99J8836C

| Vent Group | Item | |
|---|------|-----------------|
| Vent group 1 Left and right Forward vent Ports 1 and 2 | a | L FWD VENTS 1&2 |
| | b | L FWD VENTS 1&2 |
| | c | R FWD VENTS 1&2 |
| | d | R FWD VENTS 1&2 |
| Vent Group 2 Left and right Mid fuselage vent Port 3 | a | L PB VENT 3 |
| | b | L PB VENT 3 |
| | c | R PB VENT 3 |
| | d | R PB VENT 3 |
| Vent group 3 Left and right Mid fuselage Port 5 | a | L PB VENT 5 |
| | b | L PB VENT 5 |
| | c | R PB VENT 5 |
| | d | R PB VENT 5 |
| Vent group 5 Left and Right Aft payload vent Port 6 | a | L PB VENT 6 |
| | b | L PB VENT 6 |
| | c | R PB VENT 6 |
| | d | R PB VENT 6 |
| Vent group 6 Left and right Aft vent Ports 8 and 9 | a | L AFT VENTS 8&9 |
| | b | L AFT VENTS 8&9 |
| | c | R AFT VENTS 8&9 |
| | d | R AFT VENTS 8&9 |

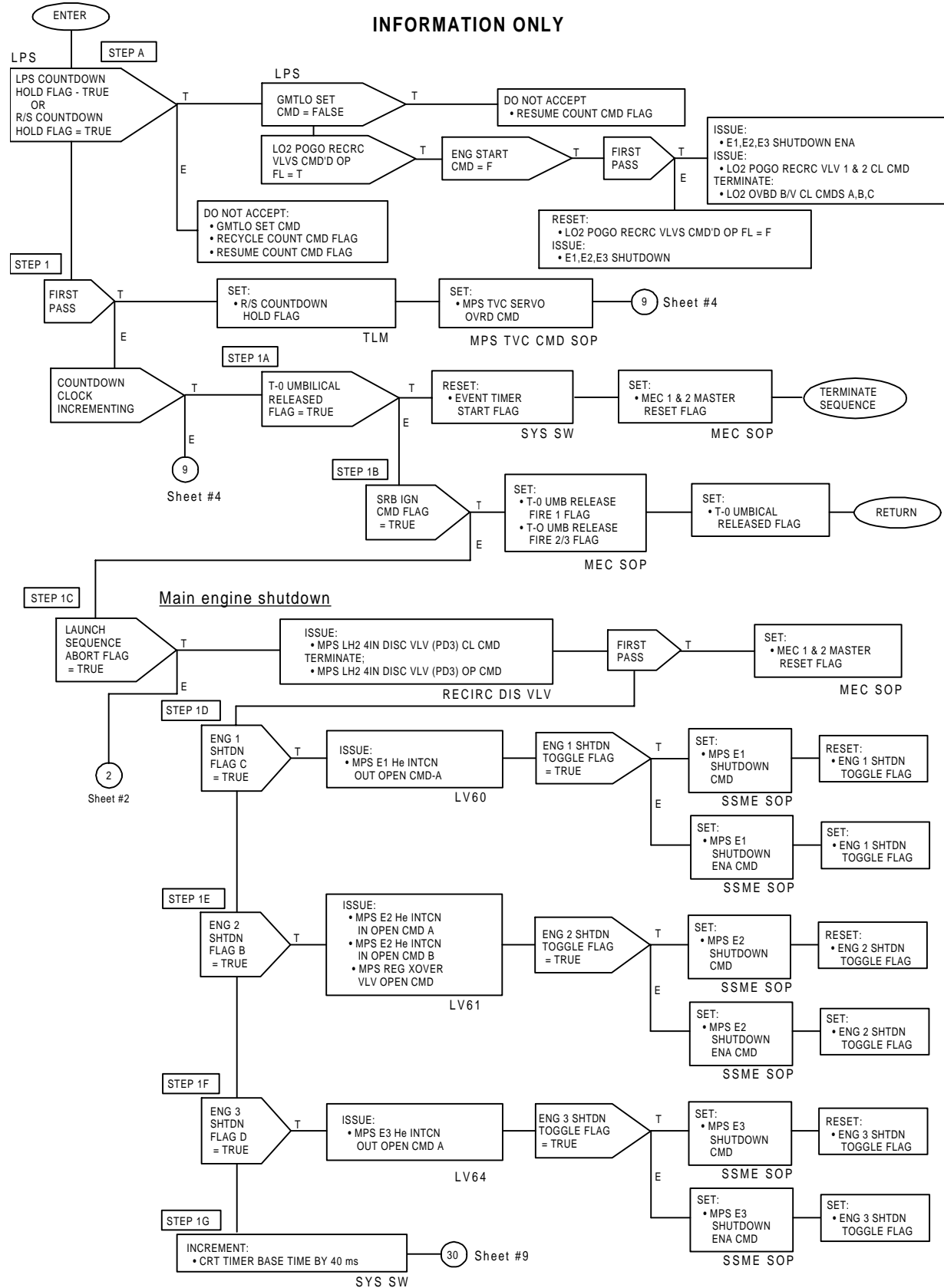


FIGURE 4.114.(1) Redundant Set Launch Sequence (Sheet 1 of 10)

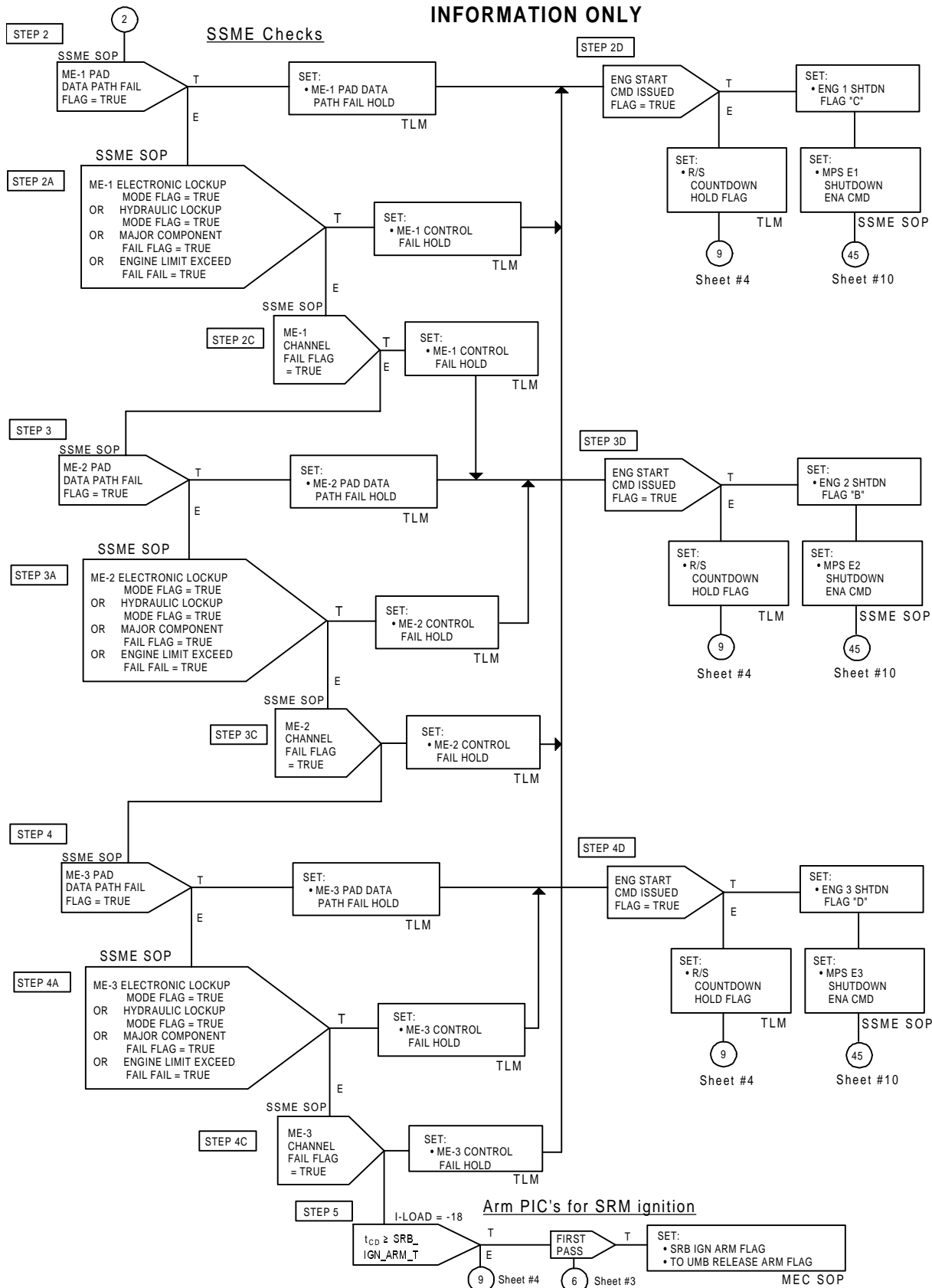


FIGURE 4.114.(2) Redundant Set Launch Sequence (Sheet 2 of 10)

INFORMATION ONLY

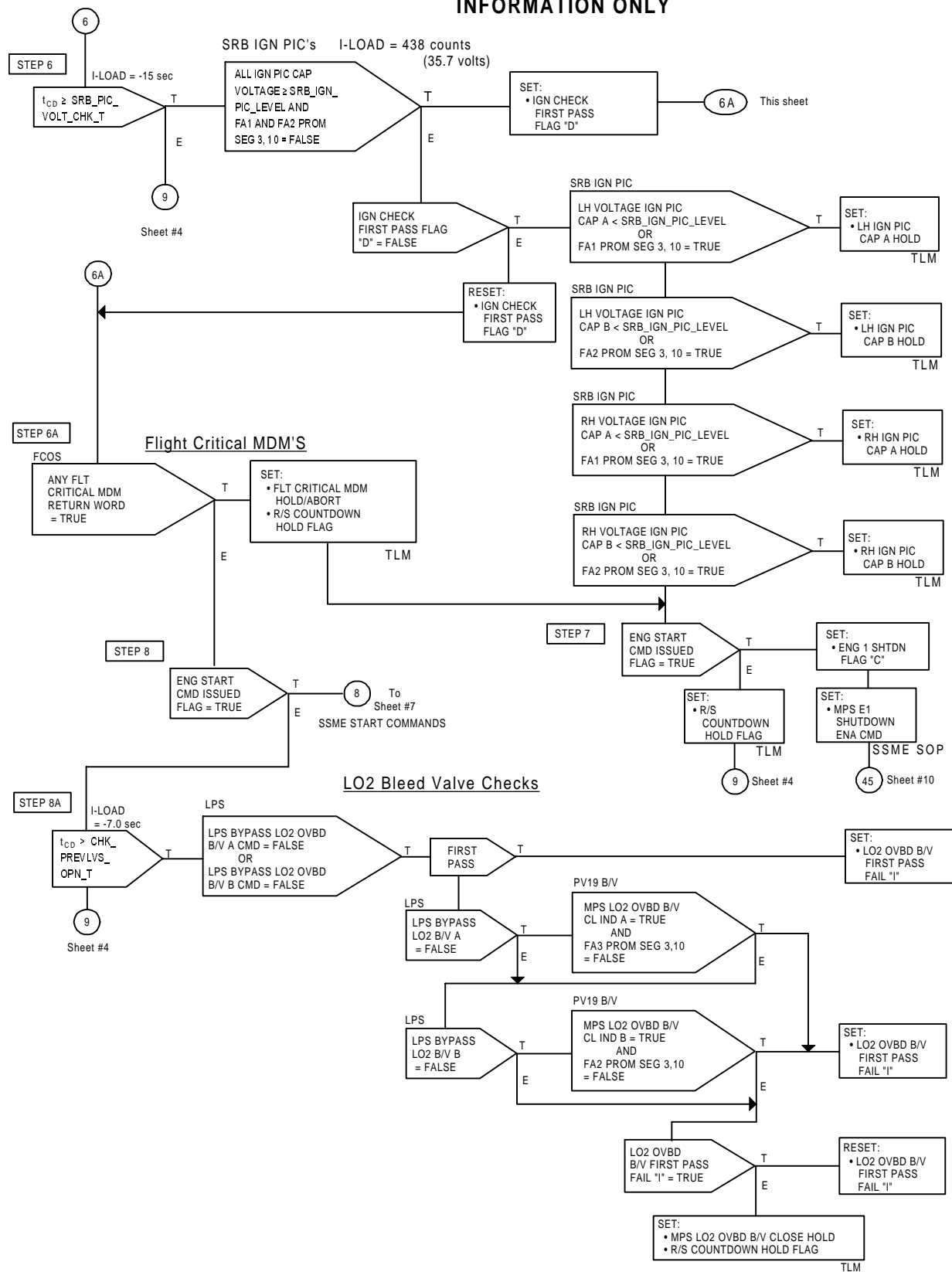


FIGURE 4.114.(3) Redundant Set Launch Sequence (Sheet 3 of 10)

INFORMATION ONLY

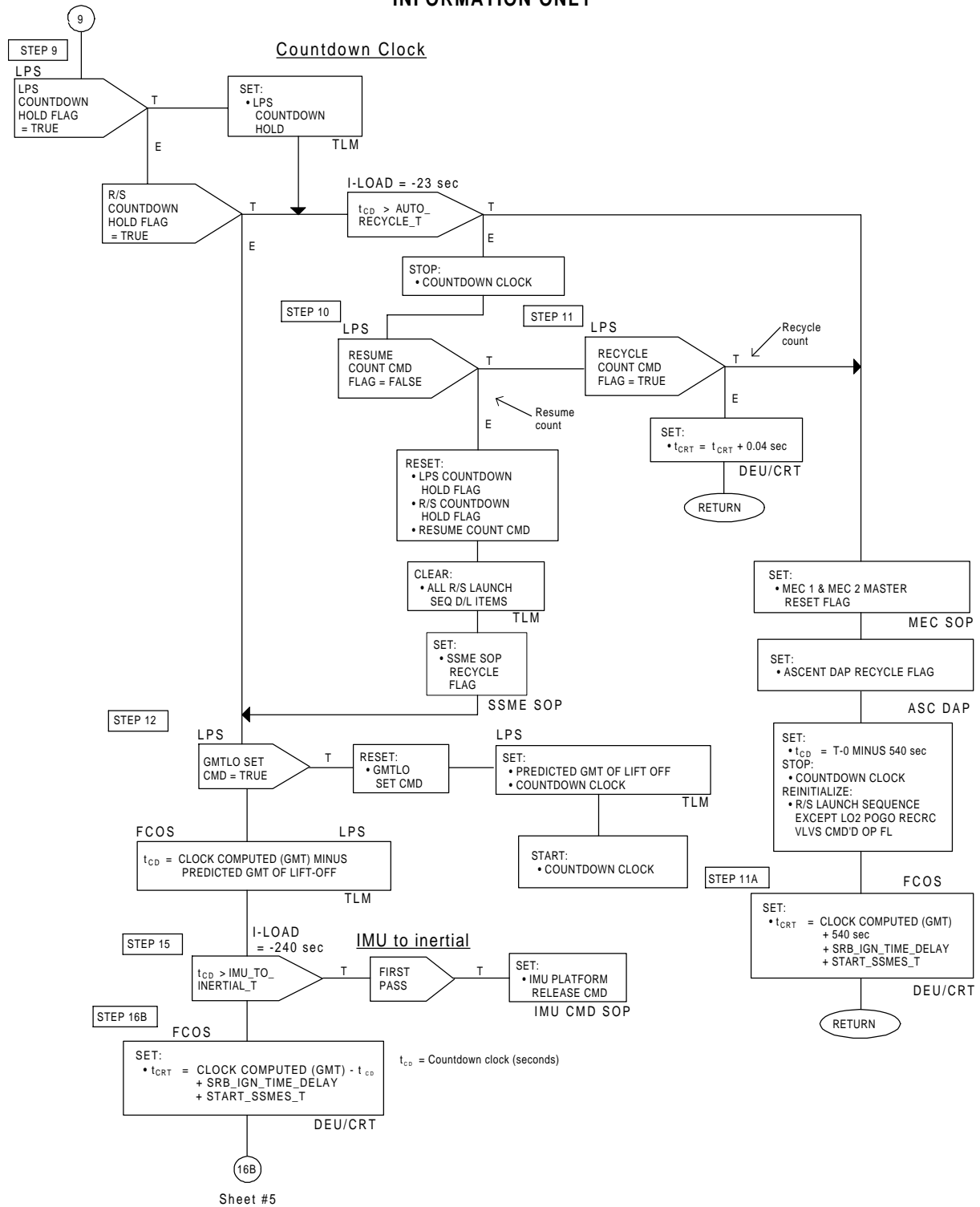


FIGURE 4.114.(4) Redundant Set Launch Sequence (Sheet 4 of 10)

INFORMATION ONLY

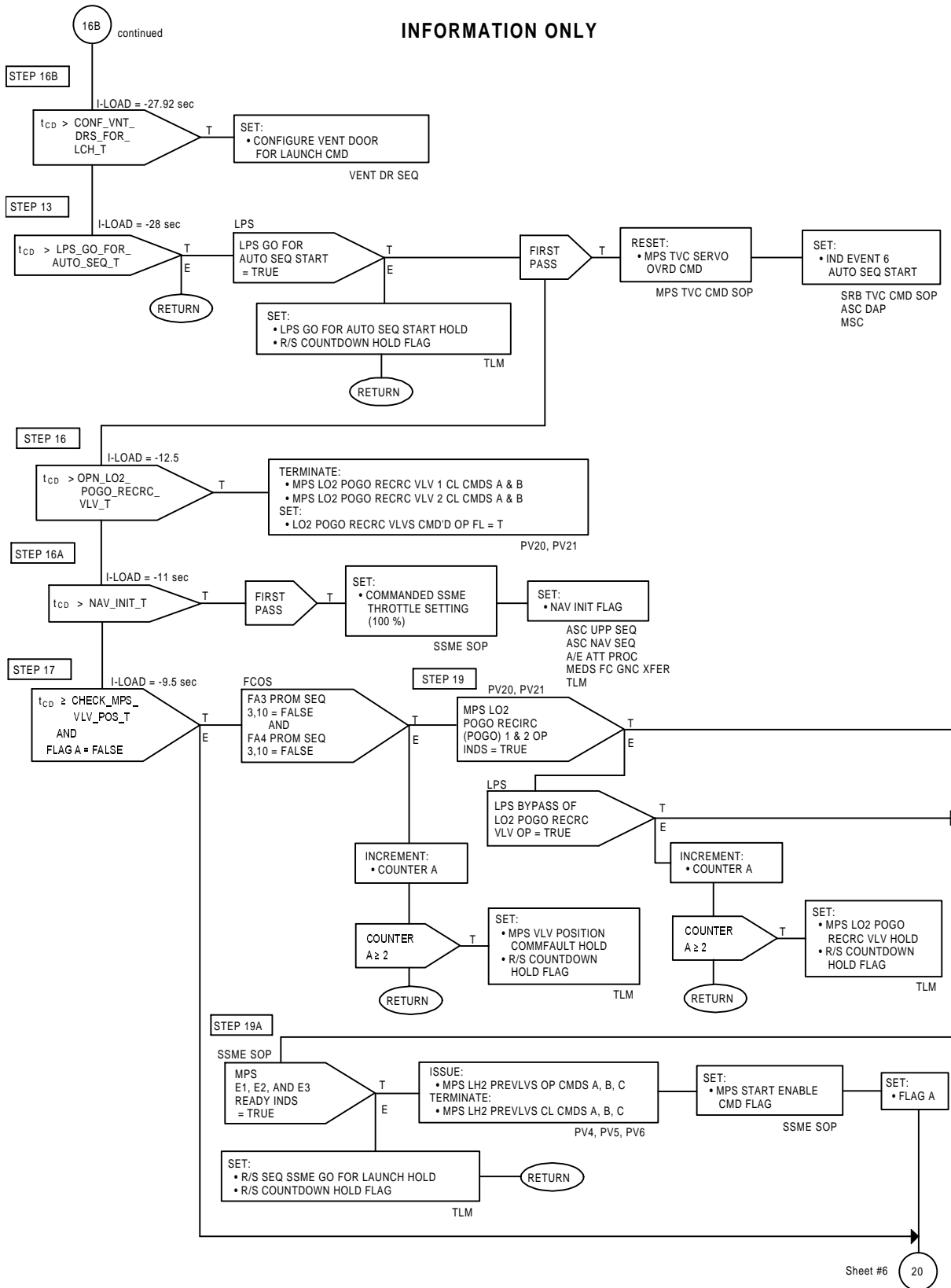


FIGURE 4.114.(5) Redundant Set Launch Sequence (Sheet 5 of 10)

INFORMATION ONLY

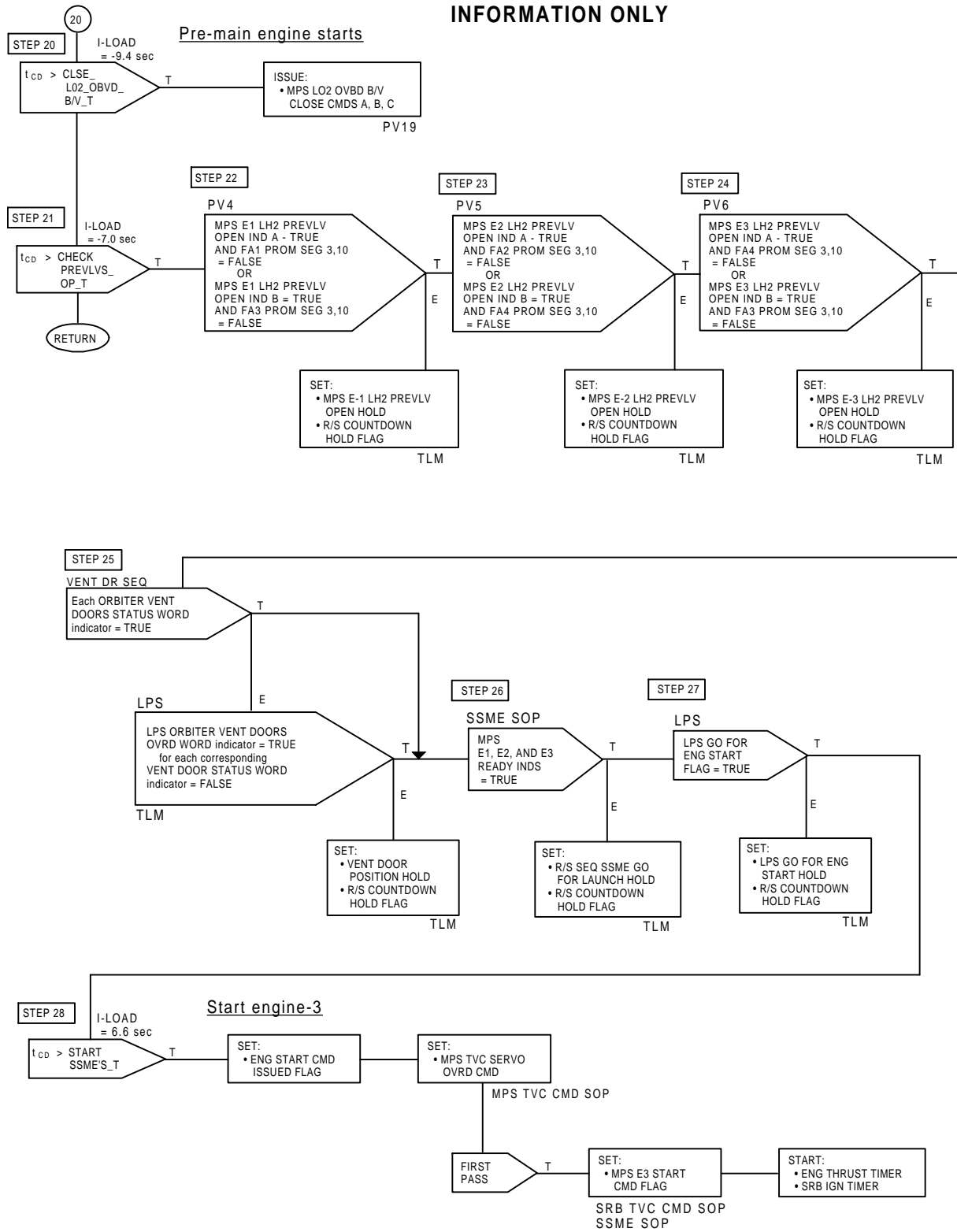


FIGURE 4.114.(6) Redundant Set Launch Sequence (Sheet 6 of 10)

INFORMATION ONLY

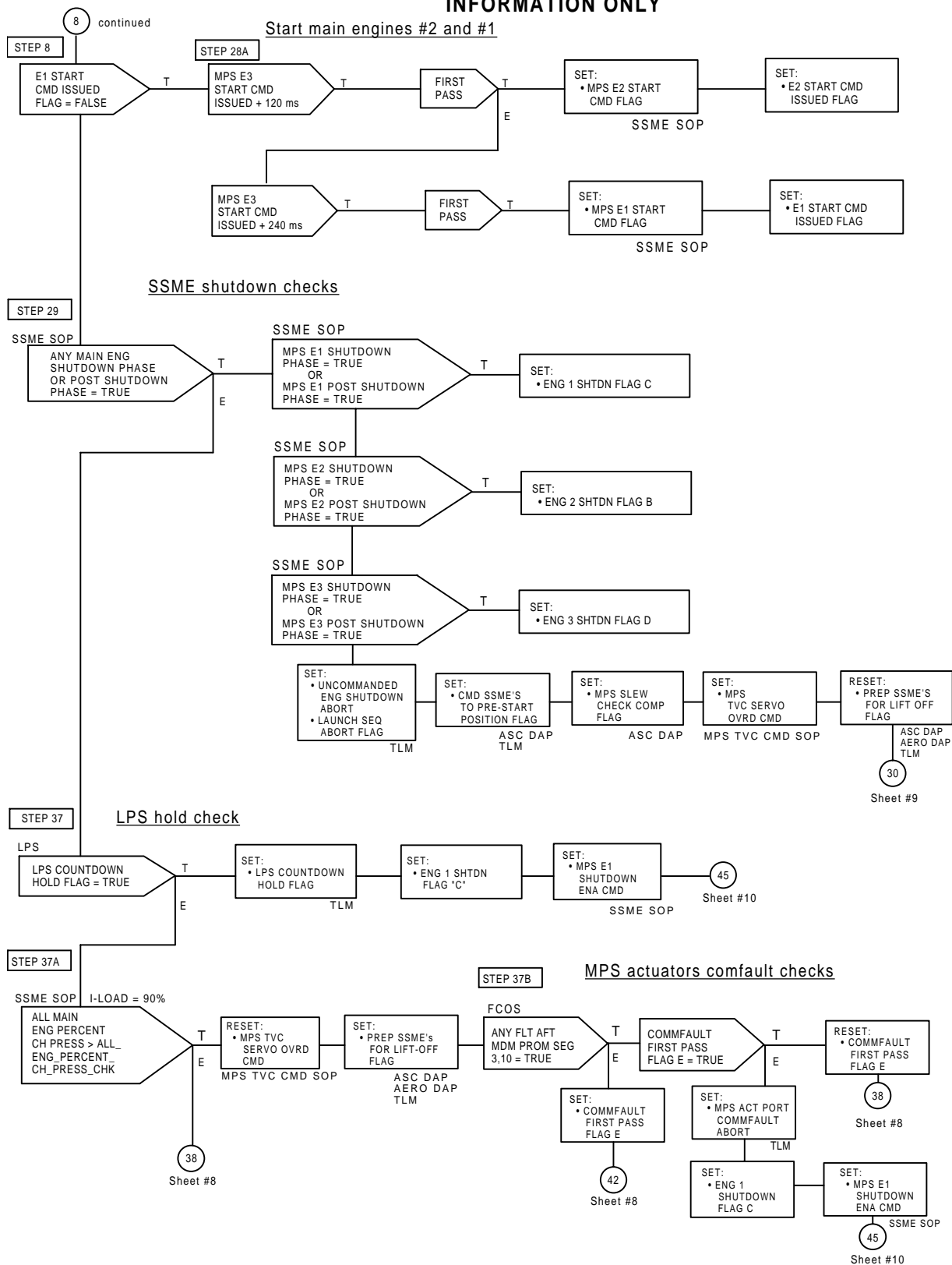


FIGURE 4.114.(7) Redundant Set Launch Sequence (Sheet 7 of 10)

INFORMATION ONLY

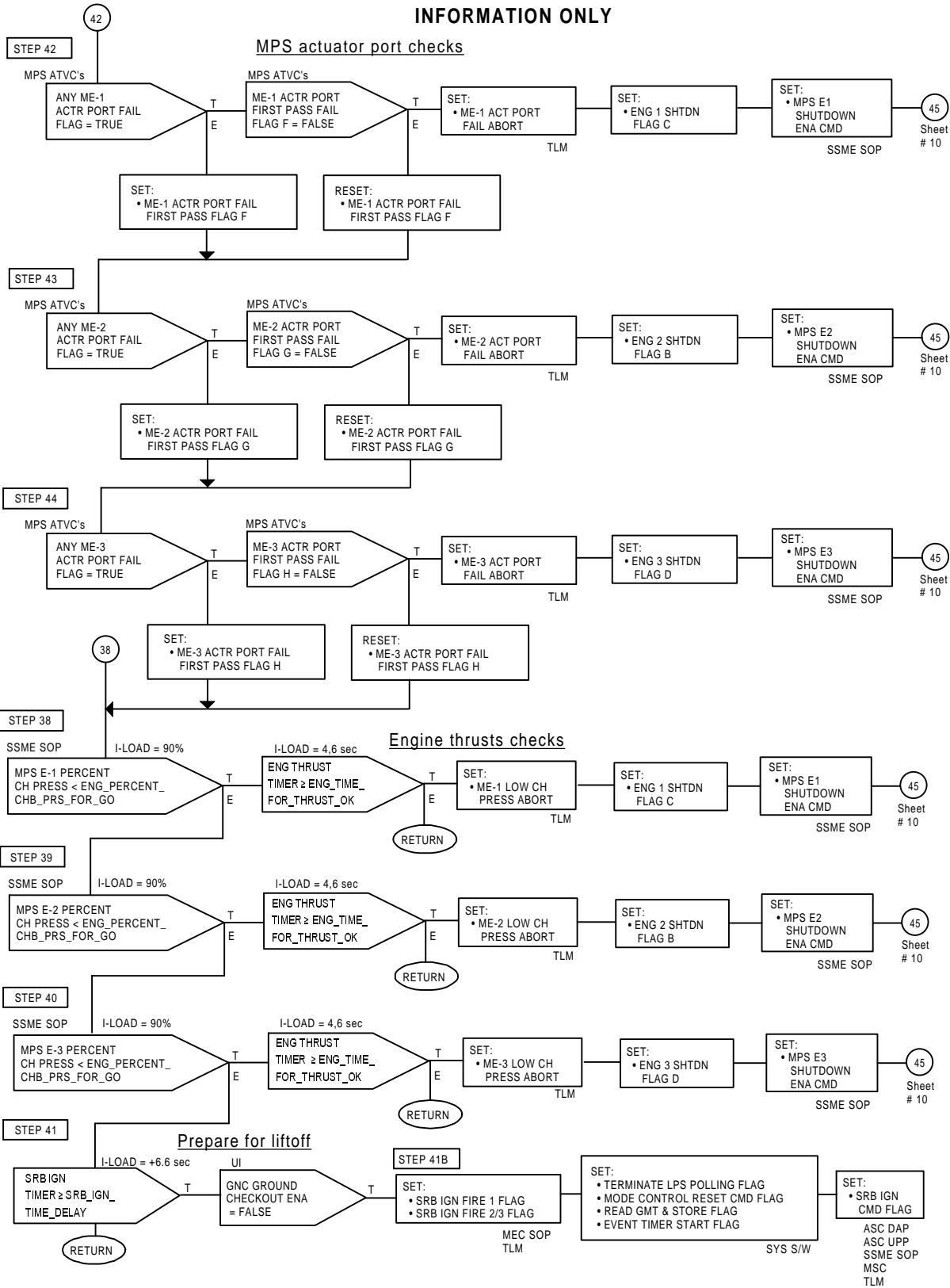


FIGURE 4.114.(8) Redundant Set Launch Sequence (Sheet 8 of 10)

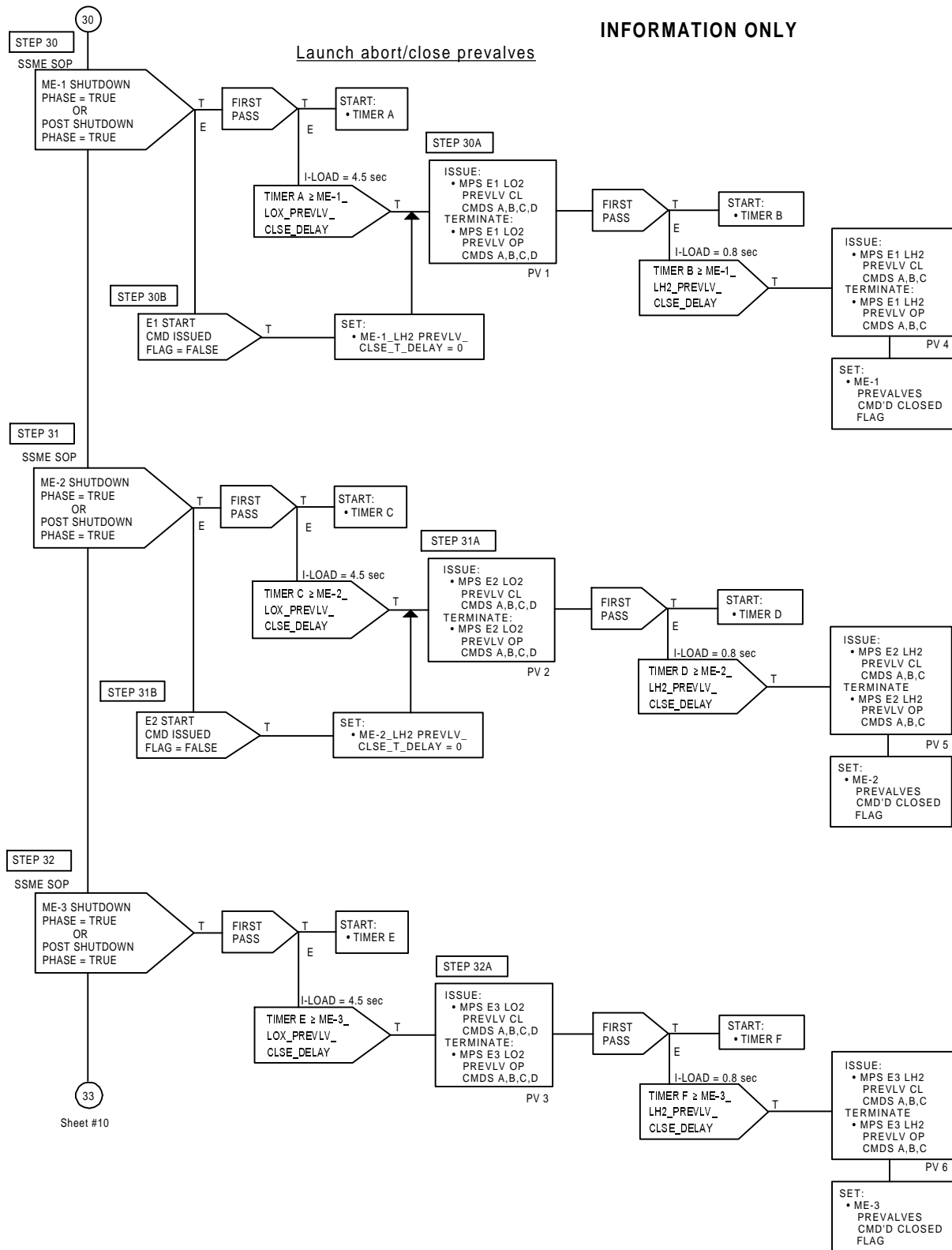


FIGURE 4.114.(9) Redundant Set Launch Sequence (9 of 10)

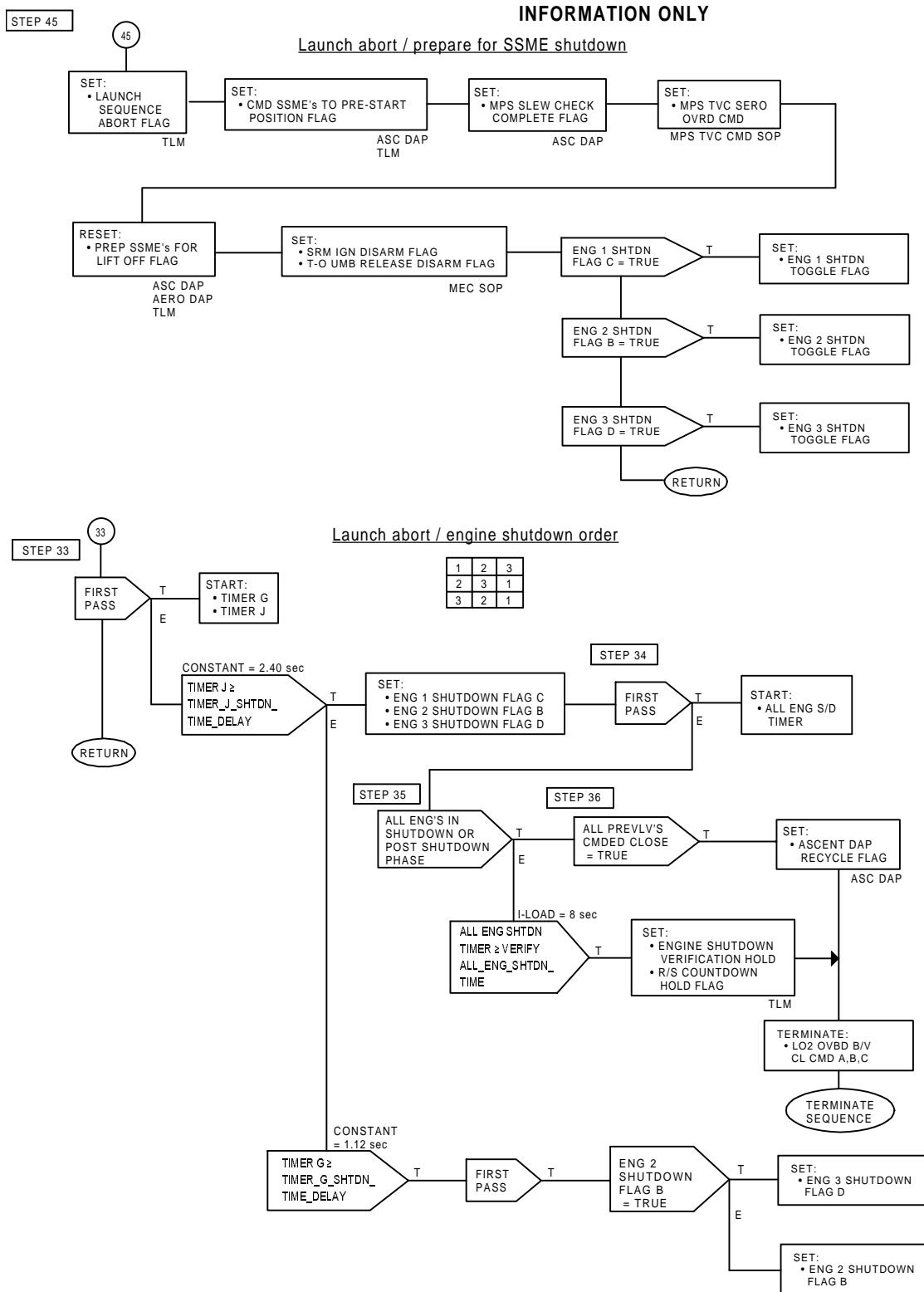


FIGURE 4.114.(10) Redundant Set Launch Sequence (Sheet 10 of 10)

TABLE 4.1.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------|------------|-----------------------------------|----------|-------|-----------|---------|---------|-------|
| CLOCK/CLOCKTIME | V91W5000C | CLOCK-COMPUTER (GMT) | FCOS | S | | | 93160B | * |
| ME1_CH_PRESS_FDBK | V95U1186C | MPS E-1 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| ME2_CH_PRESS_FDBK | V95U1187C | MPS E-2 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| ME3_CH_PRESS_FDBK | V95U1188C | MPS E-3 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| MEPSTSHDN (1) | V95X1160X | MPS E1 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MEPSTSHDN (2) | V95X1161X | MPS E2 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MEPSTSHDN (3) | V95X1162X | MPS E3 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN (1) | V95X1155X | MPS E1 SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN (2) | V95X1156X | MPS E2 SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN (3) | V95X1157X | MPS E3 SHUTDOWN PHASE | SSME SOP | | | | | |
| ME_ELEC_LOCKUP (1) | V95X1194X | ME-1 ELECTRONIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_ELEC_LOCKUP (2) | V95X1195X | ME-2 ELECTRONIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_ELEC_LOCKUP (3) | V95X1196X | ME-3 ELECTRONIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_HYD_LOCKUP (1) | V95X1198X | ME-1 HYDRAULIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_HYD_LOCKUP (2) | V95X1199X | ME-2 HYDRAULIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_HYD_LOCKUP (3) | V95X1200X | ME-3 HYDRAULIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_LIM_EX (1) | V95X1190X | ME-1 ENGINE LIMIT EXCEEDED FLAG | SSME SOP | | | | 89672A | |
| ME_LIM_EX (2) | V95X1191X | ME-2 ENGINE LIMIT EXCEEDED FLAG | SSME SOP | | | | 89672A | |
| ME_LIM_EX (3) | V95X1192X | ME-3 ENGINE LIMIT EXCEEDED FLAG | SSME SOP | | | | 89672A | |
| ME_READY (1) | V95X1182X | MPS E-1 ENG READY IND | SSME SOP | | | | | |
| ME_READY (2) | V95X1183X | MPS E-2 ENG READY IND | SSME SOP | | | | | |
| ME_READY (3) | V95X1184X | MPS E-3 ENG READY IND | SSME SOP | | | | | |
| PRED_GMT_LO | V99W8801CA | PREDICTED GMT OF LIFTOFF | LPS | S | | | 92319C | |
| R/S_AUTO_SEQ_START | V99X8803X | LPS GO FOR AUTO SEQUENCE START | LPS | | | | 89599C | |
| RECYCLE_COUNT | V99X8830X | RECYCLE COUNT CMD FLAG | LPS | | | | 89599C | |
| RESUME_COUNT | V99X8828X | RESUME COUNT CMD FLAG | LPS | | | | 89599C | |
| B55V1603C | B55V1603C | LH VOLTAGE IGN PIC CAP A | LF IEA | | AMU | | 93017G | * |
| B55V1604C | B55V1604C | LH VOLTAGE IGN PIC CAP B | LF IEA | | AMU | | 93017G | * |
| B55V2603C | B55V2603C | RH VOLTAGE IGN PIC CAP A | RF IEA | | AMU | | 93017G | * |
| B55V2604C | B55V2604C | RH VOLTAGE IGN PIC CAP B | RF IEA | | AMU | | 93017G | * |
| V41X1104X | V41X1104X | MPS E1 LH2 PREV LV (PV4) OP IND A | HDWR | | BD | | 93017G | * |
| V41X1106X | V41X1106X | MPS E1 LH2 PREV LV (PV4) OP IND B | HDWR | | BD | | 93017G | * |
| V41X1204X | V41X1204X | MPS E2 LH2 PREV LV (PV5) OP IND A | HDWR | | BD | | 93017G | * |
| V41X1206X | V41X1206X | MPS E2 LH2 PREV LV (PV5) OP IND B | HDWR | | BD | | 93017G | * |
| V41X1304X | V41X1304X | MPS E3 LH2 PREV LV (PV6) OP IND A | HDWR | | BD | | 93017G | * |
| V41X1306X | V41X1306X | MPS E3 LH2 PREV LV (PV6) OP IND B | HDWR | | BD | | 93017G | * |
| V41X1580X | V41X1580X | MPS LO2 OVBD B/V (PV19) CL IND A | HDWR | | BD | | 93017G | * |
| V41X1581X | V41X1581X | MPS LO2 OVBD B/V (PV19) CL IND B | HDWR | | BD | | 93017G | * |
| V41X1811X | V41X1811X | MPS LO2 POGO RECR 1 (PV20) OP IND | HDWR | | BD | | 93017G | * |
| V41X1821X | V41X1821X | MPS LO2 POGO RECR 2 (PV21) OP IND | HDWR | | BD | | 93017G | * |
| V79X1170X | V79X1170X | MPS ENG 1 P ACTR A FAIL | ATVC 1 | | BD | | 93017G | * |
| V79X1171X | V79X1171X | MPS ENG 1 Y ACTR A FAIL | ATVC 1 | | BD | | 93017G | * |
| V79X1173X | V79X1173X | MPS ENG 1 P ACTR B FAIL | ATVC 2 | | BD | | 93017G | * |
| V79X1174X | V79X1174X | MPS ENG 1 Y ACTR B FAIL | ATVC 2 | | BD | | 93017G | * |
| V79X1176X | V79X1176X | MPS ENG 1 P ACTR C FAIL | ATVC 3 | | BD | | 93017G | * |
| V79X1177X | V79X1177X | MPS ENG 1 Y ACTR C FAIL | ATVC 3 | | BD | | 93017G | * |

TABLE 4.1.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|---------------|-------|-----------|---------|---------|-------|
| | V79X1178X | MPS ENG 1 P ACTR D FAIL | ATVC 4 | | BD | | 93017G | * |
| | V79X1179X | MPS ENG 1 Y ACTR D FAIL | ATVC 4 | | BD | | 93017G | * |
| | V79X1270X | MPS ENG 2 P ACTR A FAIL | ATVC 1 | | BD | | 93017G | * |
| | V79X1271X | MPS ENG 2 Y ACTR A FAIL | ATVC 1 | | BD | | 93017G | * |
| | V79X1273X | MPS ENG 2 P ACTR B FAIL | ATVC 2 | | BD | | 93017G | * |
| | V79X1274X | MPS ENG 2 Y ACTR B FAIL | ATVC 2 | | BD | | 93017G | * |
| | V79X1276X | MPS ENG 2 P ACTR C FAIL | ATVC 3 | | BD | | 93017G | * |
| | V79X1277X | MPS ENG 2 Y ACTR C FAIL | ATVC 3 | | BD | | 93017G | * |
| | V79X1278X | MPS ENG 2 P ACTR D FAIL | ATVC 4 | | BD | | 93017G | * |
| | V79X1279X | MPS ENG 2 Y ACTR D FAIL | ATVC 4 | | BD | | 93017G | * |
| | V79X1370X | MPS ENG 3 P ACTR A FAIL | ATVC 1 | | BD | | 93017G | * |
| | V79X1371X | MPS ENG 3 Y ACTR A FAIL | ATVC 1 | | BD | | 93017G | * |
| | V79X1373X | MPS ENG 3 P ACTR B FAIL | ATVC 2 | | BD | | 93017G | * |
| | V79X1374X | MPS ENG 3 Y ACTR B FAIL | ATVC 2 | | BD | | 93017G | * |
| | V79X1376X | MPS ENG 3 P ACTR C FAIL | ATVC 3 | | BD | | 93017G | * |
| | V79X1377X | MPS ENG 3 Y ACTR C FAIL | ATVC 3 | | BD | | 93017G | * |
| | V79X1378X | MPS ENG 3 P ACTR D FAIL | ATVC 4 | | BD | | 93017G | * |
| | V79X1379X | MPS ENG 3 Y ACTR D FAIL | ATVC 4 | | BD | | 93017G | * |
| | V90J8201C | ORBITER VENT DOORS STATUS WORD | VENT CNTL SEQ | | BSU | | 93017G | * |
| | V91X2845X | FA1 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 89991E | |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2848X | FA4 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 92316B | |
| | V91X2904X | FF1 MDM RETURN WORD BYPASS(HFE) | FCOS | | | | 93017G | * |
| | V91X2905X | FF2 MDM RETURN WORD BYPASS(HFE) | FCOS | | | | 93017G | * |
| | V91X2906X | FF3 MDM RETURN WORD BYPASS(HFE) | FCOS | | | | 93017G | * |
| | V91X2907X | FF4 MDM RETURN WORD BYPASS(HFE) | FCOS | | | | 93017G | * |
| | V91X2920X | FA1 MDM RETURN WORD BYPASS(HFE) | FCOS | | | | 93017G | * |
| | V91X2921X | FA2 MDM RETURN WORD BYPASS(HFE) | FCOS | | | | 93017G | * |
| | V91X2922X | FA3 MDM RETURN WORD BYPASS(HFE) | FCOS | | | | 93017G | * |
| | V91X2923X | FA4 MDM RETURN WORD BYPASS(HFE) | FCOS | | | | 93017G | * |
| | V93X5538X | GNC GROUND CHECKOUT ENABLE | UI | | BD | | 93017G | * |
| | V95X1217X | ME-1 PAD DATA PATH FAIL FLAG | SSME SOP | | | | | |
| | V95X1218X | ME-2 PAD DATA PATH FAIL FLAG | SSME SOP | | | | | |
| | V95X1219X | ME-3 PAD DATA PATH FAIL FLAG | SSME SOP | | | | | |
| | V95X1230X | ME-1 MAJOR COMPONENT FAIL FLAG | SSME SOP | | | | | |
| | V95X1231X | ME-2 MAJOR COMPONENT FAIL FLAG | SSME SOP | | | | | |
| | V95X1232X | ME-3 MAJOR COMPONENT FAIL FLAG | SSME SOP | | | | | |
| | V95X1236X | ME-1 CHANNEL FAIL FLAG | SSME SOP | | | | | |
| | V95X1237X | ME-2 CHANNEL FAIL FLAG | SSME SOP | | | | | |
| | V95X1238X | ME-3 CHANNEL FAIL FLAG | SSME SOP | | | | | |
| | V99J8836CA | LPS ORBITER VENT DOORS OVRD WORD | LPS | | BSU | | 93017G | * |
| | V99X8804X | LPS GO FOR ENGINE START FLAG | LPS | | | | | |
| | V99X8827X | GMTLO SET COMMAND | LPS | | | | | |
| | V99X8829X | LPS COUNTDOWN HOLD FLAG | LPS | | | | | |
| | V99X8833X | LPS BYPASS LO2 POGO RECR | LPS | | | | 92213D | |

TABLE 4.1.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|--------------------------------|--------|-------|--------------|------------------|---------|-------------|
| | V99X8835X | LPS BYPASS L02 OVBD B/V A FLAG | LPS | | BD | | 89400G | |
| | V99X8837X | LPS BYPASS L02 OVBD B/V B FLAG | LPS | | BD | | 89400G | |

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

TABLE 4.1.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------------|------------|----------------------------------|--|-------|-----------|---------|---------|-------|
| AUTO_SEQ_IND | V90X8683X | INDICATOR EVENT 6 AUTO SEQ START | ASC DAP MSC SRB TVC CMD SOP | | | | 89599C | |
| A_D_RECYCLE_COUNT | V90X8669X | ASC DAP RECYCLE FLAG | ASC DAP | | | | | |
| CONF_VENT_DOORS | V90X8375X | CONFIG VENT DOORS FOR LAUNCH CMD | VENT CNTL SEQ | | | | 89599C | |
| HOLD_COUNT | V90X8667X | RS COUNTDOWN HOLD FLAG | DL FMT 21/1 | | BD | | 93017G | * |
| K_CMD | V90U1948CD | COMMANDED SSME THROTTLE SETTING | SSME SOP | PCT | | | | |
| MESHDNCMD (1) | V90X8370XA | MPS E1 SHUTDOWN CMD | SSME SOP | | | | | |
| MESHDNCMD (2) | V90X8371XA | MPS E2 SHUTDOWN CMD | SSME SOP | | | | | |
| MESHDNCMD (3) | V90X8372XA | MPS E3 SHUTDOWN CMD | SSME SOP | | | | | |
| MESHDNENA (1) | V90X8367XA | MPS E1 SHUTDOWN ENABLE CMD | SSME SOP | | | | | |
| MESHDNENA (2) | V90X8368XA | MPS E2 SHUTDOWN ENABLE CMD | SSME SOP | | | | | |
| MESHDNENA (3) | V90X8369XA | MPS E3 SHUTDOWN ENABLE CMD | SSME SOP | | | | | |
| MESTRTCMD (1) | V90X8358X | MPS E1 START CMD FLAG | SSME SOP | | | | | |
| MESTRTCMD (2) | V90X8359X | MPS E2 START CMD FLAG | SSME SOP | | | | | |
| MESTRTCMD (3) | V90X8360X | MPS E3 START CMD FLAG | SRB TVC CMD SOP SSME SOP | | | | | |
| MESTRTENA | V90X8361X | MPS START ENABLE CMD FLAG | SSME SOP | | | | | |
| MPS_OVRD_CMD | V90X8374XA | MPS TVC SERVO OVRD CMD | MPS TVC CMD SOP | | | | | |
| MPS_SLEW_COMPLETE | V90X8400XA | MPS SLEW CHECK COMPLETE FLAG | ASC DAP | | | | 89599C | |
| M_RSET_USER | V90X8258XC | MEC 1&2 MASTER RESET FLAG | MEC SOP | | | | 89456A | |
| NAV_INIT_FLAG | V90X8414X | NAV INIT FLAG | A/E ATT PROC ASC NAV SEQ ASC UPP SEQ DL FMT 21/A MEDS FC GNC XFER MSC | | BD | | 93017G | * |
| PLT_RLS | V90X8411X | IMU PLATFORM RELEASE CMD | MSC | | BD | | 89986H | |
| PRED_GMT_LO | V99W8801CB | PREDICTED GMT OF LIFTOFF | ASC UPP DL FMT 21/1 | S | DPL | | 93017G | * |
| PREP_SSMEs | V90X8373X | PREP SSME'S FOR LIFTOFF FLAG | AERO ACT SOP ASC DAP DL FMT 21/A | | BD | | 93017G | * |
| RETURN_SSME_TO_START_POS | V90X8412X | CMD SSME'S TO PRE-START POS FLAG | ASC DAP DL FMT 21/A | | BD | | 93017G | * |
| SRB_IGNITION_CMD | V90X8377X | SRB IGNITION CMD FLAG | ASC DAP ASC UPP SEQ DL FMT 21/A MSC SSME SOP | | BD | | 93017G | * |
| SRM_IGN_ARM | V90X8404X | SRM IGN ARM FLAG | MEC SOP | | | | 89456A | |
| SRM_IGN_DISARM | V90X0448X | SRM IGN DISARM FLAG | MEC SOP | | | | 92148D | |
| SRM_IGN_FIRE1 | V90X8405X | SRM IGN FIRE 1 FLAG | MEC SOP | | | | 89456A | |
| SRM_IGN_FIRE2/3 | V90X8699X | SRM IGN FIRE 2/3 FLAG | DL FMT 21/A MEC SOP | | BD | | 93017G | * |
| T0_UMB_ARM | V90X8407X | T-0 UMB RELEASE ARM FLAG | MEC SOP | | | | 93064D | |

TABLE 4.1.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|----------------|------------|------------------------------------|-------------|-------|-----------|------------------|---------|-------------|
| T0_UMB_DISARM | V90X0449X | T-0 UMB RELEASE DISARM FLAG | MEC SOP | | | | 92148D | |
| T0_UMB_FIRE1 | V90X8408X | T-0 UMB RELEASE FIRE 1 FLAG | MEC SOP | | | | 93064D | |
| T0_UMB_FIRE2/3 | V90X8698X | T-0 UMB RELEASE FIRE 2/3 FLAG | MEC SOP | | | | 92157 | |
| | V41K1119XC | MPS E1 LH2 PREVLV (PV4) OP CMD A | PCA A1 | | | | 89554A | |
| | V41K1120XC | MPS E1 LH2 PREVLV (PV4) OP CMD B | LCA A1 | | | | 89554A | |
| | V41K1121XC | MPS E1 LH2 PREVLV (PV4) OP CMD C | LCA A2 | | | | 89554A | |
| | V41K1122XC | MPS E1 LH2 PREVLV (PV4) CL CMD A | PCA A1 | | | | 89554A | |
| | V41K1123XC | MPS E1 LH2 PREVLV (PV4) CL CMD B | LCA A1 | | | | 89554A | |
| | V41K1124XC | MPS E1 LH2 PREVLV (PV4) CL CMD C | LCA A2 | | | | 89554A | |
| | V41K1136XC | MPS E1 LO2 PREVLV (PV1) OP CMD A | PCA A1 | | | | 89554A | |
| | V41K1137XC | MPS E1 LO2 PREVLV (PV1) OP CMD B | LCA A1 | | | | 89554A | |
| | V41K1138XC | MPS E1 LO2 PREVLV (PV1) OP CMD C | LCA A2 | | | | 89554A | |
| | V41K1139XC | MPS E1 LO2 PREVLV (PV1) CL CMD A | PCA A1 | | | | 89554A | |
| | V41K1140XC | MPS E1 LO2 PREVLV (PV1) CL CMD B | LCA A1 | | | | 89554A | |
| | V41K1141XC | MPS E1 LO2 PREVLV (PV1) CL CMD C | LCA A2 | | | | 89554A | |
| | V41K1142XB | MPS E1 LO2 PREVLV (PV1) CL CMD D | HDWR | | | | 89554A | |
| | V41K1143XB | MPS E1 LO2 PREVLV (PV1) OP CMD D | HDWR | | | | 89554A | |
| | V41K1168XC | MPS E1 HE INTCN OUT(LV60) OP CMD A | HDWR | | | | 89554A | |
| | V41K1219XC | MPS E2 LH2 PREVLV (PV5) OP CMD A | PCA A2 | | | | 89554A | |
| | V41K1220XC | MPS E2 LH2 PREVLV (PV5) OP CMD B | LCA A2 | | | | 89554A | |
| | V41K1221XC | MPS E2 LH2 PREVLV (PV5) OP CMD C | LCA A3 | | | | 89554A | |
| | V41K1222XC | MPS E2 LH2 PREVLV (PV5) CL CMD A | PCA A2 | | | | 89554A | |
| | V41K1223XC | MPS E2 LH2 PREVLV (PV5) CL CMD B | LCA A2 | | | | 89554A | |
| | V41K1224XC | MPS E2 LH2 PREVLV (PV5) CL CMD C | LCA A3 | | | | 89554A | |
| | V41K1236XC | MPS E2 LO2 PREVLV (PV2) OP CMD A | PCA A2 | | | | 89554A | |
| | V41K1237XC | MPS E2 LO2 PREVLV (PV2) OP CMD B | LCA A2 | | | | 89554A | |
| | V41K1238XC | MPS E2 LO2 PREVLV (PV2) OP CMD C | LCA A3 | | | | 89554A | |
| | V41K1239XC | MPS E2 LO2 PREVLV (PV2) CL CMD A | PCA A2 | | | | 89554A | |
| | V41K1240XC | MPS E2 LO2 PREVLV (PV2) CL CMD B | LCA A2 | | | | 89554A | |
| | V41K1241XC | MPS E2 LO2 PREVLV (PV2) CL CMD C | LCA A3 | | | | 89554A | |
| | V41K1242XB | MPS E2 LO2 PREVLV (PV2) CL CMD D | HDWR | | | | 89554A | |
| | V41K1243XB | MPS E2 LO2 PREVLV (PV2) OP CMD D | HDWR | | | | 89554A | |
| | V41K1262XC | MPS E2 HE INTCN IN (LV61) OP CMD A | HDWR | | | | 89554A | |
| | V41K1263XC | MPS E2 HE INTCN IN (LV61) OP CMD B | HDWR | | | | 89554A | |
| | V41K1319XC | MPS E3 LH2 PREVLV (PV6) OP CMD A | PCA A3 | | | | 89554A | |
| | V41K1320XC | MPS E3 LH2 PREVLV (PV6) OP CMD B | LCA A3 | | | | 89554A | |
| | V41K1321XC | MPS E3 LH2 PREVLV (PV6) OP CMD C | LCA A1 | | | | 89554A | |
| | V41K1322XC | MPS E3 LH2 PREVLV (PV6) CL CMD A | PCA A3 | | | | 89554A | |
| | V41K1323XC | MPS E3 LH2 PREVLV (PV6) CL CMD B | LCA A3 | | | | 89554A | |
| | V41K1324XC | MPS E3 LH2 PREVLV (PV6) CL CMD C | LCA A1 | | | | 89554A | |
| | V41K1336XC | MPS E3 LO2 PREVLV (PV3) OP CMD A | PCA A3 | | | | 89554A | |
| | V41K1337XC | MPS E3 LO2 PREVLV (PV3) OP CMD B | LCA A3 | | | | 89554A | |
| | V41K1338XC | MPS E3 LO2 PREVLV (PV3) OP CMD C | LCA A1 | | | | 89554A | |
| | V41K1339XC | MPS E3 LO2 PREVLV (PV3) CL CMD A | PCA A3 | | | | 89554A | |
| | V41K1340XC | MPS E3 LO2 PREVLV (PV3) CL CMD B | LCA A3 | | | | 89554A | |
| | V41K1341XC | MPS E3 LO2 PREVLV (PV3) CL CMD C | LCA A1 | | | | 89554A | |

TABLE 4.1.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------|---------------------|-----------------------------|-------------|-------|-----------|---------|---------|-------|
| V41K1342XB | MPS E3 | LO2 PREVLV (PV3) CL CMD D | HDWR | | | | 89554A | |
| V41K1343XB | MPS E3 | LO2 PREVLV (PV3) OP CMD D | HDWR | | | | 89554A | |
| V41K1368XC | MPS E3 | HE INTCN OUT(LV64) OP CMD A | HDWR | | | | 89554A | |
| V41K1421XB | MPS LH2 | 4IN DISC VLV(PD3)OP CMD | HDWR | | BD | | 89554A | |
| V41K1422XC | MPS LH2 | 4IN DISC VLV(PD3)CL CMD | HDWR | | BD | | 89554A | |
| V41K1584XA | MPS LO2 | OVBD B/V (PV19) CL CMD A | PCA A3 | | | | 89554A | |
| V41K1585XA | MPS LO2 | OVBD B/V (PV19) CL CMD B | LCA A3 | | | | 89554A | |
| V41K1586XA | MPS LO2 | OVBD B/V (PV19) CL CMD C | LCA A2 | | | | 89554A | |
| V41K1613XD | MPS REG | HE XOVER VLV (LV10) OP CMD | HDWR | | | | 89554A | |
| V41K1815X | MPS LO2 | POGO RECRC 1(PV20)CL CMD A | LCA A1 | | BD | | 89554A | |
| V41K1816X | MPS LO2 | POGO RECRC 1(PV20)CL CMD B | LCA A1 | | BD | | 89554A | |
| V41K1825X | MPS LO2 | POGO RECRC 2(PV21)CL CMD A | LCA A2 | | BD | | 89554A | |
| V41K1826X | MPS LO2 | POGO RECRC 2(PV21)CL CMD B | LCA A2 | | BD | | 89554A | |
| V90M2935P | CGSB_RS | HOLDS | DL FMT | 21/1 | | | 93017G | * |
| V90M2960P | CGSB_ENG_HOLD\$(1:) | | DL FMT | 21/1 | | | 93017G | * |
| V90M2961P | CGSB_ENG_HOLD\$(2:) | | DL FMT | 21/1 | | | 93017G | * |
| V90M2962P | CGSB_ENG_HOLD\$(3:) | | DL FMT | 21/1 | | | 93017G | * |
| V90M3129PC | CGSB_SEQ_DL_FLAG_WD | | DL FMT | 21/A | | | 93017G | * |
| V90W8380C | COUNTDOWN | TIME | DL FMT | 21/1 | S | SPL | 93017G | * |
| V90X8378X | TERMINATE | LPS POLLING FLAG | SYS | S/W | | | | |
| V90X8382X | LAUNCH | SEQUENCE ABORT FLAG | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8383X | LH IGN | PIC CAP A HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8384X | LH IGN | PIC CAP B HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8385X | RH IGN | PIC CAP A HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8386X | RH IGN | PIC CAP B HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8389X | ENGINE | SHUTDOWN VERIFICATION HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8392X | MPS LOX | POGO RECRC VLV HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8393X | LPS GO | FOR AUTO SEQ START HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8394X | LPS GO | FOR ENGINE START HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8395X | R/S SEQ | SSME GO FOR LAUNCH HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8396X | MPS E-1 | LH2 PREVLV OPEN HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8397X | MPS E-2 | LH2 PREVLV OPEN HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8398X | MPS E-3 | LH2 PREVLV OPEN HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8399X | MPS LO2 | OVBD B/V CLOSE HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8401X | MODE | CONTROL MET RESET CMD | SYS | S/W | | | | |
| V90X8402X | READ | GMT & STORE FLAG | SYS | S/W | | | | |
| V90X8403XA | EVENT | TIMER START FLAG | SYS | S/W | | | | |
| V90X8668X | SSME | SOP RECYCLE FLAG | SSME | SOP | | | | |
| V90X8670X | ME-1 | PAD DATA PATH FAIL HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8671X | ME-2 | PAD DATA PATH FAIL HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8672X | ME-3 | PAD DATA PATH FAIL HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8679X | ME-1 | CONTROL FAIL HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8680X | ME-2 | CONTROL FAIL HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8681X | ME-3 | CONTROL FAIL HOLD | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8767X | FLIGHT | CRITICAL MDM HOLD/ABORT | DL FMT | 21/1 | BD | | 93017G | * |
| V90X8768X | LPS | COUNTDOWN HOLD | DL FMT | 21/1 | BD | | 93017G | * |

TABLE 4.1.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|-----------------------------------|-------------|-------|--------------|------------------|---------|-------------|
| | V90X8769X | MPS VALVE POS COMM FAULT HOLD | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8770X | VENT DOOR POSITION HOLD | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8771X | UNCOMMANDED ENGINE SHUTDOWN ABORT | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8772X | MPS ACT PORT COMM FAULT ABORT | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8773X | ME-1 LOW CHAMBER PRESSURE ABORT | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8774X | ME-2 LOW CHAMBER PRESSURE ABORT | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8775X | ME-3 LOW CHAMBER PRESSURE ABORT | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8776X | ME-1 ACT PORT FAIL ABORT | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8777X | ME-2 ACT PORT FAIL ABORT | DL FMT 21/1 | | BD | | 93017G | * |
| | V90X8778X | ME-3 ACT PORT FAIL ABORT | DL FMT 21/1 | | BD | | 93017G | * |
| | V99J8836CB | LPS ORBITER VENT DOORS OVRD WORD | DL FMT 21/1 | | BSU | | 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 4.1.1.4-3. REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|-----------------------------|-----------|-----------|----|----|---|---|---------|----|-----|---------|-------------|
| ALL_ENG_PERCENT_CHB_PRS_CHK | V97U9713C | PCT | F | S | D | P | G4.114 | 00 | RLS | 92314 | |
| AUTO_RECYCLE_T | V97U9705C | SEC | F | S | D | P | G4.114 | 00 | RLS | 92314 | |
| CHK_MPS_VLVS_POS_T | V97U9709C | SEC | F | S | D | P | G4.114 | 00 | QSA | 90247 | |
| CHK_PREVLVS_OPN_T | V97U9711C | SEC | F | S | D | P | G4.114 | 00 | QSA | 90247 | |
| CLSE_LO2_OVBD_BV_T | V97U9710C | SEC | F | S | D | P | G4.114 | 00 | QSA | 90247 | |
| CONFIG_VNT_DRS_FOR_LCH_T | V97U9708C | SEC | F | S | D | P | G4.114 | 00 | RLS | 92314 | |
| ENG_PERCENT_CHB_PRS_FOR_GO | V97U9714C | PCT | F | S | D | P | G4.114 | 00 | RLS | 92314 | |
| ENG_TIMER_FOR_THRUST_OK | V97U9716C | SEC | F | S | D | P | G4.114 | 00 | RLS | 92314 | |
| IMU_TO_INERTIAL_T | V97U9704C | SEC | F | S | D | C | G4.114 | 00 | RLS | 92314 | |
| LPS_GO_FOR_AUTO_SEQ_T | V97U9700C | SEC | F | S | D | P | G4.114 | 00 | RLS | 92314 | |
| ME1_LH2_PREVLV_CLSE_T_DELAY | V97U9727C | SEC | F | D | D | P | G4.114 | 00 | ZSZ | 90007G | |
| ME1_LOX_PREVLV_CLSE_DELAY | V97U9720C | SEC | F | S | D | P | G4.114 | 00 | ZSZ | 90007G | |
| ME2_LH2_PREVLV_CLSE_T_DELAY | V97U9728C | SEC | F | D | D | P | G4.114 | 00 | ZSZ | 90007G | |
| ME2_LOX_PREVLV_CLSE_DELAY | V97U9721C | SEC | F | S | D | P | G4.114 | 00 | ZSZ | 90007G | |
| ME3_LH2_PREVLV_CLSE_T_DELAY | V97U9729C | SEC | F | D | D | P | G4.114 | 00 | ZSZ | 90007G | |
| ME3_LOX_PREVLV_CLSE_DELAY | V97U9722C | SEC | F | S | D | P | G4.114 | 00 | ZSZ | 90007G | |
| NAV_INIT_T | V97U9707C | SEC | F | S | D | P | G4.114 | 00 | RLS | 92314 | |
| OPN_LO2_POGO_RECRC_VLV_T | V97U9706C | SEC | F | S | D | P | G4.114 | 00 | QSA | 92213D | |
| SRB_IGN_ARM_T | V97U9701C | SEC | F | S | D | P | G4.114 | 00 | QSA | 90247 | |
| SRB_IGN_PIC_LEVEL | V97U9853C | COUNTS | I | S | D | P | G4.114 | 00 | RLS | 92314 | |
| SRB_IGN_TIME_DELAY | V97U9726C | SEC | F | S | D | P | G4.114 | 00 | QSA | 90247 | |
| SRB_PIC_VOLTS_CHK_T | V97U9702C | SEC | F | S | D | P | G4.114 | 00 | QSA | 90247 | |
| START_SSMES_T | V97U9712C | SEC | F | S | D | P | G4.114 | 00 | QSA | 90247 | |
| VERIFY_ALL_ENG_SHTDN_TIMER | V97U9719C | SEC | F | S | D | P | G4.114 | 00 | RLS | 92314 | |

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

TABLE 4.1.1.4-4. REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD 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.

TABLE 4.1.1.4-5. REDUNDANT SET LAUNCH SEQUENCE PROCESSING (G4.114) CONSTANTS

| FSSR NAME DESCRIPTION | MSID | MC | CONSTANT VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--|-----------|----|----------------|-----------|----|--------|---|---------|---------|-------------|
| TIMER_G_SHTDN_TIME_DELAY TIMER "G" SHTDN TIME DELAY | V97U6242C | 00 | +1.12 | E+00 SEC | F | D | P | G4.114 | 90374C | |
| TIMER_J_SHTDN_TIME_DELAY TIMER "J" SHTDN TIME DELAY | V97U6243C | 00 | +2.40 | E+00 SEC | F | D | P | G4.114 | 90374C | |

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

4.1.2 MPS Dedicated Display Drive Sequence (4.222)

4.1.2.1 Introduction

The main propulsion system (MPS) dedicated display drive sequence is used during prelaunch and ascent to monitor certain MPS data and drive the appropriate MPS dedicated displays. The sequence is initiated at the transition to OPS 1 and runs continuously until structural separation of the external tank (ET). The sequence provides outputs for driving the MPS chamber pressure (Pc) meter and the MPS status lights for each SSME. In addition, the sequence issues the prevalve close inhibit commands when the chamber pressure for each engine reaches the appropriate level during engine start. Likewise, these commands are removed at the proper level during shutdown of each main engine. The prevalve close inhibit commands are issued through flight-critical MDM's to load control assemblies, which prevent closure of the prevalves any time the chamber pressure is above a certain level.

4.1.2.2 Overview

The MPS dedicated display drive sequence monitors the SSME status via SSME SOP flags for each engine; and, if an engine limit is exceeded or an engine enters the shutdown phase, it will turn on the red status light for that engine. It also monitors for indication of an electronic lockup, hydraulic lockup, flight data path fail, or the command path fail. Any one of these will turn on the amber status light for that engine. After main engine cutoff and ET separation, the red and amber status lights for all engines are commanded off.

The sequence also monitors the averaged chamber pressure data from each SSME via the SSME SOP and drives the dedicated meters. In addition, the sequence issues the prevalve close inhibit Commands A, B, C for each SSME prevalve when that engine reaches a particular percent thrust. Likewise, these commands are removed when the pressure decreases below that level during SSME shutdown and tail-off, or after MECO COMMAND. When the loss of valid data from an engine occurs, the SSME SOP sets the flight data path fail flag, and the prevalve close inhibit commands are removed. The chamber pressure (Pc) meter is also driven to zero if the flight data path fail flag is set.

4.1.2.3 Detailed Requirements

Step 1 – ET Structural Separation Command Check. This step monitors for a flag from the ET separation sequence, which indicates that structural separation commands have been issued. When the flag is set, all of the MPS red and amber status lights are commanded off.

Monitor the following

- (a) ET SEPARATION CMD FLAG V90X8250X

If (a) = false, proceed to Step 2.

If (a) = true, terminate the following commands and then terminate this sequence:

- | | | |
|-----|------------------------------|-----------|
| (1) | MPS E-1 STATUS/RED LITE ON | V72X0030X |
| (2) | MPS E-1 STATUS/AMBER LITE ON | V72X0035X |
| (3) | MPS E-2 STATUS/RED LITE ON | V72X0031X |
| (4) | MPS E-2 STATUS/AMBER LITE ON | V72X0036X |
| (5) | MPS E-3 STATUS/RED LITE ON | V72X0032X |
| (6) | MPS E-3 STATUS/AMBER LITE ON | V72X0037X |

Step 2 – ME-1 Red Status Light Control. This step monitors the ME-1 engine status; and if the engine limit is exceeded or if the engine enters shutdown, then the red status light is commanded on.

Monitor the following:

- | | | |
|-----|---------------------------------|-----------|
| (a) | ME-1 ENGINE LIMIT EXCEEDED FLAG | V95X1190X |
| (b) | MPS E1 SHUTDOWN PHASE | V95X1155X |
| (c) | MPS E1 POST-SHUTDOWN PHASE | V95X1160X |

If neither (a) nor (b) nor (c) = true, then terminate output (1) below and proceed to Step 3.

If either (a) or (b) or (c) = true, then issue the following output and proceed to Step 3.

- | | | |
|-----|----------------------------|-----------|
| (1) | MPS E-1 STATUS/RED LITE ON | V72X0030X |
|-----|----------------------------|-----------|

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Step 3 – ME-1 Amber Status Light Control. This step monitors the ME-1 engine status via flags from the SSME SOP; and if either electronic lockup or hydraulic lockup mode is indicated or if the engine data path or command path is lost, then the amber status light is turned on.

Monitor the following:

- | | | |
|-----|----------------------------------|-----------|
| (a) | ME-1 ELECTRONIC LOCKUP MODE FLAG | V95X1194X |
| (b) | ME-1 HYDRAULIC LOCKUP MODE FLAG | V95X1198X |
| (c) | ME-1 FLIGHT DATA PATH FAIL FLAG | V95X1150X |
| (d) | ME-1 COMMAND PATH FAIL FLAG | V95X1202X |

If neither (a) nor (b) nor (c) nor (d) = true, terminate output (1) below and proceed to Step 4.

If either (a) or (b) or (c) or (d) = true, then issue the following output and proceed to Step 4.

- | | | |
|-----|------------------------------|-----------|
| (1) | MPS E-1 STATUS/AMBER LITE ON | V72X0035X |
|-----|------------------------------|-----------|

Step 4 – ME-2 Red Status Light Control. This step monitors the ME-2 engine status, and if the engine limit is exceeded or if the engine enters shutdown, then the red status light is commanded on.

Monitor the following:

- | | | |
|-----|---------------------------------|-----------|
| (a) | ME-2 ENGINE LIMIT EXCEEDED FLAG | V95X1191X |
| (b) | MPS E2 SHUTDOWN PHASE | V95X1156X |
| (c) | MPS E2 POST-SHUTDOWN PHASE | V95X1161X |

If neither (a) nor (b) nor (c) a true, terminate output (1) below and then proceed to Step 5.

If either (a) or (b) or (c) = true, then issue the following output and proceed to Step 5.

- | | | |
|-----|----------------------------|-----------|
| (1) | MPS E-2 STATUS/RED LITE ON | V72X0031X |
|-----|----------------------------|-----------|

Step 5 – ME-2 Amber Status Light Control. This step monitors the ME-2 engine status via flags from the SSME SOP; and if either electronic lockup or hydraulic lockup mode is indicated or if the engine data path or command path is lost, then the amber status light is turned on.

Monitor the following:

- | | | |
|-----|----------------------------------|-----------|
| (a) | ME-2 ELECTRONIC LOCKUP MODE FLAG | V95X1195X |
| (b) | ME-2 HYDRAULIC LOCKUP MODE FLAG | V95X1199X |
| (c) | ME-2 FLIGHT DATA PATH FAIL FLAG | V95X1151X |
| (d) | ME-2 COMMAND PATH FAIL FLAG | V95X1203X |

If neither (a) nor (b) nor (c) nor (d) = true, terminate output (1) below and proceed to Step 6.

If either (a) or (b) or (c) or (d) = true, then issue the following output and proceed to Step 6.

- | | | |
|-----|------------------------------|-----------|
| (1) | MPS E-2 STATUS/AMBER LITE ON | V72X0036X |
|-----|------------------------------|-----------|

Step 6 – ME–3 Red Status Light Control. This step monitors the ME–3 engine status, and if the engine limit is exceeded or if the engine enters shutdown, then the red status light is commanded on.

Monitor the following:

- | | | |
|-----|---------------------------------|-----------|
| (a) | ME–3 ENGINE LIMIT EXCEEDED FLAG | V95X1192X |
| (b) | MPS E3 SHUTDOWN PHASE | V95X1157X |
| (c) | MPS E3 POST–SHUTDOWN PHASE | V95X1162X |

If neither (a) nor (b) nor (c) = true, terminate output (1) below and then proceed to Step 7.

If either (a) or (b) or (c) = true, then issue the following output and proceed to Step 7.

- | | | |
|-----|----------------------------|-----------|
| (1) | MPS E–3 STATUS/RED LITE ON | V72X0032X |
|-----|----------------------------|-----------|

Step 7 – ME–3 Amber Status Light Control. This step monitors the ME–3 engine status via flags from the SSME SOP; and if either electronic lockup or hydraulic lockup mode is indicated or if the engine data path or command path is lost, then the amber status light is turned on.

Monitor the following:

- | | | |
|-----|----------------------------------|-----------|
| (a) | ME–3 ELECTRONIC LOCKUP MODE FLAG | V95X1196X |
| (b) | ME–3 HYDRAULIC LOCKUP MODE FLAG | V95X1200X |
| (c) | ME–3 FLIGHT DATA PATH FAIL FLAG | V95X1152X |
| (d) | ME–3 COMMAND PATH FAIL FLAG | V95X1204X |

If neither (a) nor (b) nor (c) nor (d) = true, terminate output (1) below and proceed to Step 8.

If either (a) or (b) or (c) or (d) = true, then issue the following output and proceed to Step 8.

- | | | |
|-----|------------------------------|-----------|
| (1) | MPS E–3 STATUS/AMBER LITE ON | V72X0037X |
|-----|------------------------------|-----------|

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Step 8 – ME–1 Data Path Fail Check. This step monitors the ME–1 FLT DATA PATH FAIL FLAG from the SSME SOP, and if set, the ME–1 prevalve close inhibit commands are removed and the ME–1 chamber pressure (Pc) meter is driven to zero scale.

Monitor the following:

- (a) ME–1 FLIGHT DATA PATH FAIL FLAG V95X1150X

If (a) = false, then proceed to Step 9.

If (a) = true, then terminate the following commands:

- (1) MPS E1 MAINSTAGE CMD A V41K1125X
(2) MPS E1 MAINSTAGE CMD B V41K1126X
(3) MPS E1 MAINSTAGE CMD C V41K1127X

and drive the Pc meter to zero scale (0 Vdc) with the following output:

- (4) MPS E–1 MAIN CHAMBER–PR/CMPT V72P0040C

Then proceed to Step 11.

Step 9 – Normal Control of ME–1 Prevalve Close Inhibit Commands. This step monitors ME–1 main chamber pressure in percent via the SSME SOP and at the appropriate level will either issue or remove the prevalve close inhibit commands for Engine 1.

Monitor the following:

- (a) MPS E–1 PERCENT CH PRESS V95U1186C

If (a) is equal to or greater than 30 percent, then issue the following outputs and proceed to Step 10.

- (1) MPS E1 MAINSTAGE CMD A V41K1125X
(2) MPS E1 MAINSTAGE CMD B V41K1126X
(3) MPS E1 MAINSTAGE CMD C V41K1127X

If (a) is less than 30 percent, then terminate outputs (1), (2), and (3), and proceed to Step 10.

Step 10 – ME–1 Chamber Pressure Meter Drive. This step provides the output to the ME–1 chamber pressure (Pc) meter. The SSME SOP converts ME–1 main chamber pressure to percent and provides this as an input to this sequence. This step scales the percent input to 0 to 5 Vdc and outputs to the Pc meter.

Monitor the following:

- (a) MPS E–1 PERCENT CH PRESS V95U1186C

Output (a) in volts (0 to 115 percent scaled to 0 to 5 Vdc) as follows:

- (1) MPS E–1 MAIN CHAMBER–PR/CMPT V72P0040C

Proceed to Step 11.

Step 11 – ME–2 Data Path Fail Check. This step monitors the ME –2 data path fail flag from the SSME SOP, and if set, the ME –2 prevalve close inhibit commands are removed and the ME–2 chamber pressure (Pc) meter is driven to zero scale.

Monitor the following:

- (a) ME–2 FLT DATA PATH FAIL FLAG V95X1151X

If (a) = false, then proceed to Step 12.

If (a) = true, then terminate the following commands:

- (1) MPS E2 MAINSTAGE CMD A V41K1225X
(2) MPS E2 MAINSTAGE CMD B V41K1226X
(3) MPS E2 MAINSTAGE CMD C V41K1227X

and drive the Pc meter to zero scale (0 Vdc) with the following output:

- (4) MPS E–2 MAIN CHAMBER–PR/CMPT V72P0041C

Then proceed to Step 14.

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Step 12 – Normal Control of ME–2 Main Stage Commands. This step monitors ME–2 main chamber pressure in percent via the SSME SOP and at the appropriate Level will either issue or remove the preclude close inhibit commands for Engine 2.

Monitor the following:

- (a) MPS E–2 PERCENT CH PRESS V95U1187C

If (a) is equal to or greater than 30 percent, then issue the following outputs and proceed to Step 13.

- (1) MPS E2 MAINSTAGE CMD A V41K1225X
(2) MPS E2 MAINSTAGE CMD B V41K1226X
(3) MPS E2 MAINSTAGE CMD C V41K1227X

If (a) is less than 30 percent, then terminate outputs (1), (2), and (3) and proceed to Step 13.

Step 13 – ME–2 Chamber Pressure Meter Drive. This step provides the output to the ME–2 chamber pressure (Pc) meter. The SSME SOP converts ME–2 main chamber pressure to percent and provides this as an input to this sequence. This step scales the percent input to 0 to 5 Vdc and outputs to the Pc meter.

Monitor the following:

- (a) MPS E–2 PERCENT CH PRESS V95U1187C

Output (a) in volts (0 to 115 percent scales to 0 to 5 Vdc) as follows:

- (1) MPS E–2 MAIN CHAMBER–PR/CMPT V72P0041C

Proceed to Step 14.

Step 14 – ME–3 Data Path Fail Check. This step monitors the ME–3 data path fail flag from the SSME SOP, and if set, the ME–3 pre valve close inhibit commands are removed, and the ME–3 chamber pressure (Pc) meter is driven to zero scale.

Monitor the following:

- (a) ME–3 FLT DATA PATH FAIL FLAG V95X1152X

If (a) = false, then proceed to Step 15.

If (a) = true, then terminate the following commands:

- (1) MPS E3 MAINSTAGE CMD A V41K1325X
(2) MPS E3 MAINSTAGE CMD B V41K1326X
(3) MPS E3 MAINSTAGE CMD C V41K1327X

and drive the Pc meter to zero scale (0 Vdc) with the following output:

- (4) MPS E–3 MAIN CHAMBER–PR/CMPT V72P0042C

Then proceed to Step 17.

Step 15 – Normal Control of ME–3 Main Stage Commands. This step monitors ME–3 main chamber pressure in percent via the SSME SOP and at the appropriate level will either issue or remove the pre valve close inhibit commands for Engine 3.

Monitor the following:

- (a) MPS E–3 PERCENT CH PRESS V95U1188C

If (a) is equal to or greater than 30 percent, then issue the following outputs and proceed to Step 16.

- (1) MPS E3 MAINSTAGE CMD A V41K1325X
(2) MPS E3 MAINSTAGE CMD B V41K1326X
(3) MPS E3 MAINSTAGE CMD C V41K1327X

If (a) is less than 30 percent, then terminate outputs (1), (2), and (3) and proceed to Step 16.

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Step 16 – ME–3 Chamber Pressure Meter Drive. This step provides the output to the ME–3 chamber pressure (Pc) meter. The SSME SOP converts ME–3 main chamber pressure to percent and provides this as an input to this sequence. This step scales the percent input to 0 to 5 Vdc and outputs to the Pc meter.

Monitor the following:

- (a) MPS E–3 PERCENT CH PRESS V95U1188C

Output (a) in volts (0 to 115 percent scaled to 0 to 5 Vdc) as follows:

- (1) MPS E–3 MAIN CHAMBER–PR/CMPT V72P0042C

Proceed to Step 17.

Step 17 – MECO Command Monitor. This step monitors for the issuance of the MECO COMMAND FLAG and terminates the prevalue close inhibit commands after the appropriate time delay if flag is set true.

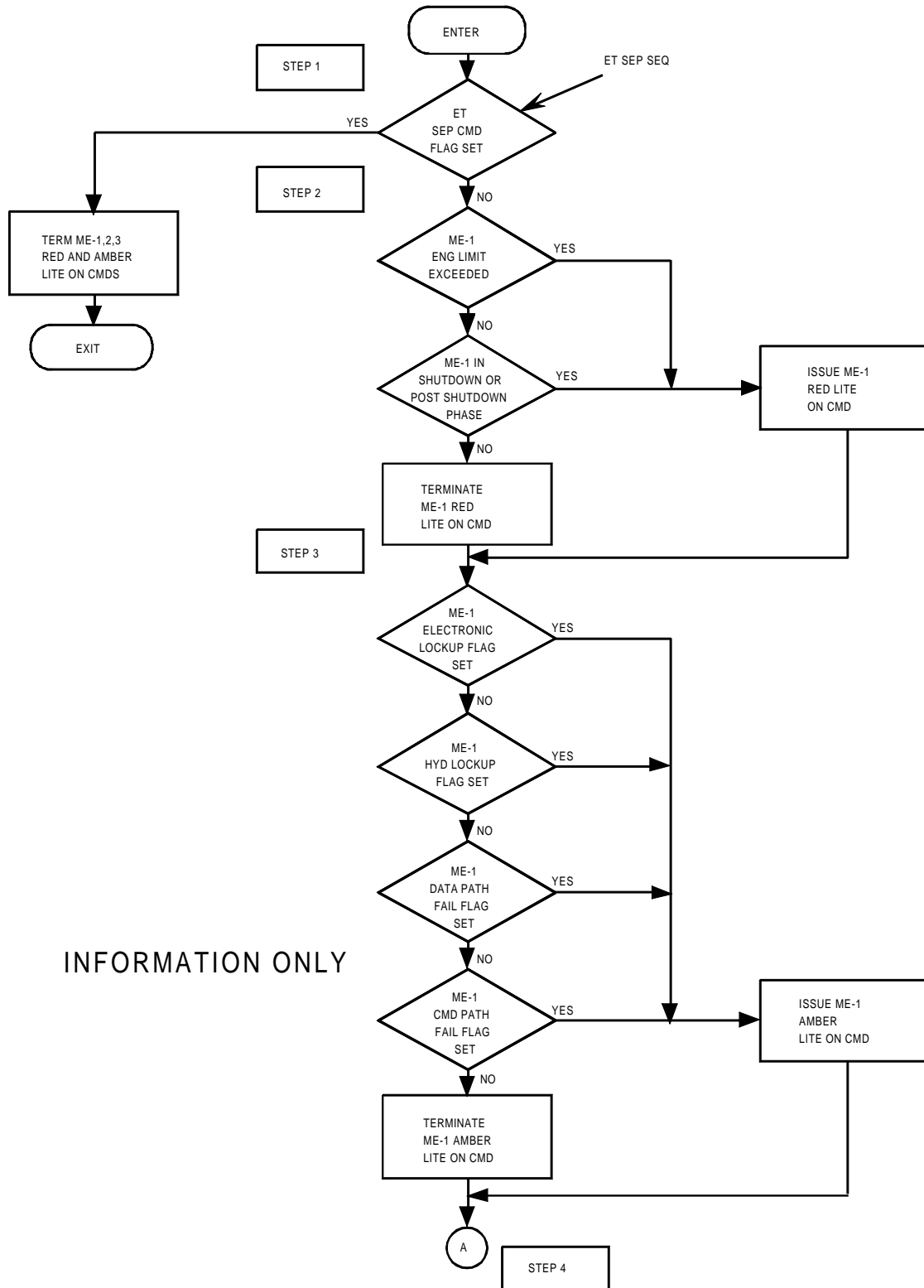
Monitor the following:

- (a) MECO COMMAND FLAG V90X8569X
(b) MECO_PREVLV_CLOSE_DELAY V96U9761C

If (a) is true and (b) seconds have elapsed after detecting (a) true, terminate outputs (1) through (9) below and return to Step 1.

- (1) MPS E1 MAINSTAGE CMD A V41K1125X
(2) MPS E1 MAINSTAGE CMD B V41K1126X
(3) MPS E2 MAINSTAGE CMD A V41K1225X
(4) MPS E2 MAINSTAGE CMD B V41K1226X
(5) MPS E3 MAINSTAGE CMD A V41K1325X
(6) MPS E3 MAINSTAGE CMD B V41K1326X
(7) MPS E1 MAINSTAGE CMD C V41K1127X
(8) MPS E2 MAINSTAGE CMD C V41K1227X
(9) MPS E3 MAINSTAGE CMD C V41K1327X

Otherwise, return to Step 1.



INFORMATION ONLY

FIGURE 4.222.(1) MPS D/D Drive Sequence (Sheet 1 of 6)

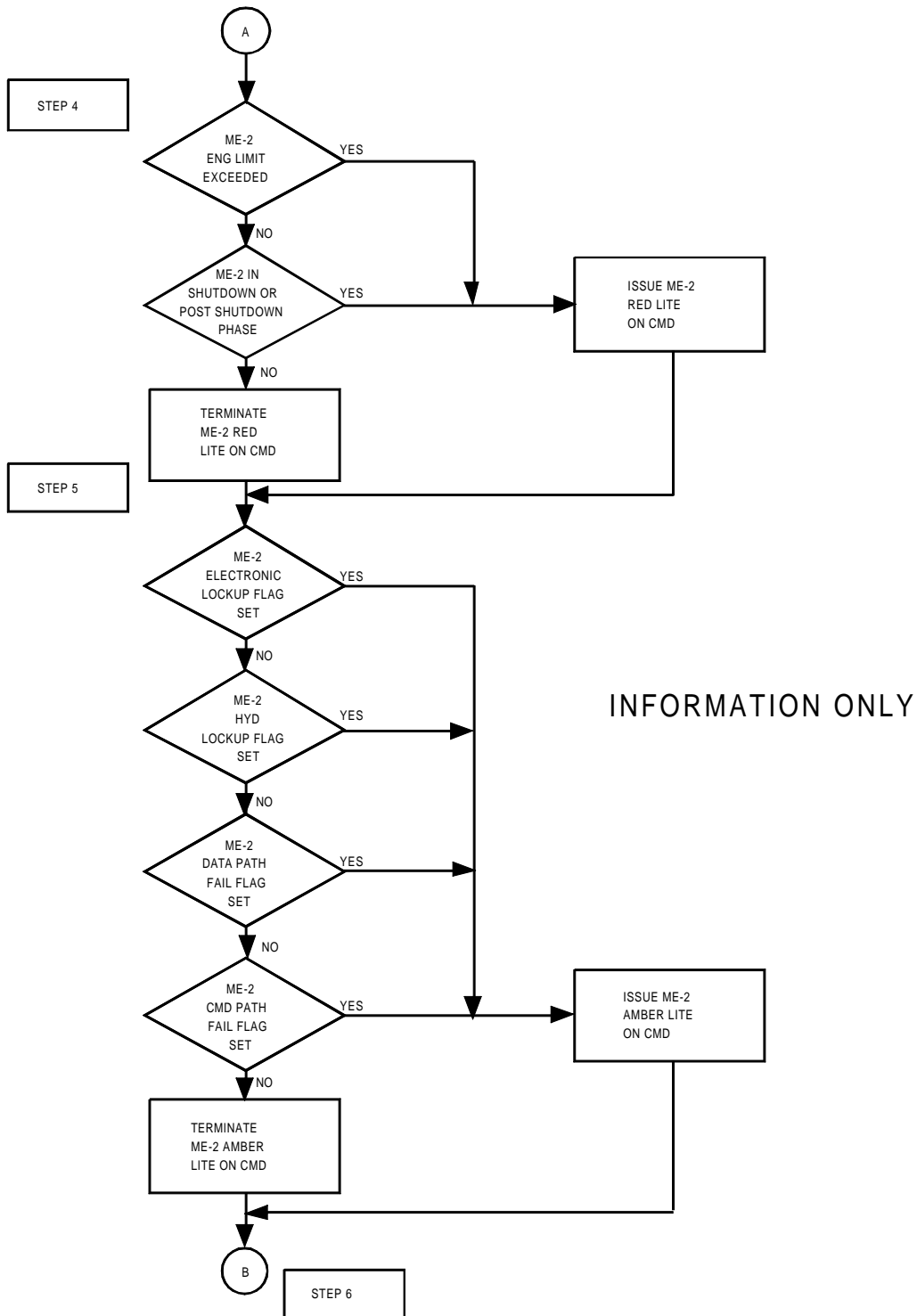


FIGURE 4.222.(2) MPS D/D Drive Sequence (Sheet 2 of 6)

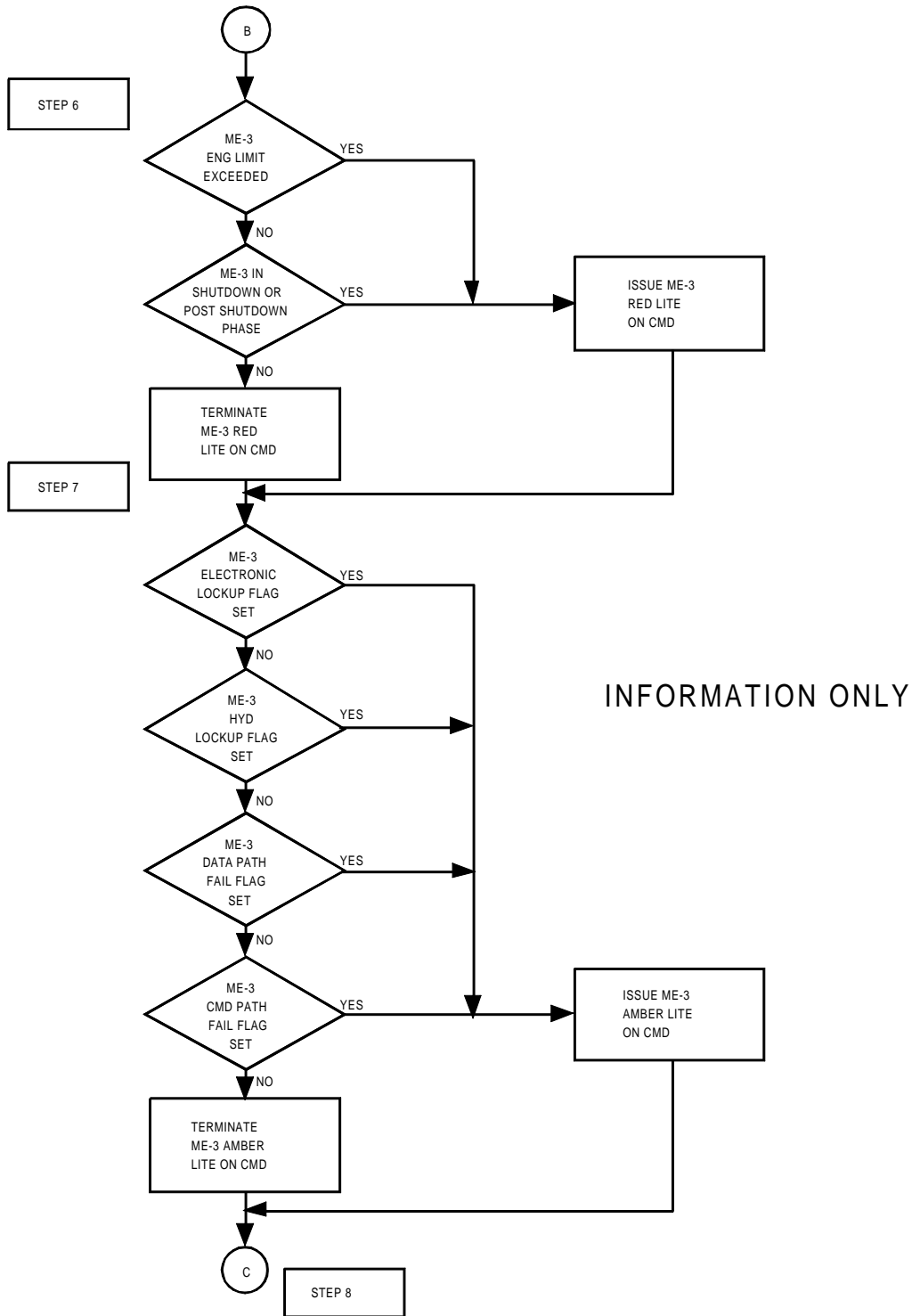


FIGURE 4.222.(3) MPS D/D Drive Sequence (Sheet 3 of 6)

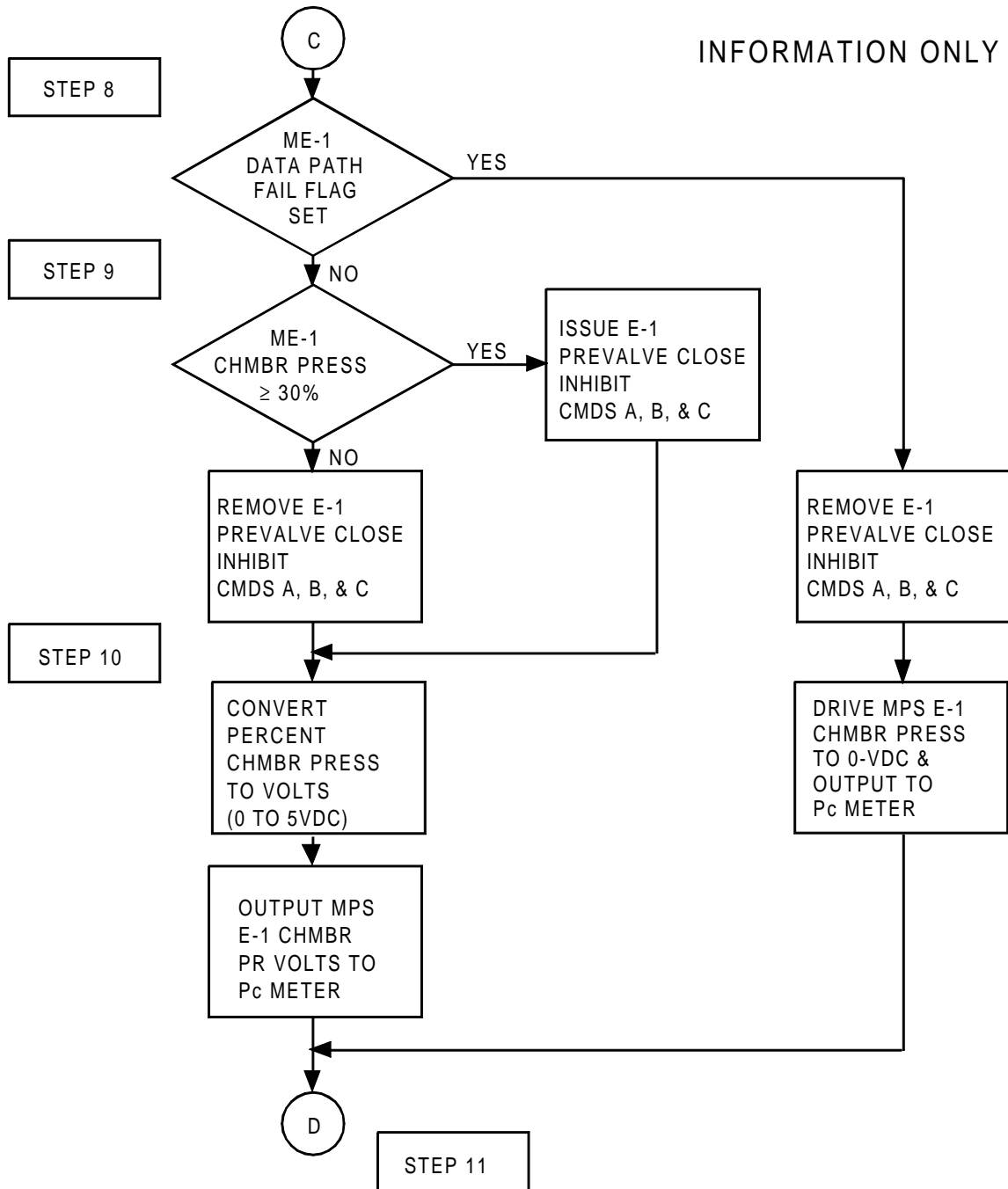


FIGURE 4.222.(4) MPS D/D Drive Sequence (Sheet 4 of 6)

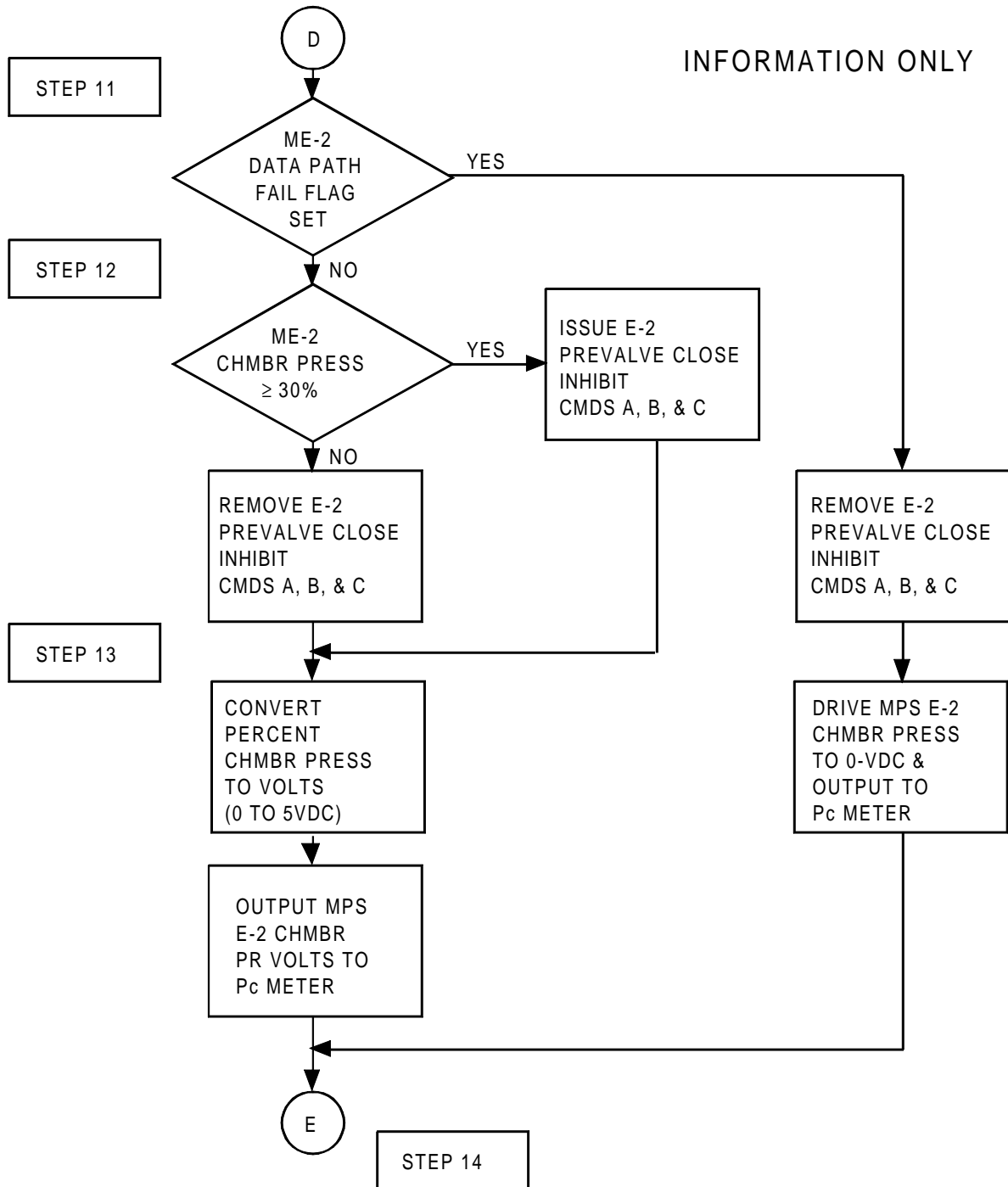


FIGURE 4.222.(5) MPS D/D Drive Sequence (Sheet 5 of 6)

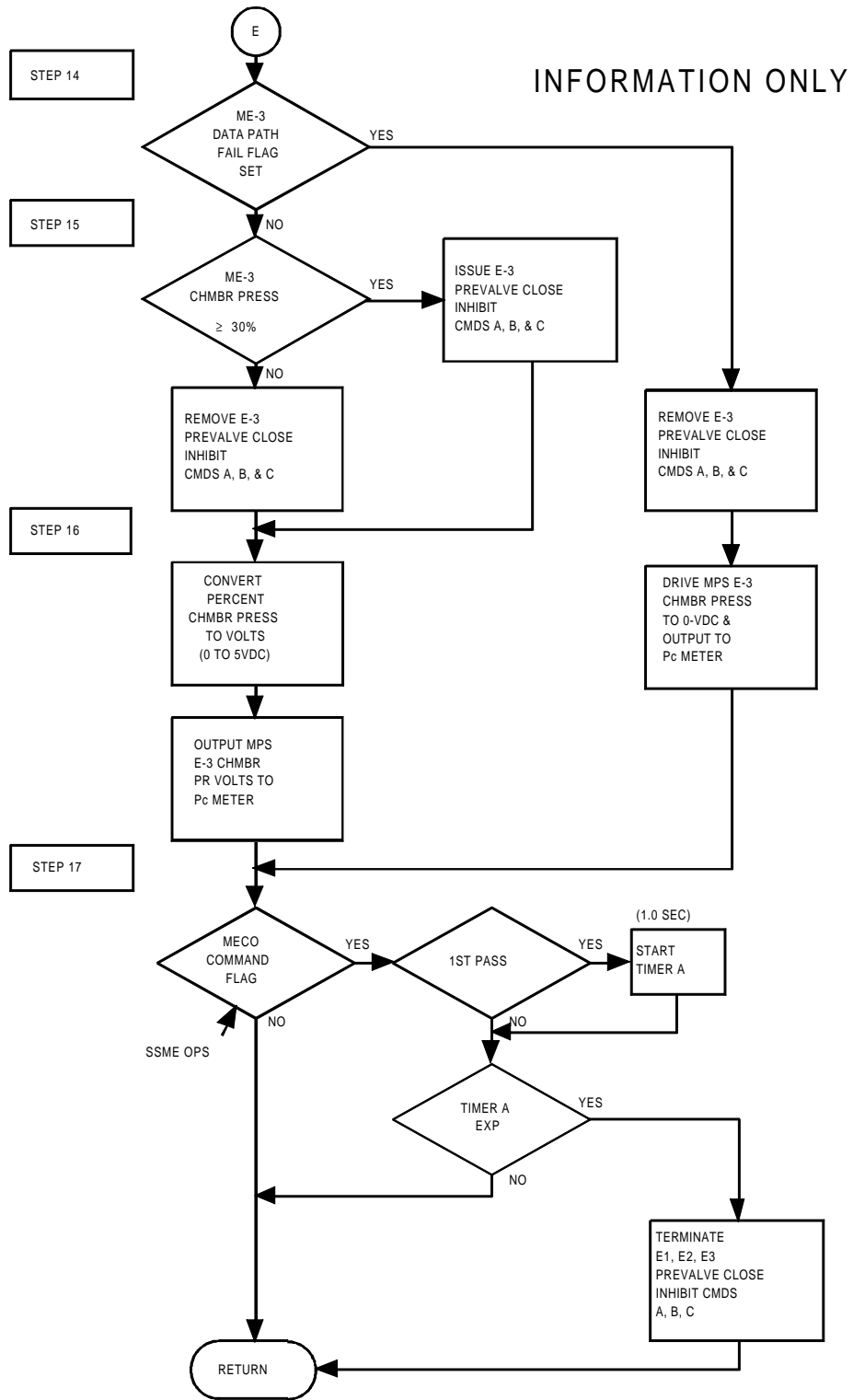


FIGURE 4.222.(6) MPS D/D Drive Sequence (Sheet 6 of 6)

TABLE 4.1.2.4-1. INPUT FUNCTIONAL PARAMETERS FOR MPS DEDICATED DISPLAY DRIVE SEQUENCE (G4.222)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------------|------------|----------------------------------|------------|-------|-----------|---------|---------|-------|
| ET_SEP_CMD | V90X8250X | ET SEPARATION CMD FLAG | ET SEP SEQ | | BD | | 93017G | * |
| ME1_CH_PRESS_FDBK | V95U1186C | MPS E-1 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| ME2_CH_PRESS_FDBK | V95U1187C | MPS E-2 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| ME3_CH_PRESS_FDBK | V95U1188C | MPS E-3 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| MECO_CMD | V90X8569XA | MECO COMMAND FLAG | SSME OPS | | BD | | 93017G | * |
| MECO_PREVLV_CLOSE_DELAY | V96U9761C | MECO PREVLV CLOSE DELAY | SSME OPS | S | | | 90839 | |
| MEPSTSHDN(1) | V95X1160X | MPS E1 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MEPSTSHDN(2) | V95X1161X | MPS E2 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MEPSTSHDN(3) | V95X1162X | MPS E3 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN(1) | V95X1155X | MPS E1 SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN(2) | V95X1156X | MPS E2 SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN(3) | V95X1157X | MPS E3 SHUTDOWN PHASE | SSME SOP | | | | | |
| ME_CMD_PATH_FAIL(1) | V95X1202X | ME-1 COMMAND PATH FAIL FLAG | SSME SOP | | BD | | 93017G | * |
| ME_CMD_PATH_FAIL(2) | V95X1203X | ME-2 COMMAND PATH FAIL FLAG | SSME SOP | | BD | | 93017G | * |
| ME_CMD_PATH_FAIL(3) | V95X1204X | ME-3 COMMAND PATH FAIL FLAG | SSME SOP | | BD | | 93017G | * |
| ME_ELEC_LOCKUP(1) | V95X1194X | ME-1 ELECTRONIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_ELEC_LOCKUP(2) | V95X1195X | ME-2 ELECTRONIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_ELEC_LOCKUP(3) | V95X1196X | ME-3 ELECTRONIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_FLT_DATA_PATH_FAIL(1) | V95X1150X | ME-1 FLIGHT DATA PATH FAIL FLAG | SSME SOP | | | | 90243C | |
| ME_FLT_DATA_PATH_FAIL(2) | V95X1151X | ME-2 FLIGHT DATA PATH FAIL FLAG | SSME SOP | | | | 90243C | |
| ME_FLT_DATA_PATH_FAIL(3) | V95X1152X | ME-3 FLIGHT DATA PATH FAIL FLAG | SSME SOP | | | | 90243C | |
| ME_HYD_LOCKUP(1) | V95X1198X | ME-1 HYDRAULIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_HYD_LOCKUP(2) | V95X1199X | ME-2 HYDRAULIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_HYD_LOCKUP(3) | V95X1200X | ME-3 HYDRAULIC LOCKUP MODE FLAG | SSME SOP | | | | | |
| ME_LIM_EX(1) | V95X1190X | ME-1 ENGINE LIMIT EXCEEDED FLAG | SSME SOP | | | | 89672A | |
| ME_LIM_EX(2) | V95X1191X | ME-2 ENGINE LIMIT EXCEEDED FLAG | SSME SOP | | | | 89672A | |
| ME_LIM_EX(3) | V95X1192X | ME-3 ENGINE LIMIT EXCEEDED FLAG | SSME SOP | | | | 89672A | |

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

TABLE 4.1.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MPS DEDICATED DISPLAY DRIVE SEQUENCE (G4.222)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------|-------------|-------|--------------|------------------|---------|-------------|
| | V41K1125X | MPS E1 MAINSTAGE CMD A | HDWR | | BD | | 89554A | |
| | V41K1126X | MPS E1 MAINSTAGE CMD B | HDWR | | BD | | 89554A | |
| | V41K1127X | MPS E1 MAINSTAGE CMD C | HDWR | | BD | | 89554A | |
| | V41K1225X | MPS E2 MAINSTAGE CMD A | HDWR | | BD | | 89554A | |
| | V41K1226X | MPS E2 MAINSTAGE CMD B | HDWR | | BD | | 89554A | |
| | V41K1227X | MPS E2 MAINSTAGE CMD C | HDWR | | BD | | 89554A | |
| | V41K1325X | MPS E3 MAINSTAGE CMD A | HDWR | | BD | | 89554A | |
| | V41K1326X | MPS E3 MAINSTAGE CMD B | HDWR | | BD | | 89554A | |
| | V41K1327X | MPS E3 MAINSTAGE CMD C | HDWR | | BD | | 89554A | |
| | V72P0040C | MPS E-1 MAIN CHAMBER-PR/CMPT | D&C PNL | VDC | AMU | | | |
| | V72P0041C | MPS E-2 MAIN CHAMBER-PR/CMPT | D&C PNL | VDC | AMU | | | |
| | V72P0042C | MPS E-3 MAIN CHAMBER-PR/CMPT | D&C PNL | VDC | AMU | | | |
| | V72X0030X | MPS E-1 STATUS/RED LITE ON | D&C PNL | | BD | | | |
| | V72X0031X | MPS E-2 STATUS/RED LITE ON | D&C PNL | | BD | | | |
| | V72X0032X | MPS E-3 STATUS/RED LITE ON | D&C PNL | | BD | | | |
| | V72X0035X | MPS E-1 STATUS/AMBER LITE ON | D&C PNL | | BD | | | |
| | V72X0036X | MPS E-2 STATUS/AMBER LITE ON | D&C PNL | | BD | | | |
| | V72X0037X | MPS E-3 STATUS/AMBER LITE ON | D&C PNL | | BD | | | |

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 4.1.2.4-3. MPS DEDICATED DISPLAY DRIVE SEQUENCE (G4.222) 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 4.1.2.4-4. MPS DEDICATED DISPLAY DRIVE SEQUENCE (G4.222) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--------------------------|-----------|----|-------------|-----------|-----|--------|---|----------|---------|-------------|
| MECO_PREVLV_CLOSE_DELAY | V96U9761C | 00 | +1.0 | E+00 | SEC | F | S | C G4.222 | 29855B | |

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

TABLE 4.1.2.4-5. MPS DEDICATED DISPLAY DRIVE SEQUENCE (G4.222) 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.

4.1.3 SRB MDM Data Acquisition (4.203)

4.1.3.1 Introduction

SRB MDM data must be obtained from the SRB's during prelaunch operations and during SRB-powered flight portions of the mission. Data are used for two purposes.

1. Prelaunch Control of the SRB's
2. Downlist operations to place the data on Telemetry and on-board recorders

4.1.3.2 Overview

The GPC shall contain provisions to acquire data from all four (two each SRB) MDM's. This data shall be periodically updated in COMPOOL and thereby made available to system software for downlist processing. The acquisition of the SRB MDM data shall be initiated with the transition to OPS 1 approximately 20 minutes prior to launch and shall be terminated by the SRB Separation Sequence.

NOTE: Before the transition to GNC OPS 1, the SRB MDM data acquisition is accomplished by the V.U. function (GNC-9 and/or SM-9).

4.1.3.3 Detailed Requirements

Step 1. The IDD table contains the SRB MDM data listed by the principle function (4.203) to be acquired for use in GNC MM 101 and 102. Acquire the signals listed in the table and place them in main memory.

TABLE 4.1.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------------|--------|-------|-----------|---------|---------|-------|
| | B46P1305C | LH PRESS N2H4/GN2 BOTTLE OUT SYS A | LA IEA | | AMU | | 93017G | * |
| | B46P1306C | LH PRESS N2H4/GN2 BOTTLE OUT SYS B | LA IEA | | AMU | | 93017G | * |
| | B46P2305C | RH PRESS N2H4/GN2 BOTTLE OUT SYS A | RA IEA | | AMU | | 93017G | * |
| | B46P2306C | RH PRESS N2H4/GN2 BOTTLE OUT SYS B | RA IEA | | AMU | | 93017G | * |
| | B46R1406C | LH RATE APU A TURBINE SPEED SNSR 1 | LA IEA | | AMU | | 93017G | * |
| | B46R1407C | LH RATE APU B TURBINE SPEED SNSR 1 | LA IEA | | AMU | | 93017G | * |
| | B46R1408C | LH RATE APU A TURBINE SPEED SNSR 2 | LA IEA | | AMU | | 93017G | * |
| | B46R1409C | LH RATE APU B TURBINE SPEED SNSR 2 | LA IEA | | AMU | | 93017G | * |
| | B46R2406C | RH RATE APU A TURBINE SPEED SNSR 1 | RA IEA | | AMU | | 93017G | * |
| | B46R2407C | RH RATE APU B TURBINE SPEED SNSR 1 | RA IEA | | AMU | | 93017G | * |
| | B46R2408C | RH RATE APU A TURBINE SPEED SNSR 2 | RA IEA | | AMU | | 93017G | * |
| | B46R2409C | RH RATE APU B TURBINE SPEED SNSR 2 | RA IEA | | AMU | | 93017G | * |
| | B46T1501C | LH TEMP GAS N2H4/GN2 BOTTLE SYS A | LA IEA | | AMU | | 93017G | * |
| | B46T1502C | LH TEMP GAS N2H4/GN2 BOTTLE SYS B | LA IEA | | AMU | | 93017G | * |
| | B46T1503C | LH TEMP GAS GENERATOR BED SYS A | LA IEA | | AMU | | | |
| | B46T1504C | LH TEMP GAS GENERATOR BED SYS B | LA IEA | | AMU | | | |
| | B46T2501C | RH TEMP GAS N2H4/GN2 BOTTLE SYS A | RA IEA | | AMU | | 93017G | * |
| | B46T2502C | RH TEMP GAS N2H4/GN2 BOTTLE SYS B | RA IEA | | AMU | | 93017G | * |
| | B46T2503C | RH TEMP GAS GENERATOR BED SYS A | RA IEA | | AMU | | | |
| | B46T2504C | RH TEMP GAS GENERATOR BED SYS B | RA IEA | | AMU | | | |
| | B46X1851X | LH EVENT APU A ISLN VALVE OPEN | LA IEA | | BD | | 93017G | * |
| | B46X1852X | LH EVENT APU B ISLN VALVE OPEN | LA IEA | | BD | | 93017G | * |
| | B46X1853X | LH EVENT APU A ISLN VALVE CLOSED | LA IEA | | BD | | 93017G | * |
| | B46X1854X | LH EVENT APU B ISLN VALVE CLOSED | LA IEA | | BD | | 93017G | * |
| | B46X1861X | LH EV APU SEC SP CON VLV CLD,SYS A | LF IEA | | BD | | 93017G | * |
| | B46X1862X | LH EV APU PRI SP CON VLV OP, SYS A | LF IEA | | BD | | 93017G | * |
| | B46X1863X | LH EV APU SEC SP CON VLV CLD,SYS B | LF IEA | | BD | | 93017G | * |
| | B46X1864X | LH EV APU PRI SP CON VLV OP, SYS B | LF IEA | | BD | | 93017G | * |
| | B46X1908X | LH EVENT APU-A GG HEATER 1 ON CMD | LA IEA | | BD | | 93017G | * |
| | B46X1909X | LH EVENT APU-A GG HEATER 2 ON CMD | LA IEA | | BD | | 93017G | * |
| | B46X1910X | LH EVENT APU-B GG HEATER 1 ON CMD | LA IEA | | BD | | 93017G | * |
| | B46X1911X | LH EVENT APU-B GG HEATER 2 ON CMD | LA IEA | | BD | | 93017G | * |
| | B46X2851X | RH EVENT APU A ISLN VALVE OPEN | RA IEA | | BD | | 93017G | * |
| | B46X2852X | RH EVENT APU B ISLN VALVE OPEN | RA IEA | | BD | | 93017G | * |
| | B46X2853X | RH EVENT APU A ISLN VALVE CLOSED | RA IEA | | BD | | 93017G | * |
| | B46X2854X | RH EVENT APU B ISLN VALVE CLOSED | RA IEA | | BD | | 93017G | * |
| | B46X2861X | RH EV APU SEC SP CON VLV CLD,SYS A | RF IEA | | BD | | 93017G | * |
| | B46X2862X | RH EV APU PRI SP CON VLV OP, SYS A | RF IEA | | BD | | 93017G | * |
| | B46X2863X | RH EV APU SEC SP CON VLV CLD,SYS B | RF IEA | | BD | | 93017G | * |
| | B46X2864X | RH EV APU PRI SP CON VLV OP, SYS B | RF IEA | | BD | | 93017G | * |
| | B46X2908X | RH EVENT APU-A GG HEATER 1 ON CMD | RA IEA | | BD | | 93017G | * |
| | B46X2909X | RH EVENT APU-A GG HEATER 2 ON CMD | RA IEA | | BD | | 93017G | * |
| | B46X2910X | RH EVENT APU-B GG HEATER 1 ON CMD | RA IEA | | BD | | 93017G | * |
| | B46X2911X | RH EVENT APU-B GG HEATER 2 ON CMD | RA IEA | | BD | | 93017G | * |
| | B47X1901X | LH EVENT SRM CHMBR PRESS A SIM CMD | LF IEA | | BD | | 93017G | * |
| | B47X1902X | LH EVENT SRM CHMBR PRESS B SIM CMD | LF IEA | | BD | | 93017G | * |

TABLE 4.1.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------------|--------|-------|--------------|------------------|---------|-------------|
| | B47X1903X | LH EVENT SRM CHMBR PRESS C SIM CMD | LF IEA | | BD | | 93017G | * |
| | B47X2901X | RH EVENT SRM CHMBR PRESS A SIM CMD | RF IEA | | BD | | 93017G | * |
| | B47X2902X | RH EVENT SRM CHMBR PRESS B SIM CMD | RF IEA | | BD | | 93017G | * |
| | B47X2903X | RH EVENT SRM CHMBR PRESS C SIM CMD | RF IEA | | BD | | 93017G | * |
| | B52X1904X | LH EVENT BARO SW HIGH ALT SIM CMD | LA IEA | | BD | | 93017G | * |
| | B52X1905X | LH EVENT BARO SW LOW ALT SIM CMD | LA IEA | | BD | | 93017G | * |
| | B52X1907X | LH EVENT RECOVERY SYSTEM RESET CMD | LA IEA | | BD | | 93017G | * |
| | B52X1939X | LH EV WATER IMPACT SW SIM A CMD IN | LA IEA | | BD | | 93017G | * |
| | B52X1940X | LH EV WATER IMPACT SW SIM B CMD IN | LA IEA | | BD | | 93017G | * |
| | B52X2904X | RH EVENT BARO SW HIGH ALT SIM CMD | RA IEA | | BD | | 93017G | * |
| | B52X2905X | RH EVENT BARO SW LOW ALT SIM CMD | RA IEA | | BD | | 93017G | * |
| | B52X2907X | RH EVENT RECOVERY SYSTEM RESET CMD | RA IEA | | BD | | 93017G | * |
| | B52X2939X | RH EV WATER IMPACT SW SIM A CMD IN | RA IEA | | BD | | 93017G | * |
| | B52X2940X | RH EV WATER IMPACT SW SIM B CMD IN | RA IEA | | BD | | 93017G | * |
| | B55C1051C | LH CURRENT RSS BATTERY NO 1 | L RSS | | AMU | | 93017G | * |
| | B55C2051C | RH CURRENT RSS BATTERY NO 1 | R RSS | | AMU | | 93017G | * |
| | B55C3054C | LH CURRENT, C-BAND BATTERY | LF IEA | | AMU | | 93017G | * |
| | B55C4054C | RH CURRENT, C-BAND BATTERY | RF IEA | | AMU | | 93017G | * |
| | B55E1100C | LH POWER RSS RCVR SIG STRENGTH A | L RSS | | AMU | | 93017G | * |
| | B55E1101C | LH POWER RSS RCVR SIG STRENGTH B | L RSS | | AMU | | 93017G | * |
| | B55E2100C | RH POWER RSS RCVR SIG STRENGTH A | R RSS | | AMU | | 93017G | * |
| | B55E2101C | RH POWER RSS RCVR SIG STRENGTH B | R RSS | | AMU | | 93017G | * |
| | B55T1505C | LH TEMP SRB RSS BATTERY | L RSS | DEGF | AMU | | 93017G | * |
| | B55T2505C | RH TEMP SRB RSS BATTERY | R RSS | DEGF | AMU | | 93017G | * |
| | B55V1605C | LH VOLTAGE FWD THR PIN PIC CAP A | LF IEA | | AMU | | 93017G | * |
| | B55V1606C | LH VOLTAGE FWD THR PIN PIC CAP B | LF IEA | | AMU | | 93017G | * |
| | B55V1607C | LH VOLTAGE AFT UPR BRC PIC CAP A | LA IEA | | AMU | | 93017G | * |
| | B55V1608C | LH VOLTAGE AFT UPR BRC PIC CAP B | LA IEA | | AMU | | 93017G | * |
| | B55V1609C | LH VOLTAGE AFT MID BRC PIC CAP A | LA IEA | | AMU | | 93017G | * |
| | B55V1610C | LH VOLTAGE AFT MID BRC PIC CAP B | LA IEA | | AMU | | 93017G | * |
| | B55V1611C | LH VOLTAGE AFT LWR BRC PIC CAP A | LA IEA | | AMU | | 93017G | * |
| | B55V1612C | LH VOLTAGE AFT LWR BRC PIC CAP B | LA IEA | | AMU | | 93017G | * |
| | B55V1613C | LH VOLTAGE FWD SEPN MOT PIC CAP A | LA IEA | | AMU | | 93017G | * |
| | B55V1614C | LH VOLTAGE FWD SEPN MOT PIC CAP B | LA IEA | | AMU | | 93017G | * |
| | B55V1615C | LH VOLTAGE AFT SEPN MOT PIC CAP A | LA IEA | | AMU | | 93017G | * |
| | B55V1616C | LH VOLTAGE AFT SEPN MOT PIC CAP B | LA IEA | | AMU | | 93017G | * |
| | B55V1623C | LH VOLTAGE RSS ARM LATCH A | L RSS | | AMU | | 93017G | * |
| | B55V1624C | LH VOLTAGE RSS ARM LATCH B | L RSS | | AMU | | 93017G | * |
| | B55V1625C | LH VOLTAGE RSS BATTERY NO 1 | L RSS | | AMU | | 93017G | * |
| | B55V2605C | RH VOLTAGE FWD THR PIN PIC CAP A | RF IEA | | AMU | | 93017G | * |
| | B55V2606C | RH VOLTAGE FWD THR PIN PIC CAP B | RF IEA | | AMU | | 93017G | * |
| | B55V2607C | RH VOLTAGE AFT UPR BRC PIC CAP A | RA IEA | | AMU | | 93017G | * |
| | B55V2608C | RH VOLTAGE AFT UPR BRC PIC CAP B | RA IEA | | AMU | | 93017G | * |
| | B55V2609C | RH VOLTAGE AFT MID BRC PIC CAP A | RA IEA | | AMU | | 93017G | * |
| | B55V2610C | RH VOLTAGE AFT MID BRC PIC CAP B | RA IEA | | AMU | | 93017G | * |
| | B55V2611C | RH VOLTAGE AFT LWR BRC PIC CAP A | RA IEA | | AMU | | 93017G | * |

TABLE 4.1.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------------|--------|-------|-----------|---------|---------|-------|
| | B55V2612C | RH VOLTAGE AFT LWR BRC PIC CAP B | RA IEA | | AMU | | 93017G | * |
| | B55V2613C | RH VOLTAGE FWD SEPN MOT PIC CAP A | RF IEA | | AMU | | 93017G | * |
| | B55V2614C | RH VOLTAGE FWD SEPN MOT PIC CAP B | RF IEA | | AMU | | 93017G | * |
| | B55V2615C | RH VOLTAGE AFT SEPN MOT PIC CAP A | RA IEA | | AMU | | 93017G | * |
| | B55V2616C | RH VOLTAGE AFT SEPN MOT PIC CAP B | RA IEA | | AMU | | 93017G | * |
| | B55V2623C | RH VOLTAGE RSS ARM LATCH A | R RSS | | AMU | | 93017G | * |
| | B55V2624C | RH VOLTAGE RSS ARM LATCH B | R RSS | | AMU | | 93017G | * |
| | B55V2625C | RH VOLTAGE RSS BATTERY NO 1 | R RSS | | AMU | | 93017G | * |
| | B55V3053C | LH VOLTAGE, C-BAND BATTERY | LF IEA | | AMU | | 93017G | * |
| | B55V4053C | RH VOLTAGE, C-BAND BATTERY | RF IEA | | AMU | | 93017G | * |
| | B55X1806X | LH EVENT IGN PIC A RTST OK | LF IEA | | BD | | 93017G | * |
| | B55X1807X | LH EVENT IGN PIC B RTST OK | LF IEA | | BD | | 93017G | * |
| | B55X1818X | LH EVENT AFT SEP MOT PIC A RTST OK | LF IEA | | BD | | 93017G | * |
| | B55X1819X | LH EVENT AFT SEP MOT PIC B RTST OK | LF IEA | | BD | | 93017G | * |
| | B55X1823X | LH EVENT MN CHUTE DISC PIC RTST OK | LF IEA | | BD | | 93017G | * |
| | B55X1841X | LH EVENT MN CHUTE DISC PIC L/T OK | LF IEA | | BD | | 93017G | * |
| | B55X1842X | LH EVENT IGN S&A DEVICE ARMED | LF IEA | | BD | | 93017G | * |
| | B55X1843X | LH EVENT IGN S&A DEVICE SAFED | LF IEA | | BD | | 93017G | * |
| | B55X1865X | LH EV RSS ARM LTCH SW A OUTPUT | L RSS | | BD | | 93017G | * |
| | B55X1866X | LH EV RSS ARM LTCH SW B OUTPUT | L RSS | | BD | | 93017G | * |
| | B55X1867X | LH EVENT RSS DCFC A FIRED | L RSS | | BD | | 93017G | * |
| | B55X1868X | LH EVENT RSS DCFC B FIRED | L RSS | | BD | | 93017G | * |
| | B55X1869X | LH EVENT RSS S&A DEVICE SAFED | L RSS | | BD | | 93017G | * |
| | B55X1870X | LH EVENT RSS S&A DEVICE ARMED | L RSS | | BD | | 93017G | * |
| | B55X1871X | LH EV RSS CRD A PWR/ST ON/PT OFF | L RSS | | BD | | 93017G | * |
| | B55X1872X | LH EV RSS CRD B PWR/ST ON/PT OFF | L RSS | | BD | | 93017G | * |
| | B55X1873X | LH EVENT RSS DCFC A RTST TEST OK | L RSS | | BD | | 93017G | * |
| | B55X1874X | LH EVENT RSS DCFC B RTST TEST OK | L RSS | | BD | | 93017G | * |
| | B55X1875X | LH EVENT RSS DCFC A LOAD TEST OK | L RSS | | BD | | 93017G | * |
| | B55X1876X | LH EVENT RSS DCFC B LOAD TEST OK | L RSS | | BD | | 93017G | * |
| | B55X1877X | LH EV RSS ARM CMD FROM DCDR A | L RSS | | BD | | 93017G | * |
| | B55X1878X | LH EV RSS ARM CMD FROM DCDR B | L RSS | | BD | | 93017G | * |
| | B55X1879X | LH EV RSS FIRE CMD FROM DCDR A | L RSS | | BD | | 93017G | * |
| | B55X1880X | LH EV RSS FIRE CMD FROM DCDR B | L RSS | | BD | | 93017G | * |
| | B55X1881X | LH EVENT RSS A INHIBIT | L RSS | | BD | | 93017G | * |
| | B55X1882X | LH EVENT RSS B INHIBIT | L RSS | | BD | | 93017G | * |
| | B55X2806X | RH EVENT IGN PIC A RTST OK | RF IEA | | BD | | 93017G | * |
| | B55X2807X | RH EVENT IGN PIC B RTST OK | RF IEA | | BD | | 93017G | * |
| | B55X2818X | RH EVENT AFT SEP MOT PIC A RTST OK | RF IEA | | BD | | 93017G | * |
| | B55X2819X | RH EVENT AFT SEP MOT PIC B RTST OK | RF IEA | | BD | | 93017G | * |
| | B55X2823X | RH EVENT MN CHUTE DISC PIC RTST OK | RF IEA | | BD | | 93017G | * |
| | B55X2841X | RH EVENT MN CHUTE DISC PIC L/T OK | RF IEA | | BD | | 93017G | * |
| | B55X2842X | RH EVENT IGN S&A DEVICE ARMED | RF IEA | | BD | | 93017G | * |
| | B55X2843X | RH EVENT IGN S&A DEVICE SAFED | RF IEA | | BD | | 93017G | * |
| | B55X2865X | RH EV RSS ARM LTCH SW A OUTPUT | R RSS | | BD | | 93017G | * |
| | B55X2866X | RH EV RSS ARM LTCH SW B OUTPUT | R RSS | | BD | | 93017G | * |

TABLE 4.1.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|--------|---------------------------------|--------|-----------|--------------|------------------|---------|-------------|
| B55X2867X | RH | EVENT RSS DCFC A FIRED | R | RSS | BD | | 93017G | * |
| B55X2868X | RH | EVENT RSS DCFC B FIRED | R | RSS | BD | | 93017G | * |
| B55X2869X | RH | EVENT RSS S&A DEVICE SAFED | R | RSS | BD | | 93017G | * |
| B55X2870X | RH | EVENT RSS S&A DEVICE ARMED | R | RSS | BD | | 93017G | * |
| B55X2871X | RH | EV RSS CRD A PWR/ST ON/PT OFF | R | RSS | BD | | 93017G | * |
| B55X2872X | RH | EV RSS CRD B PWR/ST ON/PT OFF | R | RSS | BD | | 93017G | * |
| B55X2873X | RH | EVENT RSS DCFC A RTST TEST OK | R | RSS | BD | | 93017G | * |
| B55X2874X | RH | EVENT RSS DCFC B RTST TEST OK | R | RSS | BD | | 93017G | * |
| B55X2875X | RH | EVENT RSS DCFC A LOAD TEST OK | R | RSS | BD | | 93017G | * |
| B55X2876X | RH | EVENT RSS DCFC B LOAD TEST OK | R | RSS | BD | | 93017G | * |
| B55X2877X | RH | EV RSS ARM CMD FROM DCDR A | R | RSS | BD | | 93017G | * |
| B55X2878X | RH | EV RSS ARM CMD FROM DCDR B | R | RSS | BD | | 93017G | * |
| B55X2879X | RH | EV RSS FIRE CMD FROM DCDR A | R | RSS | BD | | 93017G | * |
| B55X2880X | RH | EV RSS FIRE CMD FROM DCDR B | R | RSS | BD | | 93017G | * |
| B55X2881X | RH | EVENT RSS A INHIBIT | R | RSS | BD | | 93017G | * |
| B55X2882X | RH | EVENT RSS B INHIBIT | R | RSS | BD | | 93017G | * |
| B58H1150C | LH | POSITION TVC ROCK ACTUATOR | L | TVC R ACT | AMU | | 93017G | * |
| B58H1151C | LH | POSITION TVC TILT ACTUATOR | L | TVC T ACT | AMU | | 93017G | * |
| B58H2150C | RH | POSITION TVC ROCK ACTUATOR | R | TVC R ACT | AMU | | 93017G | * |
| B58H2151C | RH | POSITION TVC TILT ACTUATOR | R | TVC T ACT | AMU | | 93017G | * |
| B58P1303C | LH | PRESS HYDR FLUID SUPPLY 1 | LA | IEA | AMU | | 93017G | * |
| B58P1304C | LH | PRESS HYDR FLUID SUPPLY 2 | LA | IEA | AMU | | 93017G | * |
| B58P2303C | RH | PRESS HYDR FLUID SUPPLY 1 | RA | IEA | AMU | | 93017G | * |
| B58P2304C | RH | PRESS HYDR FLUID SUPPLY 2 | RA | IEA | AMU | | 93017G | * |
| B58Q1350C | LH | LEVEL HYDR FLUID RSVR SYS A | L | HYD RES A | AMU | | 93017G | * |
| B58Q1351C | LH | LEVEL HYDR FLUID RSVR SYS B | L | HYD RES B | AMU | | 93017G | * |
| B58Q2350C | RH | LEVEL HYDR FLUID RSVR SYS A | R | HYD RES A | AMU | | 93017G | * |
| B58Q2351C | RH | LEVEL HYDR FLUID RSVR SYS B | R | HYD RES B | AMU | | 93017G | * |
| B58X1859X | LH | EV TILT SERVO ACTR PRI PRESS OK | LA | IEA | BD | | 93017G | * |
| B58X1860X | LH | EV ROCK SERVO ACTR PRI PRESS OK | LA | IEA | BD | | 93017G | * |
| B58X1912X | LH | EV TVC SYS A PRESS SNSR CAL CMD | LA | IEA | BD | | 93017G | * |
| B58X1913X | LH | EV TVC SYS B PRESS SNSR CAL CMD | LA | IEA | BD | | 93017G | * |
| B58X2859X | RH | EV TILT SERVO ACTR PRI PRESS OK | RA | IEA | BD | | 93017G | * |
| B58X2860X | RH | EV ROCK SERVO ACTR PRI PRESS OK | RA | IEA | BD | | 93017G | * |
| B58X2912X | RH | EV TVC SYS A PRESS SNSR CAL CMD | RA | IEA | BD | | 93017G | * |
| B58X2913X | RH | EV TVC SYS B PRESS SNSR CAL CMD | RA | IEA | BD | | 93017G | * |
| B76C1050C | LH | CURRENT RECOVERY BATTERY | LF | IEA | AMU | | 93017G | * |
| B76C2050C | RH | CURRENT RECOVERY BATTERY | RF | IEA | AMU | | 93017G | * |
| B76T1500C | LH | TEMPERATURE RECOVERY BATTERY | LF | IEA | AMU | | 93017G | * |
| B76T2500C | RH | TEMPERATURE RECOVERY BATTERY | RF | IEA | AMU | | 93017G | * |
| B76T7529C | LH | TEMP DEVELOPMENT FLT BATTERY | LF | IEA | AMU | | 93017G | * |
| B76T8529C | RH | TEMP DEVELOPMENT FLT BATTERY | RF | IEA | AMU | | 93017G | * |
| B76V1600C | LH | VOLTAGE OPERATIONAL BUS A | LF | IEA | AMU | | 93017G | * |
| B76V1601C | LH | VOLTAGE OPERATIONAL BUS B | LF | IEA | AMU | | 93017G | * |
| B76V1602C | LH | VOLTAGE RECOVERY BATTERY | LF | IEA | AMU | | 93017G | * |
| B76V2600C | RH | VOLTAGE OPERATIONAL BUS A | RF | IEA | AMU | | 93017G | * |

TABLE 4.1.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|-----------------------------------|--------|-------|-----------|---------|---------|-------|
| | B76V2601C | RH VOLTAGE OPERATIONAL BUS B | RF IEA | | AMU | | 93017G | * |
| | B76V2602C | RH VOLTAGE RECOVERY BATTERY | RF IEA | | AMU | | 93017G | * |
| | B78T7530C | LH TEMP,FLT RCDR | LF IEA | DEG | AMU | | 93017G | * |
| | B78T8530C | RH TEMP,FLT RCDR | RF IEA | DEG | AMU | | 93017G | * |
| | B78X7005X | LH RECORDER 1 STATUS | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7006X | LH RECORDER 2 STATUS | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7007X | LH RECORDER 3 STATUS | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7008X | LH RECORDER 4 STATUS | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7887X | LH EVENT FLT RCDR MALFUNCTION | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7888X | LH EVENT FLT RCDR RECORD IND | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7914X | LH EVENT TIME CODE GENERATOR OK | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7918X | LH EV FDM1 MUXR1 OUT-ORB RCDR OK | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7925X | LH EVENT FLT RCDR REVERSE CMD | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7926X | LH EVENT FDM AUTO CALIBRATION CMD | LF IEA | EVENT | BD | | 93017G | * |
| | B78X7929X | LH EV PCM MASTER OK | LF IEA | | BD | | 93017G | * |
| | B78X7931X | LH EV PCM REMOTE 2 OK | LF IEA | | BD | | 93017G | * |
| | B78X7935X | LH EV FDM 1 MUX 1 OK | LF IEA | | BD | | 93017G | * |
| | B78X7936X | LH EV FDM 1 MUX 2 OK | LF IEA | | BD | | 93017G | * |
| | B78X7937X | LH EV FDM 2 MUX 1 OK | LF IEA | | BD | | 93017G | * |
| | B78X7938X | LH EV FDM 2 MUX 2 OK | LF IEA | | BD | | 93017G | * |
| | B78X7939X | LH EV WBSC 1 OK | LF IEA | | BD | | 93017G | * |
| | B78X7940X | LH EV WBSC 2 OK | LF IEA | | BD | | 93017G | * |
| | B78X7943X | LH EV PCM REMOTE 3 OK | LF IEA | | BD | | 93017G | * |
| | B78X8005X | RH RECORDER 1 STATUS | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8006X | RH RECORDER 2 STATUS | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8007X | RH RECORDER 3 STATUS | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8008X | RH RECORDER 4 STATUS | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8887X | RH EVENT FLT RCDR MALFUNCTION | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8888X | RH EVENT FLT RCDR RECORD IND | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8914X | RH EVENT TIME CODE GENERATOR OK | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8918X | RH EV FDM1 MUXR1 OUT-ORB RCDR OK | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8925X | RH EVENT FLT RCDR REVERSE CMD | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8926X | RH EVENT FDM AUTO CALIBRATION CMD | RF IEA | EVENT | BD | | 93017G | * |
| | B78X8929X | RH EV PCM MASTER OK | RF IEA | | BD | | 93017G | * |
| | B78X8931X | RH EV PCM REMOTE 2 OK | RF IEA | | BD | | 93017G | * |
| | B78X8935X | RH EV FDM 1 MUX 1 OK | RF IEA | | BD | | 93017G | * |
| | B78X8936X | RH EV FDM 1 MUX 2 OK | RF IEA | | BD | | 93017G | * |
| | B78X8937X | RH EV FDM 2 MUX 1 OK | RF IEA | | BD | | 93017G | * |
| | B78X8938X | RH EV FDM 2 MUX 2 OK | RF IEA | | BD | | 93017G | * |
| | B78X8939X | RH EV WBSC 1 OK | RF IEA | | BD | | 93017G | * |
| | B78X8940X | RH EV WBSC 2 OK | RF IEA | | BD | | 93017G | * |
| | B78X8943X | RH EV PCM REMOTE 3 OK | RF IEA | | BD | | 93017G | * |
| | B79X1845X | SRGA 1 PITCH SMRD | SRGA 1 | | BD | | 93017G | * |
| | B79X1846X | SRGA 3 PITCH SMRD | SRGA 3 | | BD | | 93017G | * |
| | B79X1848X | SRGA 1 YAW SMRD | SRGA 1 | | BD | | 93017G | * |
| | B79X1849X | SRGA 3 YAW SMRD | SRGA 3 | | BD | | 93017G | * |

TABLE 4.1.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|-----------------------------|--------|-------|--------------|------------------|---------|-------------|
| | B79X1890X | SRGA 1 PITCH POS TORQUE CMD | LF IEA | | BD | | 93017G | * |
| | B79X1891X | SRGA 3 PITCH POS TORQUE CMD | LF IEA | | BD | | 93017G | * |
| | B79X1893X | SRGA 1 YAW POS TORQUE CMD | LF IEA | | BD | | 93017G | * |
| | B79X1894X | SRGA 3 YAW POS TORQUE CMD | LF IEA | | BD | | 93017G | * |
| | B79X1896X | SRGA 1 PITCH NEG TORQUE CMD | LF IEA | | BD | | 93017G | * |
| | B79X1897X | SRGA 3 PITCH NEG TORQUE CMD | LF IEA | | BD | | 93017G | * |
| | B79X1899X | SRGA 1 YAW NEG TORQUE CMD | LF IEA | | BD | | 93017G | * |
| | B79X1900X | SRGA 3 YAW NEG TORQUE CMD | LF IEA | | BD | | 93017G | * |
| | B79X2845X | SRGA 2 PITCH SMRD | SRGA 2 | | BD | | 93017G | * |
| | B79X2846X | SRGA 4 PITCH SMRD | SRGA 4 | | BD | | 93017G | * |
| | B79X2848X | SRGA 2 YAW SMRD | SRGA 2 | | BD | | 93017G | * |
| | B79X2849X | SRGA 4 YAW SMRD | SRGA 4 | | BD | | 93017G | * |
| | B79X2890X | SRGA 2 PITCH POS TORQUE CMD | RF IEA | | BD | | 93017G | * |
| | B79X2891X | SRGA 4 PITCH POS TORQUE CMD | RF IEA | | BD | | 93017G | * |
| | B79X2893X | SRGA 2 YAW POS TORQUE CMD | RF IEA | | BD | | 93017G | * |
| | B79X2894X | SRGA 4 YAW POS TORQUE CMD | RF IEA | | BD | | 93017G | * |
| | B79X2896X | SRGA 2 PITCH NEG TORQUE CMD | RF IEA | | BD | | 93017G | * |
| | B79X2897X | SRGA 4 PITCH NEG TORQUE CMD | RF IEA | | BD | | 93017G | * |
| | B79X2899X | SRGA 2 YAW NEG TORQUE CMD | RF IEA | | BD | | 93017G | * |
| | B79X2900X | SRGA 4 YAW NEG TORQUE CMD | RF IEA | | BD | | 93017G | * |

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

TABLE 4.1.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|--------|--------------|-------------|-------|-----------|------------------|---------|-------------|
|-----------|--------|--------------|-------------|-------|-----------|------------------|---------|-------------|

NO REQUIREMENTS

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 4.1.3.4-3. SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203) 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 4.1.3.4-4. SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD 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.

TABLE 4.1.3.4-5. SOLID ROCKET BOOSTER DATA ACQUISITION (G4.203) 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.

4.2 ASCENT

4.2.1 SSME Operations Sequence (4.165)

4.2.1.1 Introduction

The SSME operations sequence is initiated at TO/SRB IGNITION, and is used during the ascent phase to:

1. Monitor the operating phase of each main engine
2. Issue inhibit commands to prevent a second engine from automatically shutting down if one shutdown has already occurred
3. Monitor the state of cockpit switches via flags from the switch processor and issue appropriate commands
4. Monitor a flag from GNC software for proper time to check the LO₂ and LH₂ low-level sensors and provide a single pass health check of these sensors.
5. Monitor a cut-off timing request flag from GNC software for proper time for MECO, to meet the desired time for start of thrust tailoff with accuracy requirements of ± 40 msec
6. Issue main engine shutdown commands when required
7. Close LO₂ and LH₂ prevalues for each engine after shutdown has occurred
8. Restart the event timer at MECO

In addition, an SSME data path fail flag from the SSME SOP is checked and if set and shutdown commands have been issued for that engine, then its prevalues are closed after a time delay. A MECO confirmed flag is set by the SSME operations sequence after it has been confirmed that all engines have shut down. Also, a flag is set for the external tank (ET) separation sequence after the prevalues for all engines are commanded closed. This is necessary since shutdown times may differ.

4.2.1.2 Overview

The SSME operations sequence is initiated when the RS launch sequence fires the SRB's and sets the TO flag. At this point, the main engines are at or above the required thrust, and the engine controllers will have entered the main stage phase 5.0 seconds after receipt of the start commands. The SSME OPS sequence operates cyclically at 25 Hz from initiation at TO until MECO is verified and a few seconds after the prevalues are commanded closed. Under normal operation through ascent, there are no commands to issue until the end of second stage when the engines must be shut down and certain main propulsion system (MPS) valves are closed.

Continuous monitoring of certain inputs is required in the event that an automatic shutdown by one engine occurs, the crew operates any of the manual switches, data from any of the main engines is lost, or, near the end of boost, either the LH₂ or LO₂ level sensors indicate fuel or oxidizer depletion.

If shutdown of an engine occurs for any reason, the LO₂ and LH₂ prevalves for that engine must be closed after appropriate time delays, and the remaining two engines are inhibited from performing an automatic shutdown.

The switch processor software monitors the position of several crew station switches for the MPS and sets flags which are monitored by SSME OPS. The MPS switches being monitored are the three shutdown push-button switches and the limit shutdown switch, which can override the automatic inhibit logic and inhibit or enable engine automatic shutdown.

The SSME OPS sequence monitors the main engine chamber pressure and manual shutdown switches. If shutdown is confirmed, the appropriate MPS valves are closed. The operating phase and mode within a phase are determined from the engine status word by the SSME SOP, which gathers the engine data from the EIU, decodes it, and sets applicable flags for the various user software packages. If valid data is not available from the engine, the SSME SOP sets a data path fail flag. If this flag is set and shutdown commands have been issued, SSME OPS proceeds, after a time delay, to close the engine prevalves.

SSME OPS, upon receiving a flag from guidance, begins monitoring the fuel and oxidizer low-level sensors. A first pass health check will be made to protect against premature SSME shutdown resulting from failed dry sensors. If any two LO₂ low-level sensors, which have not been disabled, indicate a dry condition, the logic will issue the MECO commands. Likewise, two LH₂ low-level sensors, which indicate dry and have not been previously disabled, will cause the issuance of MECO commands.

The three main engine fail flags are monitored to detect a three engine out scenario in order to command MECO in a timely manner. When all three main engine fail flags are set high, the logic will issue the MECO commands.

Normal engine shutdown, MECO, is triggered by the vehicle achieving the desired velocity and a flag being set by guidance software. The MECO commands issued include shutdown enable and shutdown commands through the EIU's to each of the three main engine controllers. The MECO commands are issued until it is determined that each engine has shutdown. At this point a MECO confirmed flag is set for GNC applications and to initiate the external tank separation sequence. After MECO confirmed, a command is sent to restart the event timer.

SSME OPS continues to operate until the required time after prevalves for each engine are commanded closed and the close commands are removed. Nominal MECO and shutdown during "G" conditions require different time delays for prevalve closure. When LO₂ and LH₂ prevalves for all three engines have been commanded closed, a flag is set for the ET separation sequence. This is required to prevent initiation of ET disconnect valve closure prior to initiation of all prevalves closures. When the prevalves' close commands have been removed and the flag set, the SSME OPS sequence is terminated.

4.2.1.3 Detailed Requirements.

Step 1 – Main Engine (ME) 1 Prevalves Closed Check. This step provides a bypass of the logic in Steps 2 and 3 if ME-1 is in either shutdown or post shutdown phase and the prevalves have been commanded closed.

Monitor the following:

- (a) ME-1 PREVALVES CMD'D CLOSED FLAG (INTERNAL)

If (a) = false proceed to Step 2.

If (a) = true proceed to Step 4.

Step 2 – ME-1 Shutdown Status. This step monitors for ME-1 shutdown via SSME SOP phase flags or in the case of a Data Path Failure, the Safing command from the Switch RM or the internal Shutdown Command Issued Flag. If shutdown is detected prior to MECO, a fail flag is issued to flight control and guidance functions.

Monitor the following:

- (a) ME-1 FLIGHT DATA PATH FAIL FLAG V95X1150X
(b) ME-1 SAFING CMD V90X3443X
(c) ME-1 SHUTDOWN CMD ISSUED FLAG (INTERNAL)
(d) MPS E1 SHUTDOWN PHASE V95X1155X
(e) MPS E1 POST-SHUTDOWN PHASE V95X1160X
(f) MECO COMMAND FLAG V90X8569X

If (a) is false, proceed to monitor (d) and (e). Otherwise, monitor (b) and (c). If either is true, proceed to monitor (f). If both are false, proceed to Step 5.

If (d) and (e) are false, proceed to Step 5. Otherwise, proceed to the next statement.

If (f) is false, latch output (1) true and proceed to Step 3. Otherwise proceed to Step 3.

- (1) MPS E1 FAIL FLAG V95X1207X

Step 3 – ME-1 LO2 Prevalve Timer Initiation and LH2 Recirc Disconnect Closure. This step closes the LH2 Recirc disconnect and initiates the ME-1 LO2 Prevalve timer.

- (a) ME-1 LO2 PREVALVE TIMER (INTERNAL)
(b) MPS_E1_T_DELAY_A V97U9738C

Terminate output (1) and issue output (2) and, on the first pass, start timer (a) and proceed to Step 5. On subsequent passes, if timer (a) \geq (b), proceed to Step 3A. Otherwise, proceed to Step 5.

- (1) MPS LH₂ 4 IN DISC VLV (PD3) OP CMD V41K1421X
(2) MPS LH₂ 4 IN DISC VLV (PD3) CL CMD V41K1422X

Step 3A – Issuance of ME-1 Prevalve Close Commands. This step provides a time delay between issuance of the ME-1 LO₂ PREVALVE CLOSE COMMANDS and the ME-1 LH₂ PREVALVE CLOSE COMMANDS.

Issue the following outputs:

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- | | | |
|-----|--|-----------|
| (1) | MPS E1 LO ₂ PREVLV (PV1) CL CMD A | V41K1139X |
| (2) | MPS E1 LO ₂ PREVLV (PV1) CL CMD B | V41K1140X |
| (3) | MPS E1 LO ₂ PREVLV (PV1) CL CMD C | V41K1141X |
| (4) | MPS E1 LO ₂ PREVLV (PV1) CL CMD D | V41K1142X |

and terminate the following outputs:

- | | | |
|-----|--|-----------|
| (5) | MPS E1 LO ₂ PREVLV (PV1) OP CMD A | V41K1136X |
| (6) | MPS E1 LO ₂ PREVLV (PV1) OP CMD B | V41K1137X |
| (7) | MPS E1 LO ₂ PREVLV (PV1) OP CMD C | V41K1138X |
| (8) | MPS E1 LO ₂ PREVLV (PV1) OP CMD D | V41K1143X |

On first pass, start (b), proceed to monitor (a) and (b). Otherwise, monitor (a) and (b).

- | | | |
|-----|-----------------------------|------------|
| (a) | ME1_LH2_PREVLV_CLSE_T_DELAY | V97U9741C |
| (b) | ME1_LH2_PREVLV_DELAY_TIMER | (INTERNAL) |
| (c) | MPS_E1_TIMER_C | (INTERNAL) |

If (b) < (a) seconds, proceed to Step 5.

If (b) ≥ (a) seconds, issue the following outputs:

- | | | |
|------|--|-----------|
| (9) | MPS E1 LH ₂ PREVLV (PV4) CL CMD A | V41K1122X |
| (10) | MPS E1 LH ₂ PREVLV (PV4) CL CMD B | V41K1123X |
| (11) | MPS E1 LH ₂ PREVLV (PV4) CL CMD C | V41K1124X |

and terminate the following outputs:

- | | | |
|------|--|-----------|
| (12) | MPS E1 LH ₂ PREVLV (PV4) OP CMD A | V41K1119X |
| (13) | MPS E1 LH ₂ PREVLV (PV4) OP CMD B | V41K1120X |
| (14) | MPS E1 LH ₂ PREVLV (PV4) OP CMD C | V41K1121X |

and then set the following flag = true:

- | | | |
|------|----------------------------------|------------|
| (15) | ME-1 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |
|------|----------------------------------|------------|

On first pass, start (c) and proceed to Step 5, otherwise proceed to Step 5.

Step 4 – Removal of ME–1 Prevalve Close Commands. This step provides for the termination of the ME–1 PREVALVE CLOSE COMMANDS after an appropriate time delay.

Monitor the following:

- | | | |
|-----|---------------------------------------|------------|
| (a) | ME1 PREVALVES CLOSE CMDS REMOVED FLAG | (INTERNAL) |
|-----|---------------------------------------|------------|

If (a) = true, proceed to Step 5.

If (a) = false, monitor the following:

- | | | |
|-----|------------------|-----------|
| (b) | MPS_E1_T_DELAY_C | V97U9740C |
|-----|------------------|-----------|

(c) MPS_E1_TIMER_C (INTERNAL)

If (c) < (b) seconds, proceed to Step 5.

If (c) ≥ (b) seconds, then terminate the following outputs:

| | | |
|-----|--|-----------|
| (1) | MPS E1 LH ₂ PREVLV (PV4) CL CMD A | V41K1122X |
| (2) | MPS E1 LH ₂ PREVLV (PV4) CL CMD B | V41K1123X |
| (3) | MPS E1 LH ₂ PREVLV (PV4) CL CMD C | V41K1124X |
| (4) | MPS E1 LO ₂ PREVLV (PV1) CL CMD A | V41K1139X |
| (5) | MPS E1 LO ₂ PREVLV (PV1) CL CMD B | V41K1140X |
| (6) | MPS E1 LO ₂ PREVLV (PV1) CL CMD C | V41K1141X |
| (7) | MPS E1 LO ₂ PREVLV (PV1) CL CMD D | V41K1142X |

and then set the following flag = true:

(8) ME-1 PREVALVES CLOSE CMDS REMOVED FLAG (INTERNAL)

Proceed to Step 5.

Step 5 – ME-2 Prevalves Closed Check. This step provides a bypass of the logic in Steps 6 and 7 if ME-2 is in either the shutdown or post-shutdown phase and the prevalves have been commanded closed.

Monitor the following:

(a) ME-2 PREVALVES CMD'D CLOSED FLAG (INTERNAL)

If (a) = false, proceed to Step 6.

If (a) = true, proceed to Step 8.

Step 6 – ME-2 Shutdown Status. This step monitors for ME-2 shutdown via SSME SOP phase flags or in the case of a Data Path Failure the Safing command from the Switch RM or the internal Shutdown Command Issued Flag. If shutdown is detected prior to MECO, a fail flag is issued to flight control and guidance functions.

Monitor the following:

| | | |
|-----|---------------------------------|------------|
| (a) | ME-2 FLIGHT DATA PATH FAIL FLAG | V95X1151X |
| (b) | ME-2 SAFING CMD | V90X3444X |
| (c) | ME-2 SHUTDOWN CMD ISSUED FLAG | (INTERNAL) |
| (d) | MPS E2 SHUTDOWN PHASE | V95X1156X |
| (e) | MPS E2 POST-SHUTDOWN PHASE | V95X1161X |
| (f) | MECO COMMAND FLAG | V90X8569X |

If (a) is false, proceed to monitor (d) and (e). Otherwise, monitor (b) and (c).
If either is true, proceed to monitor (f). If both are false, proceed to Step 9.

If (d) and (e) are false, proceed Step 9. Otherwise, proceed to the next statement.

If (f) is false, latch output (1) true and proceed to Step 7. Otherwise proceed to Step 7.

- (1) MPS E2 FAIL FLAG V95X1208X

Step 7 – ME–2 LO2 Prevalve Timer Initiation and LH2 Recirc Disconnect Closure. This step closes the LH2 Recirc disconnect and initiates the ME–2 LO2 Prevalve timer.

- (a) ME–2 LO2 PREVALVE TIMER (INTERNAL)
(b) MPS_E2_T_DELAY_D V97U9742C

Terminate output (1) and issue output (2) and, on the first pass, start timer (a) and proceed to Step 9. On subsequent passes, if timer (a) \geq (b), proceed to Step 7A. Otherwise, proceed to Step 9.

- (1) MPS LH₂ 4 IN DISC VLV (PD3) OP CMD V41K1421X
(2) MPS LH₂ 4 IN DISC VLV (PD3) CL CMD V41K1422X

Step 7A – Issuance of ME–2 Prevalve Close Commands. This step provides a time delay between issuance of the ME–2 LO₂ PREVALVE CLOSE COMMANDS and the ME–2 LH₂ PREVALVE CLOSE COMMANDS.

Issue the following outputs:

- (1) MPS E2 LO₂ PREVLV (PV2) CL CMD A V41K1239X
(2) MPS E2 LO₂ PREVLV (PV2) CL CMD B V41K1240X
(3) MPS E2 LO₂ PREVLV (PV2) CL CMD C V41K1241X
(4) MPS E2 LO₂ PREVLV (PV2) CL CMD D V41K1242X

and terminate the following outputs:

- (5) MPS E2 LO₂ PREVLV (PV2) OP CMD A V41K1236X
(6) MPS E2 LO₂ PREVLV (PV2) OP CMD B V41K1237X
(7) MPS E2 LO₂ PREVLV (PV2) OP CMD C V41K1238X
(8) MPS E2 LO₂ PREVLV (PV2) OP CMD D V41K1243X

On first pass, start (b), proceed to monitor (a) and (b) otherwise monitor (a) and (b).

- (a) ME2_LH2_PREVLV_CLSE_T_DELAY V97U9745C
(b) ME2_LH2_PREVLV_DELAY_TIMER (INTERNAL)
(c) MPS_E2_TIMER_F (INTERNAL)

If (b) < (a) seconds, proceed to Step 9.

If (b) \geq (a) seconds, issue the following outputs:

- | | | |
|------|--|-----------|
| (9) | MPS E2 LH ₂ PREVLV (PV5) CL CMD A | V41K1222X |
| (10) | MPS E2 LH ₂ PREVLV (PV5) CL CMD B | V41K1223X |
| (11) | MPS E2 LH ₂ PREVLV (PV5) CL CMD C | V41K1224X |

and terminate the following outputs:

- | | | |
|------|--|-----------|
| (12) | MPS E2 LH ₂ PREVLV (PV5) OP CMD A | V41K1219X |
| (13) | MPS E2 LH ₂ PREVLV (PV5) OP CMD B | V41K1220X |
| (14) | MPS E2 LH ₂ PREVLV (PV5) OP CMD C | V41K1221X |

and set the following flag = true:

- | | | |
|------|----------------------------------|------------|
| (15) | ME-2 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |
|------|----------------------------------|------------|

On first pass, start (c) and proceed to Step 9, otherwise proceed to Step 9.

Step 8 – Removal of ME–2 Prevalve Close Commands. This step provides for the termination of the ME–2 PREVALVE CLOSE COMMANDS after an appropriate time delay.

Monitor the following:

- | | | |
|-----|---------------------------------------|------------|
| (a) | ME–2 PREVALVE CLOSE CMDS REMOVED FLAG | (INTERNAL) |
|-----|---------------------------------------|------------|

If (a) = true, proceed to Step 9.

If (a) = false, monitor the following:

- | | | |
|-----|------------------|------------|
| (b) | MPS_E2_T_DELAY_F | V97U9744C |
| (c) | MPS_E2_TIMER_F | (INTERNAL) |

If (c) < (b) seconds, proceed to Step 9.

If (c) ≥ (b) seconds, then terminate the following outputs:

- | | | |
|-----|--|-----------|
| (1) | MPS E2 LH ₂ PREVLV (PV5) CL CMD A | V41K1222X |
| (2) | MPS E2 LH ₂ PREVLV (PV5) CL CMD B | V41K1223X |
| (3) | MPS E2 LH ₂ PREVLV (PV5) CL CMD C | V41K1224X |
| (4) | MPS E2 LO ₂ PREVLV (PV2) CL CMD A | V41K1239X |
| (5) | MPS E2 LO ₂ PREVLV (PV2) CL CMD B | V41K1240X |
| (6) | MPS E2 LO ₂ PREVLV (PV2) CL CMD C | V41K1241X |
| (7) | MPS E2 LO ₂ PREVLV (PV2) CL CMD D | V41K1242X |

and then set the following flag = true:

- | | | |
|-----|--|------------|
| (8) | ME–2 PREVALVES CLOSE CMDS REMOVED FLAG | (INTERNAL) |
|-----|--|------------|

Proceed to Step 9.

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Step 9 – ME–3 Prevalves Closed Check. This step provides a bypass of the logic in Steps 10 and 11 if ME–3 is in either shutdown or post–shutdown phase and the prevalves have been commanded closed.

Monitor the following:

- (a) ME–3 PREVALVES CMD'D CLOSED FLAG (INTERNAL)

If (a) = false, proceed to Step 10.

If (a) = true, proceed to Step 12.

Step 10 – ME–3 Shutdown Status. This step monitors for ME–3 shutdown via SSME SOP phase flags or in the case of a Data Path Failure, the Safing command from the Switch RM or the internal Shutdown Command Issued Flag. If shutdown is detected prior to MECO, a fail flag is issued to flight control and guidance functions.

Monitor the following:

- (a) ME–3 FLIGHT DATA PATH FAIL FLAG V95X1152X
(b) ME–3 SAFING CMD V90X3445X
(c) ME–3 SHUTDOWN CMD ISSUED FLAG (INTERNAL)
(d) MPS E3 SHUTDOWN PHASE V95X1157X
(e) MPS E3 POST–SHUTDOWN PHASE V95X1162X
(f) MECO COMMAND FLAG V90X8569X

If (a) is false, proceed to monitor (d) and (e). Otherwise, monitor (b) and (c).
If either is true, proceed to monitor (f). If both are false, proceed to Step 13.

If (d) and (e) are false, proceed to Step 13. Otherwise, proceed to the next statement.

If (f) is false, latch output (1) true and proceed to Step 11. Otherwise proceed to Step 11.

- (1) MPS E3 FAIL FLAG V95X1209X

Step 11 – ME–3 LO2 Prevalve Timer Initiation and LH2 Recirc Disconnect Closure. This step closes the LH2 Recirc disconnect and initiates the ME–3 LO2 Prevalve timer.

- (a) ME–3 LO2 PREVALVE TIMER (INTERNAL)
(b) MPS_E3_T_DELAY_G V97U9746C

Terminate output (1) and issue output (2) and, on the first pass, start timer (a) and proceed to Step 13. On subsequent passes, if timer (a) \geq (b), proceed to Step 11A. Otherwise, proceed to Step 13.

- (1) MPS LH₂ 4 IN DISC VLV (PD3) OP CMD V41K1421X
(2) MPS LH₂ 4 IN DISC VLV (PD3) CL CMD V41K1422X

Step 11A – Issuance of ME-3 Prevalve Close Commands. This step provides a time delay between issuance of the ME-3 LO₂ PREVALVE CLOSE COMMANDS and the ME-3 LH₂ PREVALVE CLOSE COMMANDS.

Issue the following outputs:

- | | | |
|-----|--|-----------|
| (1) | MPS E3 LO ₂ PREVLV (PV3) CL CMD A | V41K1339X |
| (2) | MPS E3 LO ₂ PREVLV (PV3) CL CMD B | V41K1340X |
| (3) | MPS E3 LO ₂ PREVLV (PV3) CL CMD C | V41K1341X |
| (4) | MPS E3 LO ₂ PREVLV (PV3) CL CMD D | V41K1342X |

and terminate the following outputs:

- | | | |
|-----|--|-----------|
| (5) | MPS E3 LO ₂ PREVLV (PV3) OP CMD A | V41K1336X |
| (6) | MPS E3 LO ₂ PREVLV (PV3) OP CMD B | V41K1337X |
| (7) | MPS E3 LO ₂ PREVLV (PV3) OP CMD C | V41K1338X |
| (8) | MPS E3 LO ₂ PREVLV (PV3) OP CMD D | V41K1343X |

On first pass, start (b), proceed to monitor (a) and (b), otherwise monitor (a) and (b)

- | | | |
|-----|-----------------------------|------------|
| (a) | ME3_LH2_PREVLV_CLSE_T_DELAY | V97U9749C |
| (b) | ME3_LH2_PREVLV_DELAY_TIMER | (INTERNAL) |
| (c) | MPS_E3_TIMER_I | (INTERNAL) |

If (b) < (a) seconds, proceed to Step 13.

If (b) ≥ (a) seconds, issue the following outputs:

- | | | |
|------|--|-----------|
| (9) | MPS E3 LH ₂ PREVLV (PV6) CL CMD A | V41K1322X |
| (10) | MPS E3 LH ₂ PREVLV (PV6) CL CMD B | V41K1323X |
| (11) | MPS E3 LH ₂ PREVLV (PV6) CL CMD C | V41K1324X |

and terminate the following outputs:

- | | | |
|------|--|-----------|
| (12) | MPS E3 LH ₂ PREVLV (PV6) OP CMD A | V41K1319X |
| (13) | MPS E3 LH ₂ PREVLV (PV6) OP CMD B | V41K1320X |
| (14) | MPS E3 LH ₂ PREVLV (PV6) OP CMD C | V41K1321X |

and then set the following flag = true:

- | | | |
|------|----------------------------------|------------|
| (15) | ME-3 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |
|------|----------------------------------|------------|

On first pass, start (c), and proceed to Step 13, otherwise proceed to Step 13.

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Step 12 – Removal of ME–3 Prevalve Close Commands. This step provides for the termination of the ME–3 PREVALVE CLOSE COMMANDS after an appropriate time delay.

Monitor the following:

- (a) ME–3 PREVALVES CLOSE CMDS REMOVED FLAG (INTERNAL)

If (a) = true, proceed to Step 13.

If (a) = false, monitor the following:

- (b) MPS_E3_T_DELAY_I V97U9748C

- (c) MPS_E3_TIMER_I (INTERNAL)

If (c) < (b) seconds, proceed to Step 13.

If (c) ≥ (b) seconds, then terminate the following outputs:

- | | | |
|-----|--|-----------|
| (1) | MPS E3 LH ₂ PREVLV (PV6) CL CMD A | V41K1322X |
| (2) | MPS E3 LH ₂ PREVLV (PV6) CL CMD B | V41K1323X |
| (3) | MPS E3 LH ₂ PREVLV (PV6) CL CMD C | V41K1324X |
| (4) | MPS E3 LO ₂ PREVLV (PV3) CL CMD A | V41K1339X |
| (5) | MPS E3 LO ₂ PREVLV (PV3) CL CMD B | V41K1340X |
| (6) | MPS E3 LO ₂ PREVLV (PV3) CL CMD C | V41K1341X |
| (7) | MPS E3 LO ₂ PREVLV (PV3) CL CMD D | V41K1342X |

and then set the following flag = true:

- (8) ME–3 PREVLVS CLOSE CMDS REMOVED FLAG (INTERNAL)

Proceed to Step 13.

Step 13 – ME–1, 2, and 3 Manual Shutdown Switch Checks. This step provides and monitors for a manually initiated shutdown of any engine by the crew. If any one of the three MPS engine shutdown switches is depressed, the GN&C switch processor sets a flag for SSME OPS indicating shutdown is required for that engine. SSME OPS then sets an internal flag, which is checked in later steps in the logic, for initiating the shutdown.

Monitor the following:

- | | | |
|-----|---------------------------|-----------|
| (a) | SEL MPS ME–1 SHUTDOWN CMD | V90X7551X |
| (b) | SEL MPS ME–2 SHUTDOWN CMD | V90X7552X |
| (c) | SEL MPS ME–3 SHUTDOWN CMD | V90X7553X |

If (a), (b), and (c) all = false, proceed to Step 14.

If (a) = true, set internal flag (1) below = true.

If (b) = true, set internal flag (2) below = true.

If (c) = true, set internal flag (3) below = true.

- | | | |
|-----|---------------------------|------------|
| (1) | ME–1 MANUAL SHUTDOWN FLAG | (INTERNAL) |
| (2) | ME–2 MANUAL SHUTDOWN FLAG | (INTERNAL) |
| (3) | ME–3 MANUAL SHUTDOWN FLAG | (INTERNAL) |

Proceed to Step 14.

Step 14 – Main Engine Safing Cmd Check. This step monitors for main engine safing commands from the GN&C switch processor and latches the applicable safing commands in the on state.

Monitor the following:

- | | | |
|-----|-----------------|-----------|
| (a) | ME–1 SAFING CMD | V90X3443X |
| (b) | ME–2 SAFING CMD | V90X3444X |
| (c) | ME–3 SAFING CMD | V90X3445X |

If (a) is detected true, latch (a) = true for all subsequent passes.

If (b) is detected true, latch (b) = true for all subsequent passes.

If (c) is detected true, latch (c) = true for all subsequent passes.

Proceed to Step 17.

Step 15. Deleted.

Step 16. Deleted.

Step 17 – MECO Check. This step checks for MECO. After MECO has been commanded the software will bypass the automatic and manual limit control logic in Step 18 through Step 22, the guidance cutoff logic and low-level sensor cutoff logic of Steps 23 through 26 inclusive. It also provides for a change in

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the LO2 and LH2 preclude close time delays after MECO has been commanded, to improve shutdown safety.

Note: LO2 preclude timers initiated in Steps 3, 7, 11 and LH2 preclude timers initiated in Steps 3A, 7A and 11A are not reset or restarted in this step.

Monitor the following:

- | | | |
|-----|--------------------|------------|
| (a) | MECO COMMAND FLAG | V90X8569X |
| (b) | FAST_SEP_INITIATED | (INTERNAL) |

If (a) is false then proceed to Step 18.

If (a) is true on the first pass issue output (1) , and perform the following functions:

Set V97U9738C MPS_E1_T_DELAY_A to the value contained in input (A) below.
Set V97U9742C MPS_E2_T_DELAY_D to the value contained in input (B) below.
Set V97U9746C MPS_E3_T_DELAY_G to the value contained in input (C) below.

If (a) is true and (b) is false, on the first pass, set the following parameters to the value contained in input (D) below

| | |
|-----------------------------|-----------|
| ME1_LH2_PREVLV_CLSE_T_DELAY | V97U9741C |
| ME2_LH2_PREVLV_CLSE_T_DELAY | V97U9745C |
| ME3_LH2-PREVLV_CLSE_T_DELAY | V97U9749C |

then proceed to Step 17A. On subsequent passes proceed to Step 17A.

INPUTS

- | | |
|--|-----------|
| (A) MPS_MECO_E1_T_DELAY_A (K-LOAD) | V96U9769C |
| (B) MPS_MECO_E2_T_DELAY_D (K-LOAD) | V96U9771C |
| (C) MPS_MECO_E3_T_DELAY_G (K-LOAD) | V96U9773C |
| (D) POST_MECO_LH2_PREVLV_TIME_DLY (I-LOAD) | V97U9648C |

OUTPUTS

- | | |
|--|-----------|
| (1) MPS REG HE XOVER VLV (LV10) OP CMD | V41K1613X |
|--|-----------|

Step 17A – MPS Helium Interconnect. This step initiates a 20–second timer and branches to the helium interconnect logic. On expiration of the time delay, the interconnect valve commands are terminated.

On the first pass, start a 20–second timer and proceed to Step 17B.

On the second and subsequent passes, monitor the 20-second time delay. If 20 seconds have not elapsed, proceed to Step 24A. When 20 seconds have elapsed, terminate outputs (1) through (6) and set output (7) = false. Then proceed to Step 24A.

| | | |
|-----|------------------------------------|------------|
| (1) | MPS E1 HE INTCN IN (LV59) OP CMD A | V41K1162X |
| (2) | MPS E1 HE INTCN IN (LV59) OP CMD B | V41K1163X |
| (3) | MPS E2 HE INTCN IN (LV61) OP CMD A | V41K1262X |
| (4) | MPS E2 HE INTCN IN (LV61) OP CMD B | V41K1263X |
| (5) | MPS E3 HE INTCN IN (LV63) OP CMD A | V41K1362X |
| (6) | MPS E3 HE INTCN IN (LV63) OP CMD B | V41K1363X |
| (7) | HELIUM INTERCONNECT FLAG | (INTERNAL) |

Step 17B – Issue of ME–1 Helium Interconnect Commands. This step is processed one time only and interconnects the pneumatic system helium supply to ME–1 during shutdown if the ME–1 FAIL FLAG has not previously been set true and either the confirmed ME–1 helium supply pressure is lower than or equal to the level that is required to support SSME shutdown helium usage or the pressure is commfaulted.

Monitor the following:

| | | |
|-----|--------------------------------------|-----------|
| (a) | MPS E1 FAIL FLAG | V95X1207X |
| (b) | MPS E1 HE SUPPLY BOTTLE PRESSURE | V41P1150C |
| (c) | MPS_HELIUM_SYSTEM_LOW_PRESSURE | V97U9735C |
| (d) | FA1 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2841X |

If (a) = true, proceed to Step 17C. Otherwise, proceed to monitor (b), (c), and (d).

If (d) = false, and (b) > (c), proceed to Step 17C; otherwise, issue the following outputs (1) and (2) one time only and proceed to Step 17C.

| | | |
|-----|------------------------------------|-----------|
| (1) | MPS E1 HE INTCN IN (LV59) OP CMD A | V41K1162X |
| (2) | MPS E1 HE INTCN IN (LV59) OP CMD B | V41K1163X |

Step 17C – Issue of ME–2 Helium Interconnect Commands. This step is processed one time only and interconnects the pneumatic system helium supply to ME–2 helium supply during shutdown if the ME–2 FAIL FLAG has not previously been set true and either the confirmed ME–2 helium supply pressure is lower than or equal to the level that is required to support SSME shutdown helium usage or the pressure input is commfaulted.

Monitor the following:

| | | |
|-----|--------------------------------------|-----------|
| (a) | MPS E2 FAIL FLAG | V95X1208X |
| (b) | MPS E2 HE SUPPLY BOTTLE PRESSURE | V41P1250C |
| (c) | MPS_HELIUM_SYSTEM_LOW_PRESSURE | V97U9735C |
| (d) | FA2 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2842X |

If (a) = true, or (b) > c, proceed to Step 17D. Otherwise, issue the following outputs (1) and (2) one time only and proceed to Step 17D.

| | | |
|-----|------------------------------------|-----------|
| (1) | MPS E2 HE INTCN IN (LV61) OP CMD A | V41K1262X |
|-----|------------------------------------|-----------|

- (2) MPS E2 HE INTCN IN (LV61) OP CMD B V41K1263X

Step 17D – Issue of ME–3 Helium Interconnect Commands. This step is processed one time only and interconnects the pneumatic system helium supply to ME–3 during shutdown if the ME–3 FAIL FLAG has not previously been set true and either the confirmed ME–3 helium supply pressure is lower than or equal to the level that is required to support SSME shutdown helium usage or the pressure input is commfaulted.

Monitor the following:

- | | | |
|-----|--------------------------------------|-----------|
| (a) | MPS E3 FAIL FLAG | V95X1209X |
| (b) | MPS E3 HE SUPPLY BOTTLE PRESSURE | V41P1350C |
| (c) | MPS_HELIUM_SYSTEM_LOW_PRESSURE | V97U9735C |
| (d) | FA3 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2843X |

If (a) = true, set output (3) = true and proceed to Step 24A. Otherwise, proceed to monitor (b), (c) and (d).

If (d) = false and (b) > (c), set output (3) true and proceed to Step 24A. Otherwise, issue the following outputs (1) and (2) one time only, set output (3) true and proceed to Step 24A.

- | | | |
|-----|------------------------------------|------------|
| (1) | MPS E3 HE INTCN IN (LV63) OP CMD A | V41K1362X |
| (2) | MPS E3 HE INTCN IN (LV63) OP CMD B | V41K1363X |
| (3) | HELIUM INTERCONNECT FLAG | (INTERNAL) |

Step 18 – Limit Shutdown Switch Auto/Manual Check. This step permits a manual override of the automatic limit control logic by the crew. If the switch is in AUTO, the automatic limit control logic is active; and if one engine shuts down, the remaining two are inhibited from automatic shutdown. If the switch is in one of the manual positions, the crew overrides the automatic limit control logic and either enables or inhibits automatic shutdown by all engines.

Monitor the following:

- | | | |
|-----|--------------------------------|-----------|
| (a) | SEL MPS ENG LIMIT CONTROL AUTO | V90X7548X |
|-----|--------------------------------|-----------|

If (a) = true, set internal counters A and B to zero and proceed to Step 19.

If (a) = false, set internal counters C, D, E, F, G, and H to zero and proceed to Step 22.

Step 19 – Automatic Limit Shutdown Inhibit Control for ME-1. This step monitors the operating phase of ME-1 and the validity of ME-1 data via the FLIGHT DATA PATH FAIL FLAG from the SSME SOP. If ME-1 enters the shutdown phase or the ME-1 FLIGHT DATA PATH FAIL FLAG is set, the other two engines will be inhibited from performing an automatic shutdown. The software is initialized with counter C set to three.

Monitor the following:

- | | | |
|-----|---------------------------------|-----------|
| (a) | MPS E1 SHUTDOWN PHASE | V95X1155X |
| (b) | MPS E1 POST-SHUTDOWN PHASE | V95X1160X |
| (c) | ME-1 FLIGHT DATA PATH FAIL FLAG | V95X1150X |

If (a), (b), and (c) all = false, check internal counter C. If internal counter C is less than three counts, then issue the following output:

- | | | |
|-----|-----------------------|-----------|
| (1) | MPS E1 LIMIT CNTL ENA | V90X8573X |
|-----|-----------------------|-----------|

and increment counter C by one count and proceed to Step 20.

If (a), (b), and (c) all = false and internal counter C is greater than two counts, proceed to Step 20.

If either (a), (b), or (c) = true, check internal counter D. If internal counter D is less than three counts then issue the following outputs:

- | | | |
|-----|-----------------------|-----------|
| (2) | MPS E2 LIMIT CNTL INH | V90X8571X |
| (3) | MPS E3 LIMIT CNTL INH | V90X8572X |

and increment counter D by one count and proceed to Step 20.

If either (a), (b), or (c) = true and internal counter D is greater than two counts, proceed to Step 20.

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Step 20 – Automatic Limit Shutdown Inhibit Control for ME–2. This step monitors the operating phase of ME–2 and the validity of ME–2 data via the FLIGHT DATA PATH FAIL FLAG from the SSME SOP. If ME–2 enters the shutdown phase or the ME–2 FLIGHT DATA PATH FAIL FLAG is set, the other two engines will be inhibited from performing an automatic shutdown. The software is initialized with counter E set to three.

Monitor the following:

- | | | |
|-----|---------------------------------|-----------|
| (a) | MPS E2 SHUTDOWN PHASE | V95X1156X |
| (b) | MPS E2 POST–SHUTDOWN PHASE | V95X1161X |
| (c) | ME–2 FLIGHT DATA PATH FAIL FLAG | V95X1151X |

If (a), (b), and (c) all = false, check internal counter E. If internal counter E is less than three counts, then issue the following output:

- | | | |
|-----|-----------------------|-----------|
| (1) | MPS E2 LIMIT CNTL ENA | V90X8574X |
|-----|-----------------------|-----------|

and increment counter E by one count and proceed to Step 21.

If (a), (b), and (c) all = false and internal counter E is greater than two counts, proceed to Step 21.

If either (a), (b), or (c) = true, check internal counter F. If internal counter F is less than three counts, then issue the following outputs:

- | | | |
|-----|-----------------------|-----------|
| (2) | MPS E1 LIMIT CNTL INH | V90X8570X |
| (3) | MPS E3 LIMIT CNTL INH | V90X8572X |

and increment counter F by one count and proceed to Step 21.

If either (a), (b), or (c) = true and internal counter F is greater than two counts, proceed to Step 21.

Step 21 – Automatic Limit Shutdown Inhibit Control for ME-3. This step monitors the operating phase of ME-3 and the validity of ME-3 data via the FLIGHT DATA PATH FAIL FLAG from the SSME SOP. If ME-3 enters the shutdown phase or the ME-3 FLIGHT DATA PATH FAIL FLAG is set, the other two engines will be inhibited from performing an automatic shutdown. The software is initialized with counter G set to three.

Monitor the following:

- | | | |
|-----|---------------------------------|-----------|
| (a) | MPS E3 SHUTDOWN PHASE | V95X1157X |
| (b) | MPS E3 POST-SHUTDOWN PHASE | V95X1162X |
| (c) | ME-3 FLIGHT DATA PATH FAIL FLAG | V95X1152X |

If (a), (b), and (c) all = false, check internal counter G. If internal counter G is less than three counts, then issue the following output:

- | | | |
|-----|-----------------------|-----------|
| (1) | MPS E3 LIMIT CNTL ENA | V90X8575X |
|-----|-----------------------|-----------|

and increment counter G by one count and proceed to Step 23.

If (a), (b), and (c) all = false and internal counter G is greater than two counts, proceed to Step 23.

If either (a), (b), or (c) = true, check internal counter H. If internal counter H is less than three counts, then issue the following outputs:

- | | | |
|-----|-----------------------|-----------|
| (2) | MPS E1 LIMIT CNTL INH | V90X8570X |
| (3) | MPS E2 LIMIT CNTL INH | V90X8571X |

and increment counter H by one count and proceed to Step 23.

If either (a), (b), or (c) = true and internal counter H is greater than two counts, proceed to Step 23.

Steps 21A Through 21E – Deleted.

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Step 22 – Limit Shutdown Switch Inhibit/Enable Check. This step monitors the manual positions of the limit shutdown switch via switch processor flags and permits the crew to enable automatic shutdown by all engines or inhibit automatic shutdown by any engine.

Monitor the following:

- | | | |
|-----|-----------------------------------|-----------|
| (a) | SEL MPS ENG LIMIT CONTROL ENABLE | V90X7549X |
| (b) | SEL MPS ENG LIMIT CONTROL INHIBIT | V90X7550X |

If (a) is true and counter A is less than 3, increment counter A by one count, set counter B to zero, issue outputs (1) through (3) below, and proceed to Step 23.

If (a) is true and counter A is greater than 2, proceed to Step 23.

If (b) is true and counter B is less than 3, increment counter B by one count, set counter A to zero, issue outputs (4) through (6) below, and proceed to Step 23.

If (b) is true and counter B is greater than 2, proceed to Step 23.

- | | | |
|-----|-----------------------|-----------|
| (1) | MPS E1 LIMIT CNTL ENA | V90X8573X |
| (2) | MPS E2 LIMIT CNTL ENA | V90X8574X |
| (3) | MPS E3 LIMIT CNTL ENA | V90X8575X |
| (4) | MPS E1 LIMIT CNTL INH | V90X8570X |
| (5) | MPS E2 LIMIT CNTL INH | V90X8571X |
| (6) | MPS E3 LIMIT CNTL INH | V90X8572X |

Steps 22A Through 22F – Deleted.

Step 23 – SSME Cutoff Request Check. This step monitors for a flag from guidance indicating it is time to read the desired SSME cutoff time and initiate MECO at the desired time. The shutdown commands sent as a result of the MECO command flag must be sent at the proper time to ensure a MECO accuracy of ± 40 ms. Proper issuance of the shutdown commands is controlled by the MECO LEAD TIME I-load. The first shutdown command will be sent no sooner than 30 ms before desired cutoff time and no later than +30 ms from the desired cutoff time. Changes in software design, timing, will change the value of MECO LEAD TIME.

Monitor the following:

| | | |
|-----|------------------------------|-----------|
| (a) | SSME C/O TIMING REQUEST FLAG | V90X1944X |
| (b) | DESIRED SSME C/O TIME | V90W1945C |
| (c) | CLOCK - COMPUTED GMT | V91W5000C |
| (d) | MECO_LEAD_TIME | V97U9829C |

If (a) = false, proceed to Step 24.

If (a) = true, read (b) and subtract (c) from (b). When (b) – (c) is greater than (d), proceed to Step 24.

When (b) – (c) is less than or equal to (d), issue the following output and proceed to Step 24A.

| | | |
|-----|-------------------|-----------|
| (1) | MECO COMMAND FLAG | V90X8569X |
|-----|-------------------|-----------|

Step 24 – Low-Level Sensor Monitor Check. This step monitors for a flag set by guidance indicating time to monitor the LO₂ and LH₂ low-level sensors.

Monitor the following conditions:

| | | |
|-----|-------------------------|-----------|
| (a) | ET LEVEL SENSOR ARM CMD | V90X1942X |
|-----|-------------------------|-----------|

If (a) = false, proceed to Step 24A.

If (a) = true, proceed to Step 25.

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Step 24A – ET Fast Separation Check. This step determines if a fast ET separation has been requested and, if so, sets the proper flags and delays to provide the proper engine shutdown sequence for a fast separation.

Note: LO2 prevalve timers initiated in Steps 3, 7, 11 and LH2 prevalve timers initiated in Steps 3A, 7A and 11A are not reset or restarted in this step.

Monitor the following signals:

| | | |
|-----|--------------------------|-----------|
| (a) | MM102 FLAG | V90X8158X |
| (b) | ET MAN SEP INITIATE | V90X7564X |
| (c) | ET SEP MAN INITIATE FLAG | V90X8584X |
| (d) | MM601 FLAG | V90X8194X |
| (e) | MM103 FLAG | V90X8156X |
| (f) | SECOND SSME FAIL CONFIRM | V90X1721X |

If ((a) or (d) or [(e) and (f)]) and (b) are true or (c) is true, latch (c) true and perform the following functions; otherwise proceed to Step 27.

Set the following parameters to the value contained in input 2 below:

| | |
|------------------|-----------|
| MPS_E1_T_DELAY_A | V97U9738C |
| MPS_E2_T_DELAY_D | V97U9742C |
| MPS_E3_T_DELAY_G | V97U9746C |

Set the following flag true:

| | |
|--------------------|------------|
| FAST_SEP_INITIATED | (INTERNAL) |
|--------------------|------------|

Set the following parameters to the value contained in input 3 below:

| | |
|-----------------------------|-----------|
| ME1_LH2_PREVLV_CLSE_T_DELAY | V97U9741C |
| ME2_LH2_PREVLV_CLSE_T_DELAY | V97U9745C |
| ME3_LH2_PREVLV_CLSE_T_DELAY | V97U9749C |

Set the following times to the value contained in 1 below:

| | |
|---------------------------|------------|
| ME-1 SHUTDOWN DELAY TIMER | (INTERNAL) |
| ME-2 SHUTDOWN DELAY TIMER | (INTERNAL) |

Set the following flag true:

| | |
|---------------------------|------------|
| ME-1 MANUAL SHUTDOWN FLAG | (INTERNAL) |
|---------------------------|------------|

Initiate ME-1 shutdown delay timer and proceed to Step 27. On subsequent passes, proceed to Step 27 until ME-1 shutdown delay timer expires.

Then set the following flag = true:

ME-2 MANUAL SHUTDOWN FLAG (INTERNAL)

Initiate ME-2 shutdown delay timer and proceed to Step 27. On subsequent passes, proceed to Step 27 until ME-2 shutdown timer expires.

Then set the following flags = true:

MECO COMMAND FLAG V90X8569X
MECO CONFIRMED FLAG V90X8561X

and set the following parameter to the value contained in input 4 below and proceed to Step 27.

TIME_TO_ZERO_THRUST V97U9655C

INPUTS

1. ME_SHTDN_DLY V97U9830C
2. FAST_SEP_LOX_PREVLV_DLY V97U9831C
3. FAST_SEP_LH2_PREVLV_DLY V97U9832C
4. FAST_SEP_ZERO_THRUST_DLY V97U9833C

Step 25 – LO₂ Low-Level Sensor Dry Check. This step monitors for dry indications from four LO₂ low-level sensors, commfault indications for each sensor, and for a disable flag for each sensor. On the first pass that ET level sensor arm command is true, if a sensor indicates dry and the respective sensor commfault is false, and no previous LO₂ sensor has been disabled, then the associated sensor disable flag is latched true. On subsequent passes, if a sensor indicates dry, the respective commfault for that sensor is false, and the sensor has not been disabled, then an internal flag is latched true indicating that sensor is dry.

Monitor the following conditions:

- (a) MPS LO2 LEFT ECO SENSOR 1 V41X1555X
- (b) MPS LO2 LEFT ECO SENSOR 2 V41X1556X
- (c) MPS LO2 RIGHT ECO SENSOR 2 V41X1557X
- (d) MPS LO2 RIGHT ECO SENSOR 1 V41X1558X
- (e) MPS_LOX_LO_LVL_LIQ_SES1_DSBL_FLG V99X8814X
- (f) MPS_LOX_LO_LVL_LIQ_SES2_DSBL_FLG V99X8815X
- (g) MPS_LOX_LO_LVL_LIQ_SES3_DSBL_FLG V99X8816X
- (h) MPS_LOX_LO_LVL_LIQ_SES4_DSBL_FLG V99X8817X
- (i) FA 3 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2847X
- (j) FA 2 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2846X
- (k) FA 4 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2848X
- (l) FA 1 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2845X
- (m) ARM CMD FIRST PASS FLAG (INTERNAL)
- (n) LO₂ DSLB LIMIT FLAG (INTERNAL)

If (m) is true, check the following:

If (a) is true and (i) is false, then set outputs (1) and (5) true.

If (b) is true and (j) and (n) are false, then set outputs (2) and (5) true.

If (c) is true and (k) and (n) are false, then set outputs (3) and (5) true.

If (d) is true and (l) and (n) are false, then set output (4) true.

Else, check the following:

If (a) is true and (e) and (i) are both false, then set output (6) true.

If (b) is true and (f) and (j) are both false, then set output (7) true.

If (c) is true and (g) and (k) are both false, then set output (8) true.

If (d) is true and (h) and (l) are both false, then set output (9) true.

| | | |
|-----|-----------------------------------|------------|
| (1) | MPS_LOX_LO_LVL_LIQ_SES1_DSBL_FLG | V99X8814X |
| (2) | MPS_LOX_LO_LVL_LIQ_SES2_DSBL_FLG | V99X8815X |
| (3) | MPS_LOX_LO_LVL_LIQ-SES3_DSBL_FLG | V99X8816X |
| (4) | MPS_LOX_LO_LVL_LIQ_SES4_DSBL_FLG | V99X8817X |
| (5) | LO ₂ DSBL LIMIT FLAG | (INTERNAL) |
| (6) | LO ₂ SENSOR 1 DRY FLAG | (INTERNAL) |
| (7) | LO ₂ SENSOR 2 DRY FLAG | (INTERNAL) |
| (8) | LO ₂ SENSOR 3 DRY FLAG | (INTERNAL) |
| (9) | LO ₂ SENSOR 4 DRY FLAG | (INTERNAL) |

Proceed to Step 25A.

Step 25A – Check of LO₂ Sensor Dry Flags. This step monitors for any two LO₂ sensor flags latched true in Step 25. If any two flags are true and the required time delay has elapsed since two flags were first detected true, then MECO is initiated. Burning the engines over an additional delay time improves performance. The time delay is set to maximize performance while addressing NPSP (Net Positive Suction Pressure) concerns. To address NPSP concerns, MECO is declared immediately for the following cases: multiple SSME failures, commanded SSME throttle (K_CMD) over 67%, SSME chamber pressure on any engine greater than or equal to MPS_STUCK percent, SSME chamber pressure on any engine greater than or equal to 68% with an engine out without RTLS selected, and any SSME declared failed with a chamber pressure greater than 5% without an RTLS declaration. Otherwise the time delay is set to the appropriate engine cutoff delay timer and is monitored on subsequent passes.

Monitor the following:

| | | |
|-----|------------------------------------|------------|
| (a) | LO ₂ SENSOR 1 DRY FLAG | (INTERNAL) |
| (b) | LO ₂ SENSOR 2 DRY FLAG | (INTERNAL) |
| (c) | LO ₂ SENSOR 3 DRY FLAG | (INTERNAL) |
| (d) | LO ₂ SENSOR 4 DRY FLAG | (INTERNAL) |
| (e) | RTLS ABORT DECLARED | V90X8637X |
| (f) | MPS E1 FAIL FLAG | V95X1207X |
| (g) | MPS E2 FAIL FLAG | V95X1208X |
| (h) | MPS E3 FAIL FLAG | V95X1209X |
| (i) | NOM_LO ₂ _LL_T_DELAY_L | V97U9863C |
| (j) | RTLS_LO ₂ _LL_T_DELAY_M | V97U9864C |
| (k) | PTM_LO ₂ _LL_T_DELAY_N | V97U9865C |

| | | |
|-----|--------------------------|-----------|
| (l) | K_CMD | V90U1948C |
| (m) | MPS E-1 PERCENT CH PRESS | V95U1186C |
| (n) | MPS E-2 PERCENT CH PRESS | V95U1187C |
| (o) | MPS E-3 PERCENT CH PRESS | V95U1188C |
| (p) | MPS_STUCK | V97U0797C |

On the first pass that [(a) and (b)] or [(a) and (c)] or [(a) and (d)] or [(b) and (c)] or [(b) and (d)] or [(c) and (d)] are detected true, establish the appropriate time delay for setting the MECO COMMAND FLAG true as follows:

If more than one of (f), (g), or (h) is true, set output (1) true and proceed to Step 24A.

If (l) > 67 percent, set output (1) true and proceed to Step 24A.

If either (m), (n), or (o) >= (p) percent, set output (1) true and proceed to Step 24A.

If (f), (g), and (h) all = false, set (i) as the time delay and proceed to Step 26.

If either (f) or (g) or (h) = true and (e) = true, set (j) as the time delay and proceed to Step 26.

If either (m), (n), or (o) >= 68 percent, set output (1) true and proceed to Step 24A.

If ((f) = true and (m) > 5 percent) or ((g) = true and (n) > 5 percent) or ((h) = true and (o) > 5 percent), set output (1) true and proceed to Step 24A.

If only one of (f), (g), or (h) is true, set (k) as time delay and proceed to Step 26.

On the second and subsequent passes since two or more LO₂ sensor dry flags were detected true, monitor the time delay established above. When the selected time delay has elapsed, set output (1) true and proceed to Step 24A.

| | | |
|-----|-------------------|-----------|
| (1) | MECO COMMAND FLAG | V90X8569X |
|-----|-------------------|-----------|

Otherwise, proceed to Step 26.

Step 26 – LH₂ Low-Level Sensor Dry Check. This step monitors for dry indications from four LH₂ low-level sensors, commfault indications for each sensor, and for a disable flag for each sensor. On the first pass that ET level sensor arm command is true, if a sensor indicates dry and the respective sensor commfault is false, and no previous LH₂ sensor has been disabled, then the associated sensor disable flag is latched true. On subsequent passes, if a sensor indicates dry, the respective commfault for that sensor is false, and the sensor has not been disabled, then an internal flag is latched true indicating that sensor is dry.

Monitor the following conditions:

| | | |
|-----|---|-----------|
| (a) | ET LH ₂ LOW LEVEL LIQ SENSOR NO. 1 | T41X1730X |
| (b) | ET LH ₂ LOW LEVEL LIQ SENSOR NO. 2 | T41X1731X |
| (c) | ET LH ₂ LOW LEVEL LIQ SENSOR NO. 3 | T41X1732X |
| (d) | ET LH ₂ LOW LEVEL LIQ SENSOR NO. 4 | T41X1733X |
| (e) | ET_LH ₂ _LO_LVL_LIQ_SES1_DSBL_FLG | V99X8806X |
| (f) | ET_LH ₂ _LO_LVL_LIQ_SES2_DSBL_FLG | V99X8807X |

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| | | |
|-----|--|------------|
| (g) | ET_LH ₂ _LO_LVL_LIQ_SES3_DSBL_FLG | V99X8808X |
| (h) | ET_LH ₂ _LO_LVL_LIQ_SES4_DSBL_FLG | V99X8809X |
| (i) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (j) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (k) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |
| (l) | FA1 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2845X |
| (m) | ARM CMD FIRST PASS FLAG | (INTERNAL) |
| (n) | LH ₂ DSBL LIMIT FLAG | (INTERNAL) |

If (m) is true, check the following:

If (a) is true and (i) is false, then set outputs (1) and (5) true.

If (b) is true and (j) and (n) are false, then set outputs (2) and (5) true.

If (c) is true and (k) and (n) are false, then set outputs (3) and (5) true.

If (d) is true and (l) and (n) are false, then set output (4) true.

Else, check the following:

If (a) is true and (e) and (i) are both false, then set output (6) true.

If (b) is true and (f) and (j) are both false, then set output (7) true.

If (c) is true and (g) and (k) are both false, then set output (8) true.

If (d) is true and (h) and (l) are both false, then set output (9) true.

| | | |
|-----|--|------------|
| (1) | ET_LH ₂ _LO_LVL_LIQ_SES1_DSBL_FLG | V99X8806X |
| (2) | ET_LH ₂ _LO_LVL_LIQ_SES2_DSBL_FLG | V99X8807X |
| (3) | ET_LH ₂ _LO_LVL_LIQ_SES3_DSBL_FLG | V99X8808X |
| (4) | ET_LH ₂ _LO_LVL_LIQ_SES4_DSBL_FLG | V99X8809X |
| (5) | LH ₂ DSBL LIMIT FLAG | (INTERNAL) |
| (6) | LH ₂ SENSOR #1 DRY FLAG | (INTERNAL) |
| (7) | LH ₂ SENSOR #2 DRY FLAG | (INTERNAL) |
| (8) | LH ₂ SENSOR #3 DRY FLAG | (INTERNAL) |
| (9) | LH ₂ SENSOR #4 DRY FLAG | (INTERNAL) |

Proceed to Step 26A.

Step 26A – Check of LH₂ Sensor Dry Flags. This step monitors for any two LH₂ sensor dry flags latched true in Step 26. If any two flags are true and the required time delay has elapsed since two flags were first detected true, then MECO is initiated.

Monitor the following:

| | | |
|-----|------------------------------------|------------|
| (a) | LH ₂ SENSOR #1 DRY FLAG | (INTERNAL) |
| (b) | LH ₂ SENSOR #2 DRY FLAG | (INTERNAL) |
| (c) | LH ₂ SENSOR #3 DRY FLAG | (INTERNAL) |

| | | |
|-----|---------------------------------------|------------|
| (d) | LH ₂ SENSOR #4 DRY FLAG | (INTERNAL) |
| (e) | RTLS ABORT DECLARED | V90X8637X |
| (f) | MPS E1 FAIL FLAG | V95X1207X |
| (g) | MPS E2 FAIL FLAG | V95X1208X |
| (h) | MPS E3 FAIL FLAG | V95X1209X |
| (i) | LH2_LL_TIME_DELAY_Q | V96U9535C |
| (j) | RTLS_LH ₂ _LL_TIME_DELAY_P | V96U9536C |
| (k) | ARM CMD FIRST PASS FLAG | (INTERNAL) |

If (k) is true, then set (2) false.

On the first pass that [(a) and (b)] or [(a) and (c)] or [(a) and (d)] or [(b) and (c)] or [(b) and (d)] or [(c) and (d)] are detected true, establish the appropriate time delay for setting the MECO COMMAND FLAG true as follows:

If (e) = true and either (f) or (g) or (h) = true, then set (j) as the time delay and proceed to Step 24A.

Otherwise set (i) as the time delay and proceed to Step 24A.

On the second and subsequent passes since two or more LH₂ sensor dry flags were detected true, monitor the time delay established above. When the selected time delay has elapsed, set output (1) true and proceed to Step 24A.

| | | |
|-----|-------------------------|------------|
| (1) | MECO COMMAND FLAG | V90X8569X |
| (2) | ARM CMD FIRST PASS FLAG | (INTERNAL) |

Otherwise, proceed to Step 24A.

Step 27 – ME–1 Shutdown Initiation. This step monitors for either an ME–1 MANUAL SHUTDOWN FLAG or a MECO COMMAND FLAG. If either flag is set true, this step will alternately issue the shutdown enable and shutdown commands until ME–1 is detected to be in the post–shutdown phase.

Monitor the following:

| | | |
|-----|----------------------------|------------|
| (a) | ME–1 MANUAL SHUTDOWN FLAG | (INTERNAL) |
| (b) | MECO COMMAND FLAG | V90X8569X |
| (c) | MPS E1 POST–SHUTDOWN PHASE | V95X1160X |

If (a) and (b) both = false, proceed to Step 28.

If either (a) or (b) = true and (c) = true, then terminate outputs (1) and (2), set output (3) = true, and proceed to Step 28.

| | | |
|-----|-------------------------------|------------|
| (1) | MPS E1 SHUTDOWN ENABLE CMD | V90X8367X |
| (2) | MPS E1 SHUTDOWN CMD | V90X8370X |
| (3) | ME–1 SHUTDOWN CMD ISSUED FLAG | (INTERNAL) |

If either (a) or (b) = true and (c) = false, then proceed to Step 27A.

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Step 27A – Issuance of ME–1 Shutdown Commands. This step provides for alternately issuing the shutdown enable and shutdown commands for ME–1.

Monitor the following:

(a) ME–1 SHUTDOWN FLAG “A” (INTERNAL)

If (a) = false, issue output 2.

(1) MPS E1 SHUTDOWN CMD V90X8370X

(2) MPS E1 SHUTDOWN ENABLE CMD V90X8367X

and then set internal flag (3) below = true

(3) ME–1 SHUTDOWN FLAG “A” (INTERNAL)

(4) ME–1 SHUTDOWN CMD ISSUED FLAG (INTERNAL)

Proceed to Step 28.

If (a) = true, issue output (1) above; and then set output (3) above = false and (4) = true.

Proceed to Step 28.

Step 28 – ME–2 Shutdown Initiation. This step monitors for either an ME–2 MANUAL SHUTDOWN FLAG or a MECO COMMAND FLAG. If either flag is set true, this step will alternately issue the shutdown enable and shutdown commands until ME–2 is detected to be in the post–shutdown phase.

Monitor the following:

(a) ME–2 MANUAL SHUTDOWN FLAG (INTERNAL)

(b) MECO COMMAND FLAG V90X8569X

(c) MPS E2 POST–SHUTDOWN PHASE V95X1161X

If (a) and (b) both = false, proceed to Step 29.

If either (a) or (b) = true and (c) = true, then terminate outputs (1) and (2) and set output (3) = true and proceed to Step 29.

(1) MPS E2 SHUTDOWN ENABLE CMD V90X8368X

(2) MPS E2 SHUTDOWN CMD V90X8371X

(3) ME–2 SHUTDOWN CMD ISSUED FLAG (INTERNAL)

If either (a) or (b) = true and (c) = false, then proceed to Step 28A.

Step 28A – Issuance of ME–2 Shutdown Commands. This step provides for alternately issuing the shutdown enable and shutdown commands for ME–2.

Monitor the following:

- (a) ME–2 SHUTDOWN FLAG “B” (INTERNAL)

If (a) = false, issue output 2.

- (1) MPS E2 SHUTDOWN CMD V90X8371X
(2) MPS E2 SHUTDOWN ENABLE CMD V90X8368X

and then set internal flag (3) below = true

- (3) ME–2 SHUTDOWN FLAG “B” (INTERNAL)
(4) ME–2 SHUTDOWN CMD ISSUED FLAG (INTERNAL)

Proceed to Step 29.

If (a) = true, issue output (1) above; and then set output (3) above = false, and output (4) = true.

Proceed to Step 29.

Step 29 – ME–3 Shutdown Initiation. This step monitors for either an ME–3 MANUAL SHUTDOWN FLAG or a MECO COMMAND FLAG. If either flag is set true, this step will alternately issue the shutdown enable and shutdown commands until ME–3 is detected to be in the post–shutdown phase.

Monitor the following:

- (a) ME–3 MANUAL SHUTDOWN FLAG (INTERNAL)
(b) MECO COMMAND FLAG V90X8569X
(c) MPS E3 POST–SHUTDOWN PHASE V95X1162X

If (a) and (b) both = false, proceed to Step 30.

If either (a) or (b) = true and (c) = true, then terminate outputs (1) and (2) and set output (3) = true and proceed to Step 30.

- (1) MPS E3 SHUTDOWN ENABLE CMD V90X8369X
(2) MPS E3 SHUTDOWN CMD V90X8372X
(3) ME–3 SHUTDOWN CMD ISSUED FLAG (INTERNAL)

If either (a) or (b) = true and (c) = false, then proceed to Step 29A.

Step 29A – Issuance of ME–3 Shutdown Commands. This step provides for alternately issuing the shutdown enable and shutdown commands for ME–3.

Monitor the following:

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- (a) ME-3 SHUTDOWN FLAG "C" (INTERNAL)

If (a) = false, issue output 2.

- (1) MPS E3 SHUTDOWN CMD V90X8372X
(2) MPS E3 SHUTDOWN ENABLE CMD V90X8369X

and then set internal flag (3) below = true

- (3) ME-3 SHUTDOWN FLAG "C" (INTERNAL)
(4) ME-3 SHUTDOWN CMD ISSUED FLAG (INTERNAL)

Proceed to Step 30.

If (a) = true, issue output (1) above; and then set output (3) above = false and output (4) = true.

Proceed to Step 30.

Step 30 – All Main Engines Fail Flags Check. This step monitors the fail flags of all three main engines. If all three of the main engine fail flags are set true, then the MECO COMMAND FLAG is set true and the MECO prevalve close delay is set to zero.

Monitor the following:

- (a) MPS E1 FAIL FLAG V95X1207X
(b) MPS E2 FAIL FLAG V95X1208X
(c) MPS E3 FAIL FLAG V95X1209X

If (a), (b), and (c) all = true, then issue output (1) and set output (2) equal to zero and proceed to Step 31.

- (1) MECO COMMAND FLAG V90X8569X
(2) MECO_PREVLV_CLOSE_DELAY V96U9761C

If either (a) or (b) or (c) = false, then proceed to Step 31.

Step 31 – All Engines $P_c \leq 30$ -Percent Check. This step monitors the thrust level of all engines via chamber pressure from the SSME SOP. Also monitored is whether the data from each engine is valid. If no engine remains above 30 percent chamber pressure, or MAJOR MODE 104 FLAG is true, or ME-1, ME-2, and ME-3 safing commands are all true, or an engine has a DATA PATH FAIL and the other two engines are less than or equal to 30 percent chamber pressure, the MECO COMMAND FLAG, the MECO CONFIRMED FLAG, and the EVENT TIMER START FLAG are all set true. Monitor the following:

- (a) MPS E1 PERCENT CH PRESS V95U1186C
(b) MPS E2 PERCENT CH PRESS V95U1187C
(c) MPS E3 PERCENT CH PRESS V95U1188C
(d) ME-1 FLIGHT DATA PATH FAIL FLAG V95X1150X
(e) ME-2 FLIGHT DATA PATH FAIL FLAG V95X1151X
(f) ME-3 FLIGHT DATA PATH FAIL FLAG V95X1152X
(g) MAJOR MODE 104 FLAG V90X8152X

- | | | |
|-----|-----------------|-----------|
| (h) | ME-1 SAFING CMD | V90X3443X |
| (i) | ME-2 SAFING CMD | V90X3444X |
| (j) | ME-3 SAFING CMD | V90X3445X |

If (a), (b), and (c) are all ≤ 30 percent, then issue the following outputs and proceed to Step 32.

- | | | |
|-----|------------------------|-----------|
| (1) | MECO COMMAND FLAG | V90X8569X |
| (2) | MECO CONFIRMED FLAG | V90X8561X |
| (3) | EVENT TIMER START FLAG | V90X8403X |

If (g) = true, then issue outputs (1), (2), and (3) above and proceed to Step 32.

If (h) and (i) and (j) = true, then issue outputs (1), (2), and (3) above and proceed to Step 32.

If (d) = true and (b) and (c) are both ≤ 30 percent, then issue outputs (1), (2), and (3) above and proceed to Step 32.

If (e) = true and (a) and (c) are both ≤ 30 percent, then issue outputs (1), (2), and (3) above and proceed to Step 32.

If (f) = true and (a) and (b) are both ≤ 30 percent, then issue outputs (1), (2), and (3) above and proceed to Step 32.

Otherwise, return to Step 1.

Step 32 – All Prevalves Commanded Closed Check. This step checks that all prevalves have been commanded closed before setting a flag for the ET separation sequence and proceeding with the ET disconnect valve closure. The prevalves are closed by Steps 3A, 7A, and 11A after appropriate time delays.

Monitor the following:

- | | | |
|-----|----------------------------------|------------|
| (a) | ME-1 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |
| (b) | ME-2 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |
| (c) | ME-3 PREVALVES CMD'D CLOSED FLAG | (INTERNAL) |

If either (a), (b), or (c) = false, return to Step 1.

If (a), (b), and (c) all = true, issue the following output and proceed to Step 33.

- | | | |
|-----|---------------------------------|-----------|
| (1) | ALL PREVLVS COMMANDED CLOSE IND | V90X8568X |
|-----|---------------------------------|-----------|

Step 33 – Termination of SSME OPS Sequence. This step keeps the SSME OPS sequence active until all PREVALVE CLOSE COMMANDS have been removed and the HELIUM INTERCONNECT FLAG is set to false. The PREVALVE CLOSE COMMANDS are removed in Steps 4, 8, and 12. The HELIUM INTERCONNECT FLAG is set to false, when appropriate, by Step 17A.

Monitor the following:

- | | | |
|-----|--------------------------------------|------------|
| (a) | ME-1 PREVLVS CLOSE CMDS REMOVED FLAG | (INTERNAL) |
|-----|--------------------------------------|------------|

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- | | | |
|-----|--------------------------------------|------------|
| (b) | ME-2 PREVLVS CLOSE CMDS REMOVED FLAG | (INTERNAL) |
| (c) | ME-3 PREVLVS CLOSE CMDS REMOVED FLAG | (INTERNAL) |
| (d) | HELIUM INTERCONNECT FLAG | (INTERNAL) |

If either (a), (b), or (c) = false, return to Step 1.

If (a), (b), and (c) all = true, then set output (1) = false and monitor (d).

If (d) = true, return to Step 1.

If (d) = false, terminate the SSME OPS sequence.

- | | | |
|-----|------------------------|-----------|
| (1) | EVENT TIMER START FLAG | V90X8403X |
|-----|------------------------|-----------|

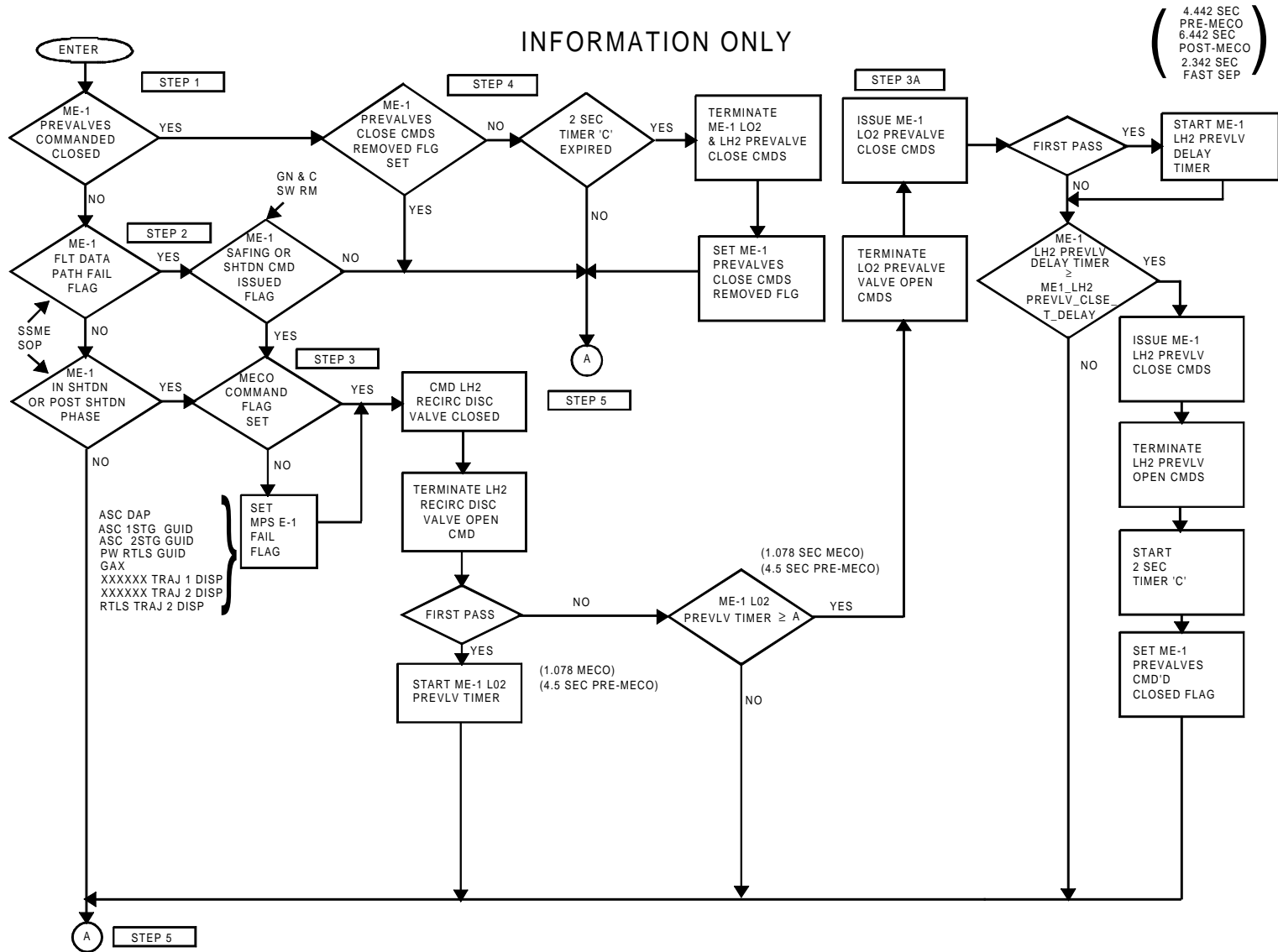


FIGURE 4.165.(1) SSME Operations Sequence (Sheet 1 of 12)

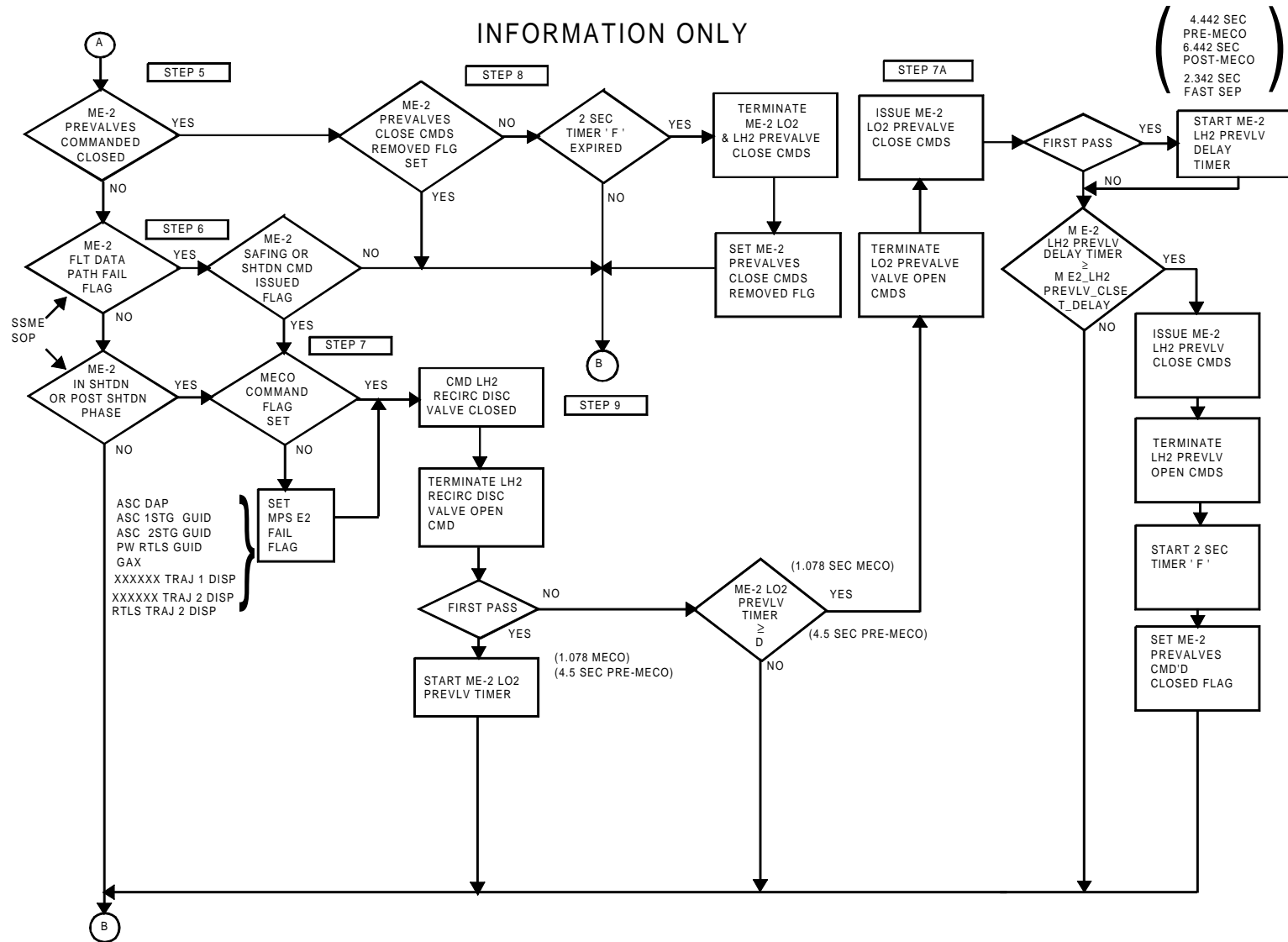


FIGURE 4.165.(2) SSME Operations Sequence (Sheet 2 of 12)

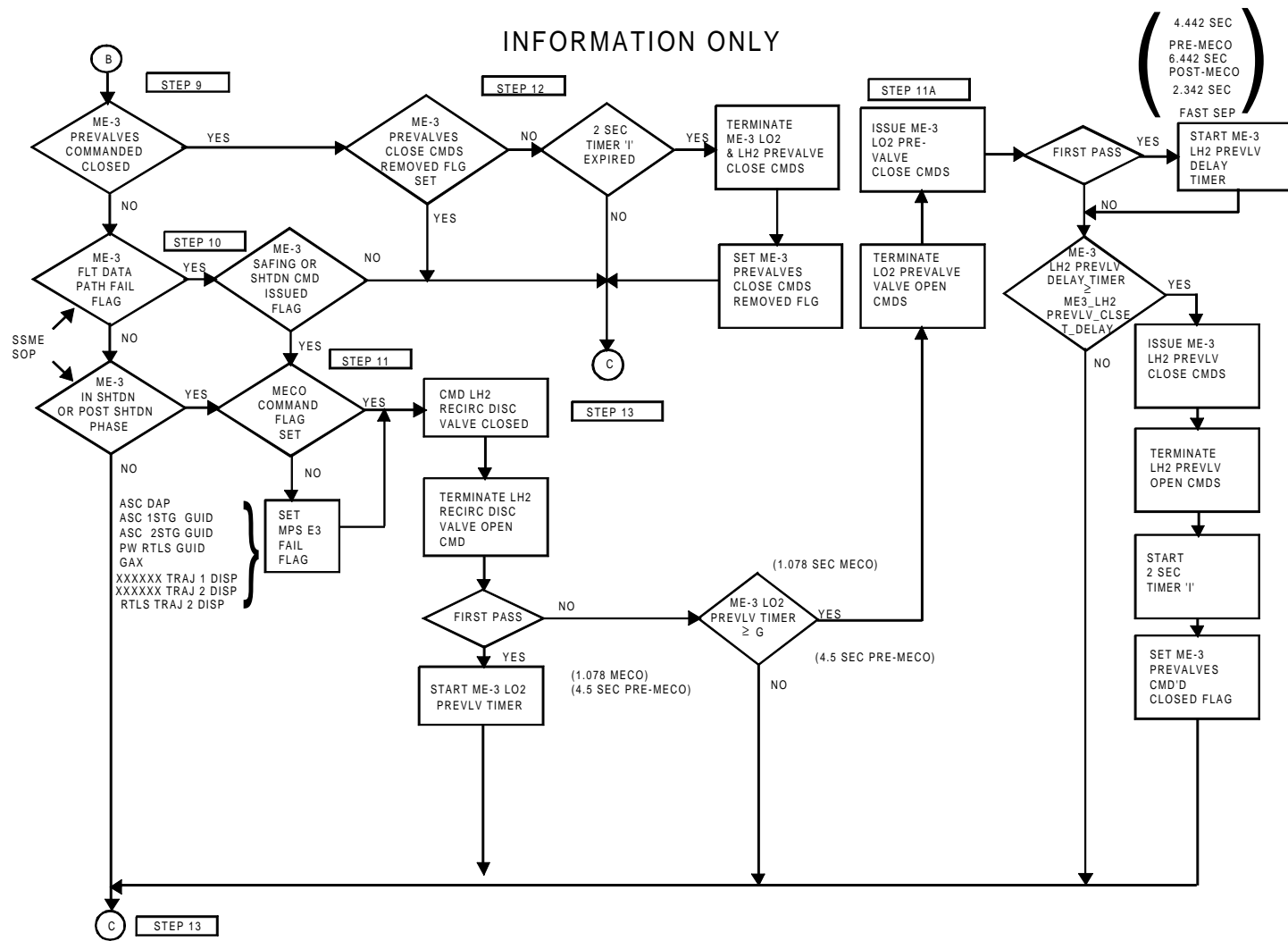


FIGURE 4.165.(3) SSME Operations Sequence (Sheet 3 of 12)

INFORMATION ONLY

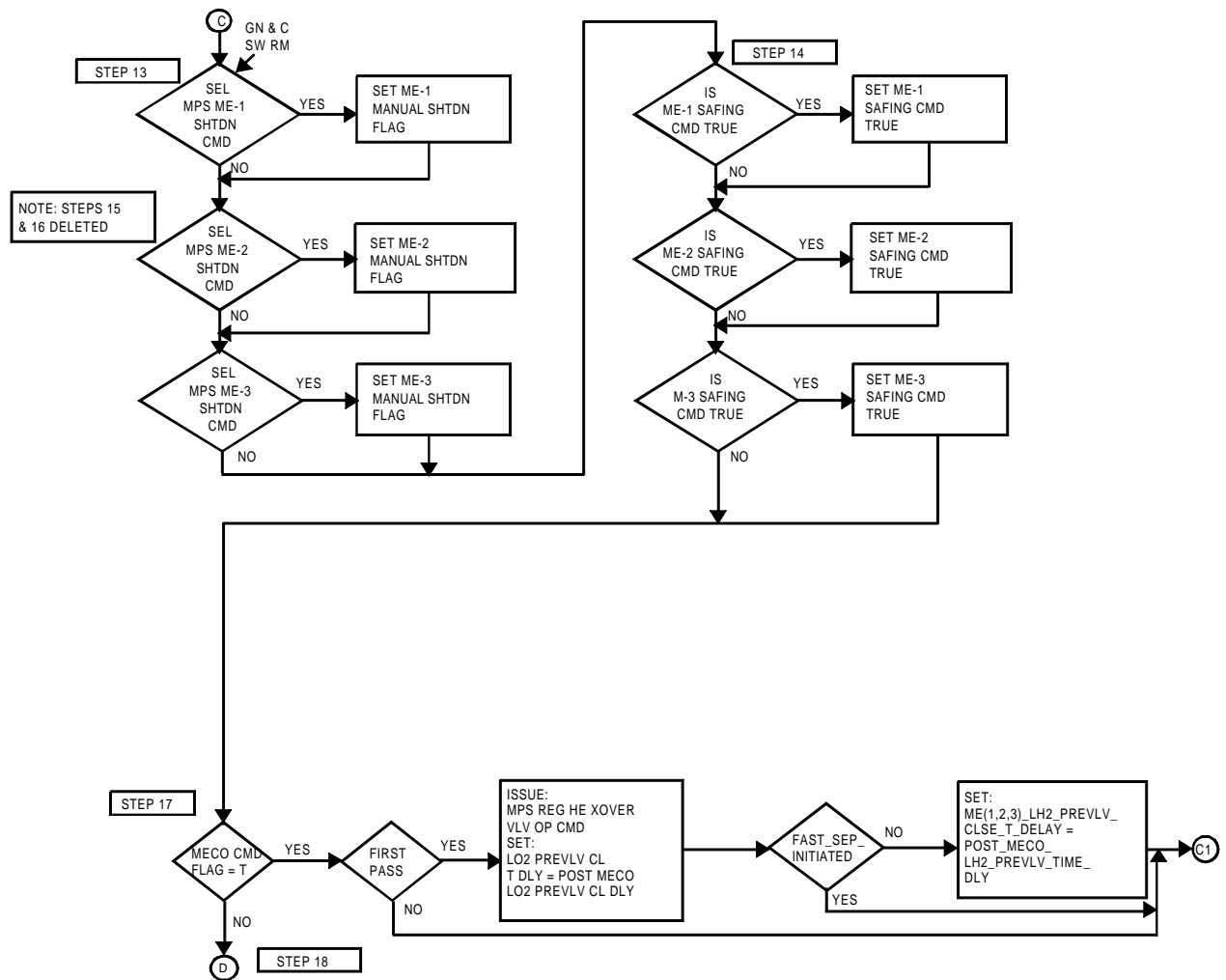


FIGURE 4.165.(4) SSME Operations Sequence (Sheet 4 of 12)

INFORMATION ONLY

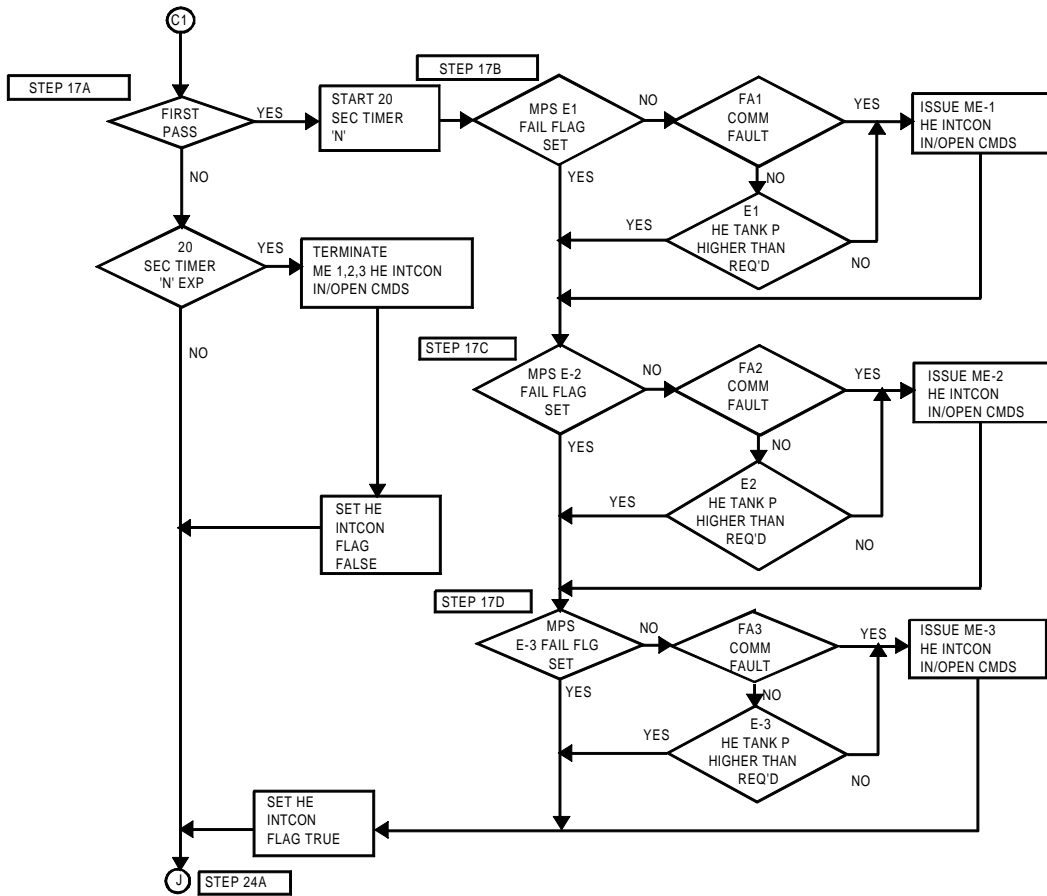


FIGURE 4.165.(5) SSME Operations Sequence (Sheet 5 of 12)

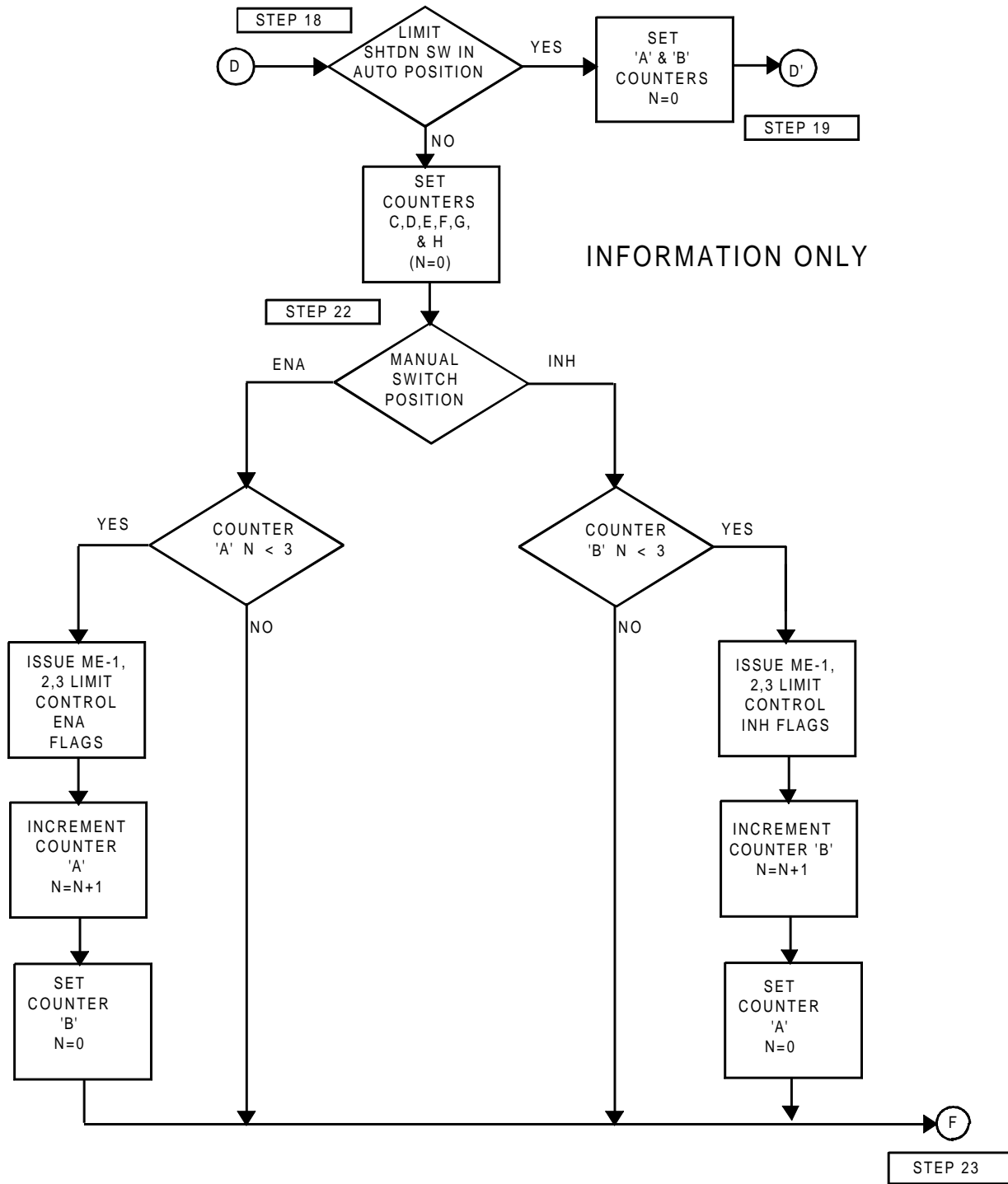


FIGURE 4.165.(6) SSME Operations Sequence (Sheet 6 of 12)

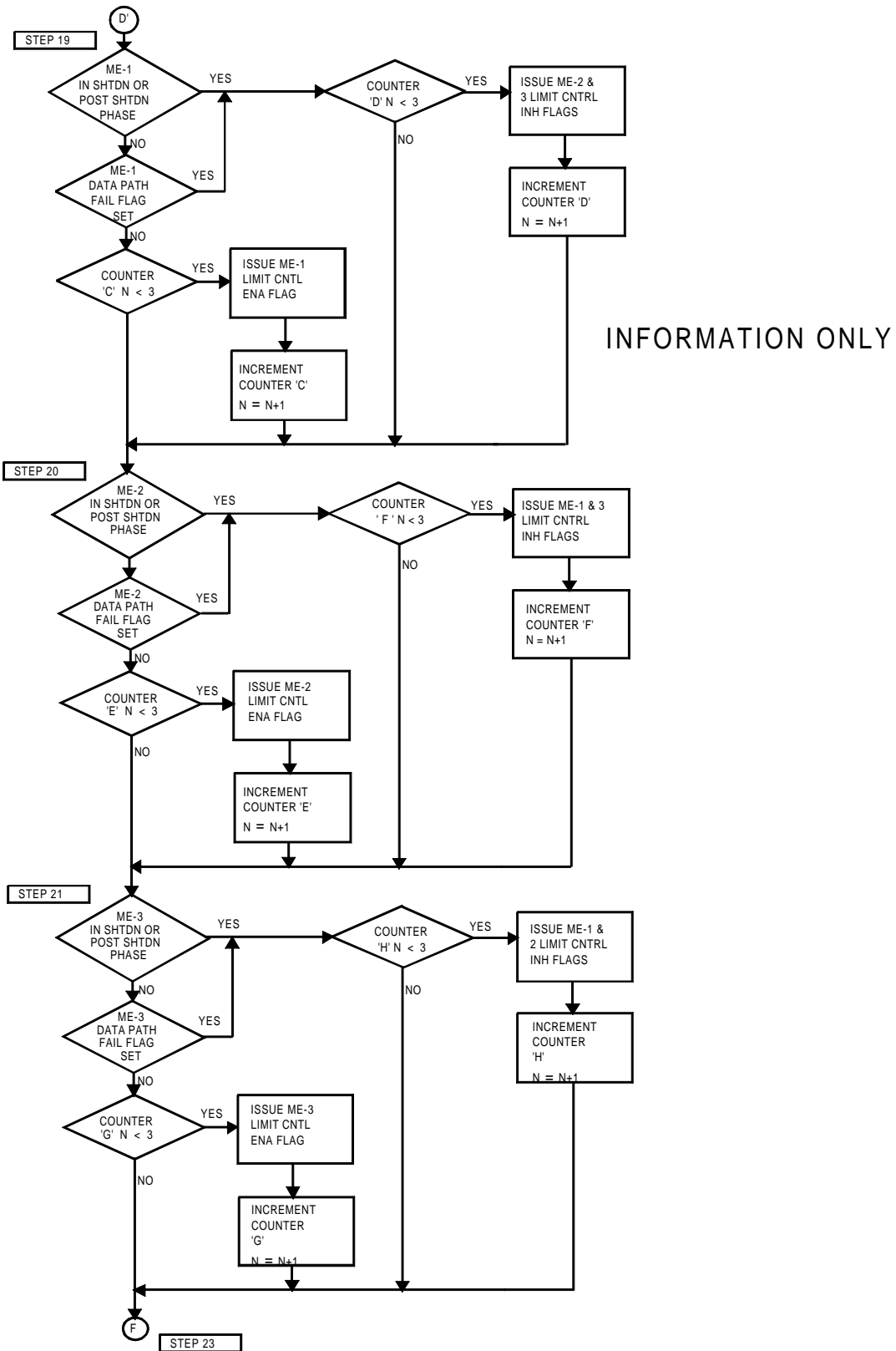


FIGURE 4.165.(7) SSME Operations Sequence (Sheet 7 of 12)

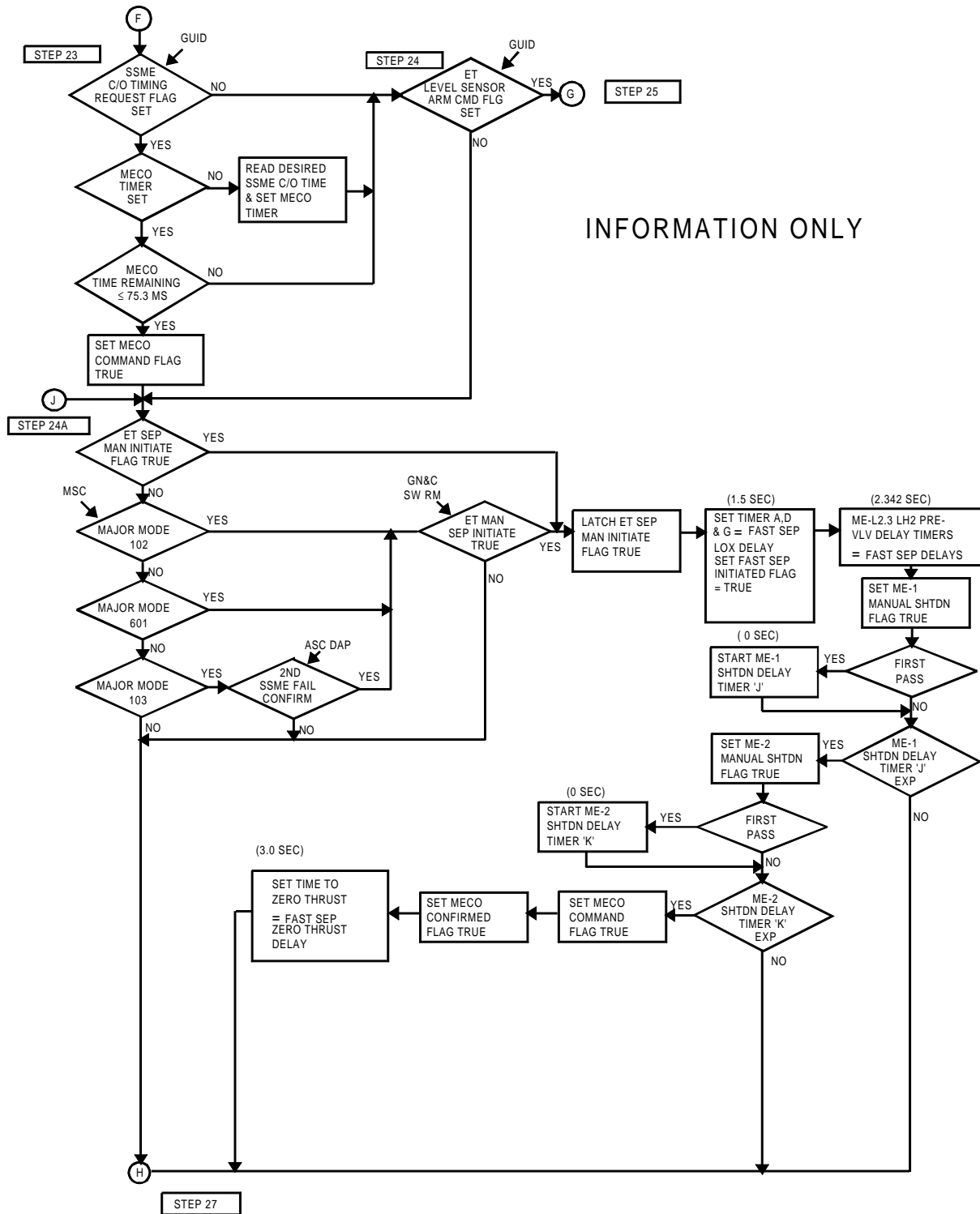


FIGURE 4.165.(8) SSME Operations Sequence (Sheet 8 of 12)

INFORMATION ONLY

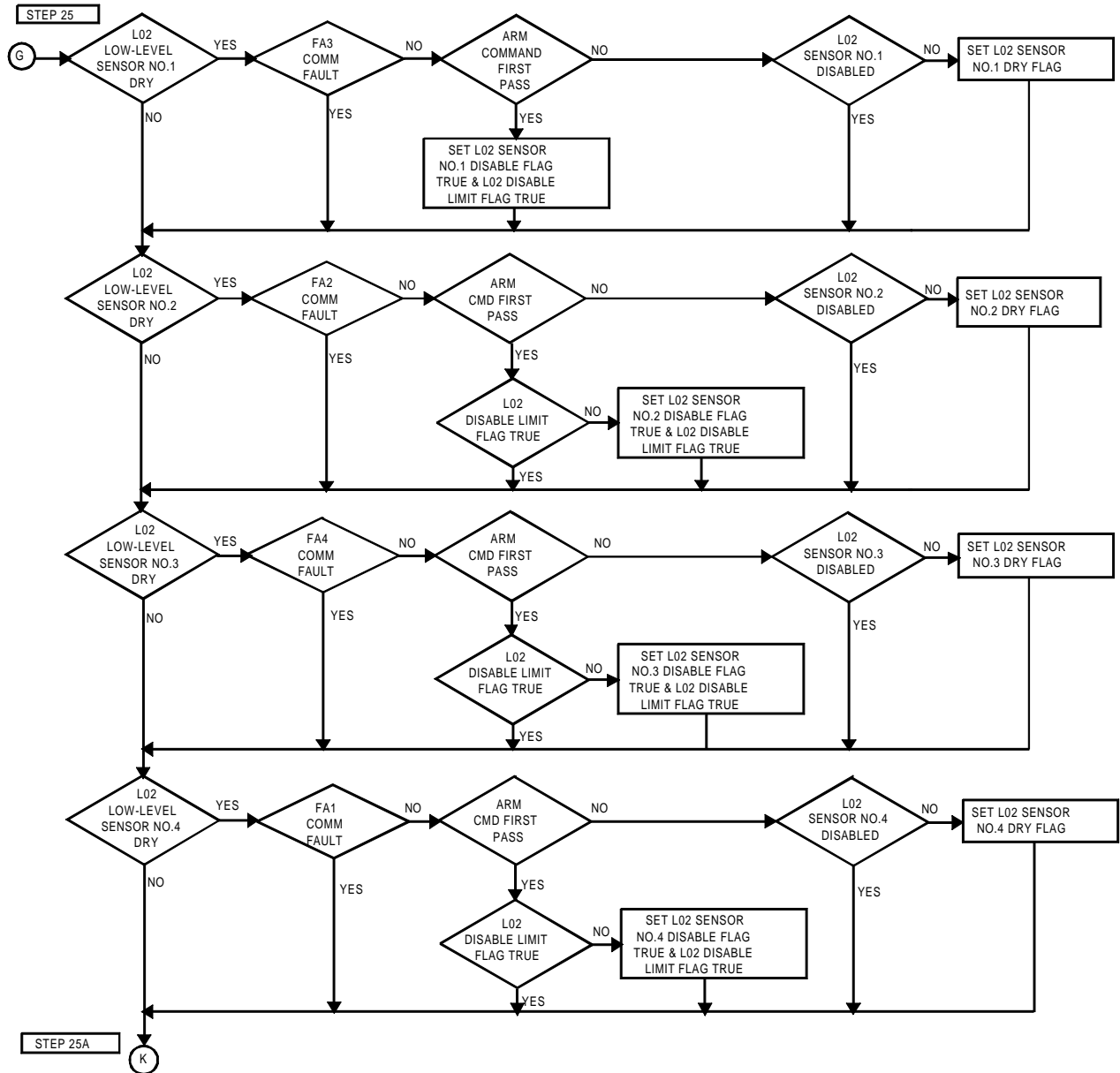


FIGURE 4.165.(9) SSME Operations Sequence (Sheet 9 of 12)

INFORMATION ONLY

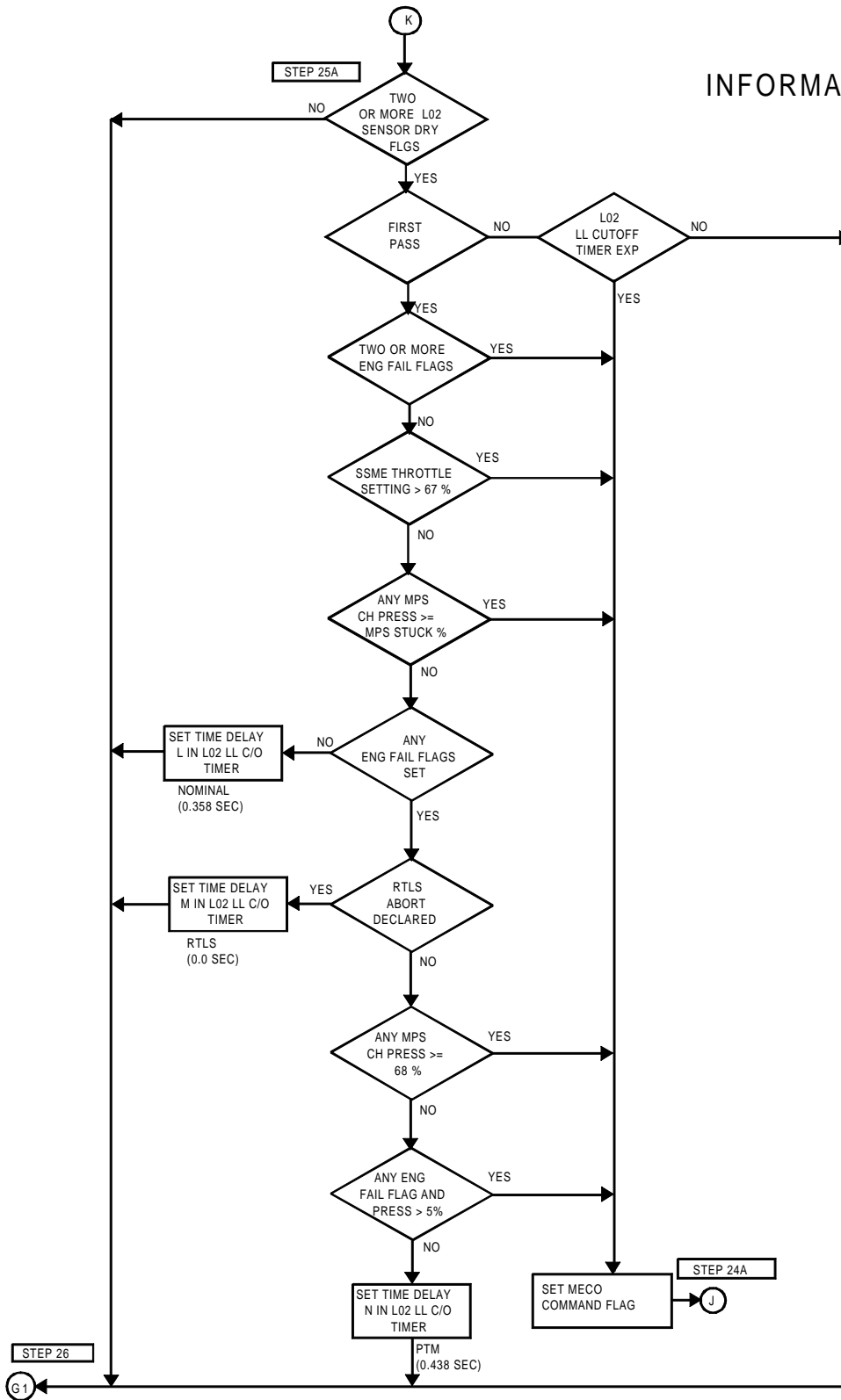


FIGURE 4.165.(9A) SSME Operations Sequence (Sheet 9A of 12)

INFORMATION ONLY

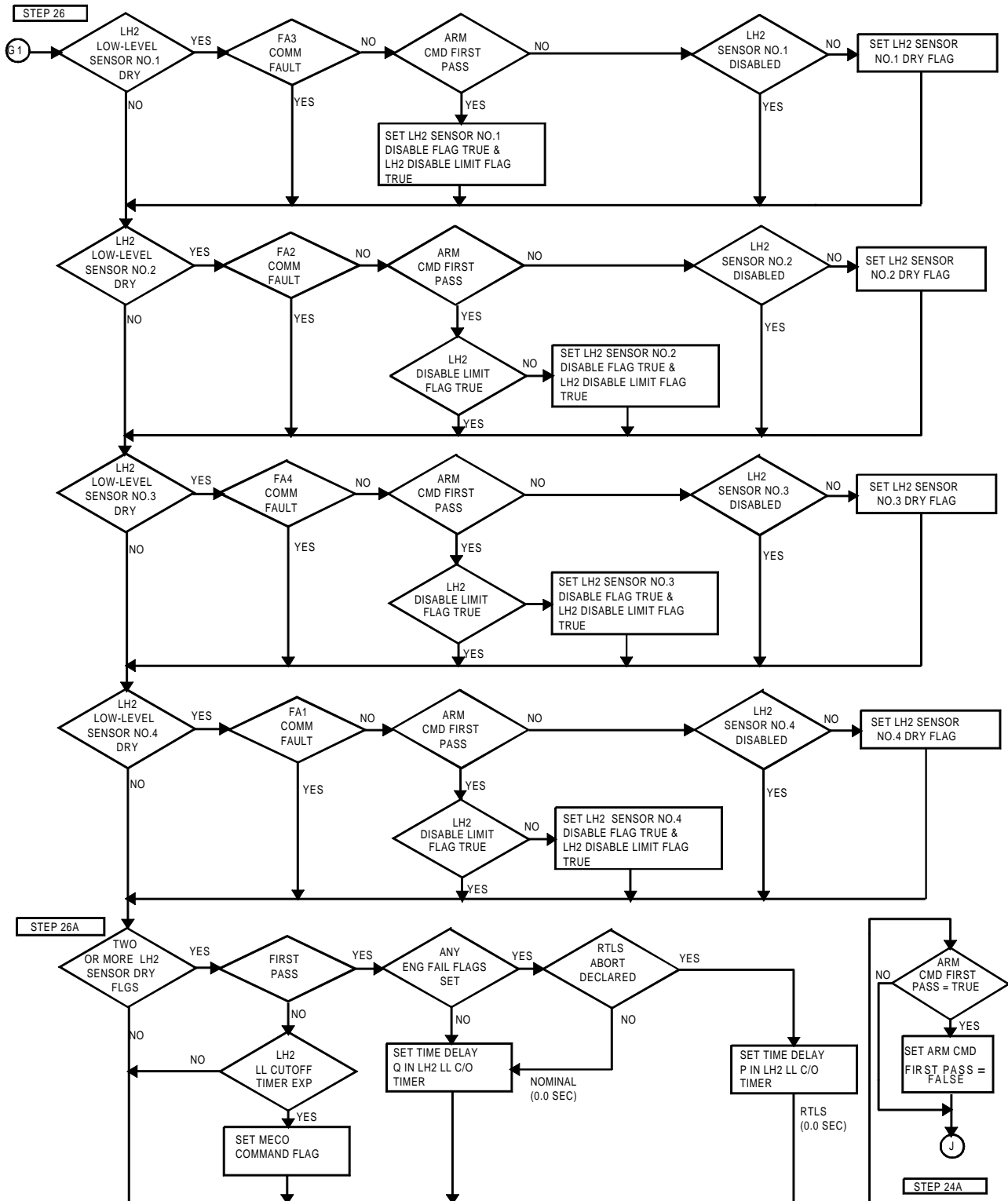


FIGURE 4.165.(10) SSME Operations Sequence (Sheet 10 of 12)

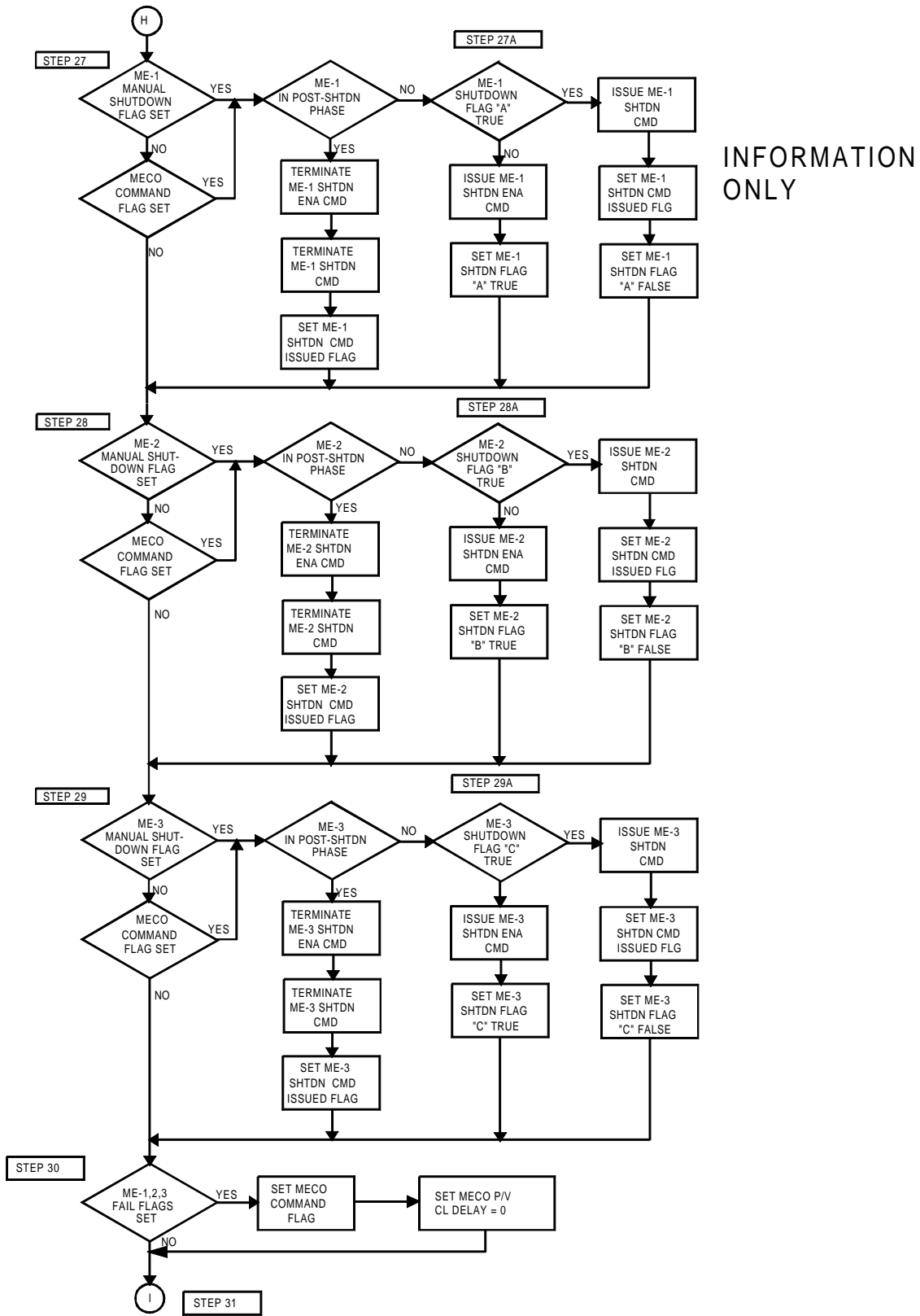


FIGURE 4.165.(11) SSME Operations Sequence (Sheet 11 of 12)

INFORMATION ONLY

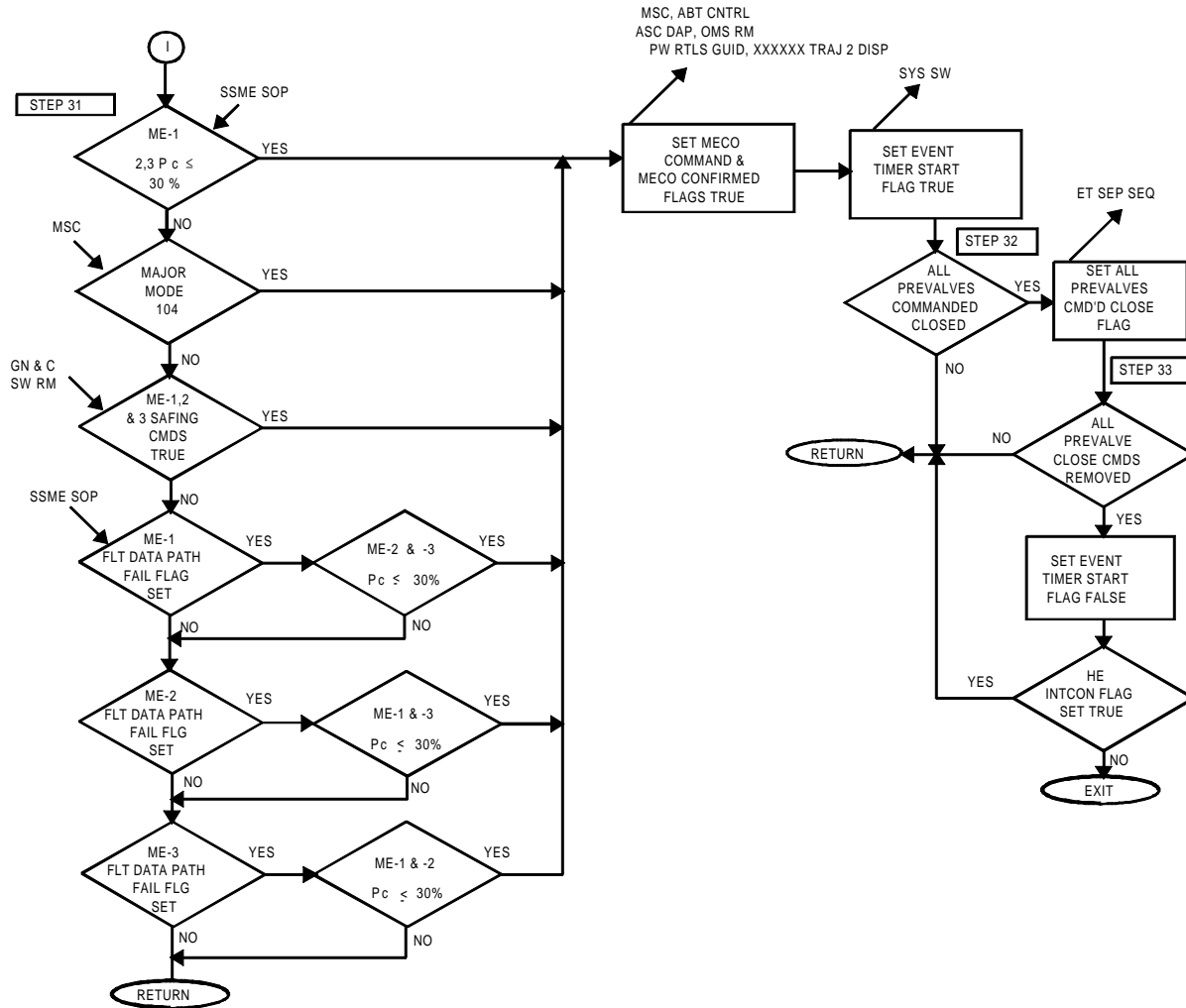


FIGURE 4.165.(12) SSME Operations Sequence (Sheet 12 of 12)

TABLE 4.2.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------------|------------|----------------------------------|----------------|-------|--------------|------------------|---------|-------------|
| CLOCK/CLOCKTIME | V91W5000C | CLOCK-COMPUTER(GMT) | FCOS | S | | | 93160B | * |
| ET_SEP_MAN_INITIATE | V90X8584XB | ET SEP MAN INITIATE FLAG | PW CONT GUID | | BD | | 90964 | |
| K_CMD | V90U1948CB | COMMANDED SSME THROTTLE SETTING | ASC 1STG GUID | PCT | | | 93017G | * |
| ME1_CH_PRESS_FDBK | V95U1186C | MPS E-1 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| ME2_CH_PRESS_FDBK | V95U1187C | MPS E-2 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| ME3_CH_PRESS_FDBK | V95U1188C | MPS E-3 PERCENT CH PRESS | SSME SOP | PCT | | | | |
| MEPSTSHDN(1) | V95X1160X | MPS E1 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MEPSTSHDN(2) | V95X1161X | MPS E2 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MEPSTSHDN(3) | V95X1162X | MPS E3 POST-SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN(1) | V95X1155X | MPS E1 SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN(2) | V95X1156X | MPS E2 SHUTDOWN PHASE | SSME SOP | | | | | |
| MESHDN(3) | V95X1157X | MPS E3 SHUTDOWN PHASE | SSME SOP | | | | | |
| ME_FLT_DATA_PATH_FAIL(1) | V95X1150X | ME-1 FLIGHT DATA PATH FAIL FLAG | SSME SOP | | | | 90243C | |
| ME_FLT_DATA_PATH_FAIL(2) | V95X1151X | ME-2 FLIGHT DATA PATH FAIL FLAG | SSME SOP | | | | 90243C | |
| ME_FLT_DATA_PATH_FAIL(3) | V95X1152X | ME-3 FLIGHT DATA PATH FAIL FLAG | SSME SOP | | | | 90243C | |
| MM_CODE_102/MM_102 | V90X8158X | MAJOR MODE 102 FLAG | MSC | | | | 93012D | |
| MM_CODE_103/MM_103 | V90X8156X | MAJOR MODE 103 FLAG | MSC | | | | 93012D | |
| MM_CODE_104/MM_104 | V90X8152X | MAJOR MODE 104 FLAG | MSC | | | | 92355B | |
| MM_CODE_601/MM_601 | V90X8194X | MAJOR MODE 601 FLAG | MSC | | BD | | 93012D | |
| 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 | * |
| SEC_ME_FL_CNFM | V90X1721X | 2ND SSME FAIL CONFIRM | ASC DAP | | | | 89990E | |
| S_LOW_LEVEL | V90X1942XA | ET LEVEL SENSOR ARM CMD | ASC 2STG GUID | | | | 93017G | * |
| S_LOW_LEVEL | V90X1942XB | ET LEVEL SENSOR ARM CMD | PW RTLS GUID | | | | 93017G | * |
| S_LOW_LEVEL | V90X1942XC | ET LEVEL SENSOR ARM CMD | PW CONT GUID | | | | 93017G | * |
| S_TMECO | V90X1944XA | SSME C/O TIMING REQUEST FLAG | ASC 2STG GUID | | | | 89461 | |
| S_TMECO | V90X1944XB | SSME C/O TIMING REQUEST FLAG | PW RTLS GUID | | | | 89990E | |
| S_TMECO | V90X1944XC | SSME C/O TIMING REQUEST FLAG | PW CONT GUID | | | | 89990E | |
| T_MECCO | V90W1945CA | DESIRED SSME C/O TIME | ASC 2STG GUID | S | | | | |
| T_MECCO | V90W1945CB | DESIRED SSME C/O TIME | PW RTLS GUID | S | | | | |
| T_MECCO | V90W1945CC | DESIRED SSME C/O TIME | PW CONT GUID | S | | | 89990E | |
| T41X1730X | | ET-LH2 LOW LEVEL LIQ SENSOR NO 1 | HDWR | | BD | | 93017G | * |
| T41X1731X | | ET-LH2 LOW LEVEL LIQ SENSOR NO 2 | HDWR | | BD | | 93017G | * |
| T41X1732X | | ET-LH2 LOW LEVEL LIQ SENSOR NO 3 | HDWR | | BD | | 93017G | * |
| T41X1733X | | ET-LH2 LOW LEVEL LIQ SENSOR NO 4 | HDWR | | BD | | 93017G | * |
| V41P1150C | | MPS E1 HE SUPPLY BOTTLE PRESS | HDWR | | AMU | | 93017G | * |
| V41P1250C | | MPS E2 HE SUPPLY BOTTLE PRESS | HDWR | | AMU | | 93017G | * |
| V41P1350C | | MPS E3 HE SUPPLY BOTTLE PRESS | HDWR | | AMU | | 93017G | * |
| V41X1555X | | MPS LO2 LEFT ECO SENSOR 1 | HDWR | | BD | | 93017G | * |
| V41X1556X | | MPS LO2 LEFT ECO SENSOR 2 | HDWR | | BD | | 93017G | * |
| V41X1557X | | MPS LO2 RIGHT ECO SENSOR 2 | HDWR | | BD | | 93017G | * |
| V41X1558X | | MPS LO2 RIGHT ECO SENSOR 1 | HDWR | | BD | | 93017G | * |
| V90X3439X | | FASCOS AUTO RESET | GN&C SW RM | | | | | |
| V90X3440X | | FASCOS INHIBIT | GN&C SW RM | | | | 89598A | |
| V90X3443X | | ME-1 SAFING CMD | GN&C SW RM | | | | | |

TABLE 4.2.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------------|------------|-------|-----------|---------|---------|-------|
| | V90X3444X | ME-2 SAFING CMD | GN&C SW RM | | | | | |
| | V90X3445X | ME-3 SAFING CMD | GN&C SW RM | | | | | |
| | V90X7548X | SEL MPS ENG LIMIT CONTROL AUTO | GN&C SW RM | | BD | | 93017G | * |
| | V90X7549X | SEL MPS ENG LIMIT CONTROL ENABLE | GN&C SW RM | | | | | |
| | V90X7550X | SEL MPS ENG LIMIT CONTROL INHIBIT | GN&C SW RM | | | | | |
| | V90X7551X | SEL MPS ME-1 SHUTDOWN CMD | GN&C SW RM | | BD | | 93017G | * |
| | V90X7552X | SEL MPS ME-2 SHUTDOWN CMD | GN&C SW RM | | BD | | 93017G | * |
| | V90X7553X | SEL MPS ME-3 SHUTDOWN CMD | GN&C SW RM | | BD | | 93017G | * |
| | V90X7564X | SEL ET SEP INITIATE/WOW-WONG CMD | GN&C SW RM | | BD | | 93017G | * |
| | V91X2841X | FA1 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2842X | FA2 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2843X | FA3 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2845X | FA1 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 89991E | |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2848X | FA4 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 92316B | |
| | V97U9831C | FAST_SEP_LOX_PREVLV_DLY | SSME OPS | | | | | |
| | V99X8806X | ET_LH2_LO_LVL_LIQ_SES1_DSBL_FLG | VU | | | | 89325B | |
| | V99X8807X | ET_LH2_LO_LVL_LIQ_SES2_DSBL_FLG | VU | | | | 89325B | |
| | V99X8808X | ET_LH2_LO_LVL_LIQ_SES3_DSBL_FLG | VU | | | | 89325B | |
| | V99X8809X | ET_LH2_LO_LVL_LIQ_SES4_DSBL_FLG | VU | | | | 89325B | |
| | V99X8814X | MPS_LOX_LO_LVL_LIQ_SES1_DSBL_FLG | VU | | | | 89325B | |
| | V99X8815X | MPS_LOX_LO_LVL_LIQ_SES2_DSBL_FLG | VU | | | | 89325B | |
| | V99X8816X | MPS_LOX_LO_LVL_LIQ_SES3_DSBL_FLG | VU | | | | 89325B | |
| | V99X8817X | MPS_LOX_LO_LVL_LIQ_SES4_DSBL_FLG | VU | | | | 89325B | |

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

TABLE 4.2.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------------|------------|--------------------------|---|-------|--------------|------------------|---------|-------------|
| ET_SEP_MAN_INITIATE | V90X8584XA | ET SEP MAN INITIATE FLAG | CONT 3E/O GUID | | BD | | 90964 | |
| ME1_FAIL_SHUTDOWN | V95X1207X | MPS E1 FAIL FLAG | ET SEP SEQ ASC 1STG GUID ASC 2STG GUID ASC DAP DL FMT 21/1 GAX MSC PW CONT GUID PW RTLS GUID RTLS TRAJ 2 DISP SPTI SOP SRB SEP SEQ XXXXXX TRAJ 1 DISP XXXXXX TRAJ 2 DISP | | BD | | 93017G | * |
| ME2_FAIL_SHUTDOWN | V95X1208X | MPS E2 FAIL FLAG | ASC 1STG GUID ASC 2STG GUID ASC DAP DL FMT 21/1 GAX MSC PW CONT GUID PW RTLS GUID RTLS TRAJ 2 DISP SPTI SOP SRB SEP SEQ XXXXXX TRAJ 1 DISP XXXXXX TRAJ 2 DISP | | BD | | 93017G | * |
| ME3_FAIL_SHUTDOWN | V95X1209X | MPS E3 FAIL FLAG | ASC 1STG GUID ASC 2STG GUID ASC DAP DL FMT 21/1 GAX MSC PW CONT GUID PW RTLS GUID RTLS TRAJ 2 DISP SPTI SOP SRB SEP SEQ XXXXXX TRAJ 1 DISP XXXXXX TRAJ 2 DISP | | BD | | 93017G | * |

TABLE 4.2.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-------------------------|------------|----------------------------------|---|-------|-----------|---------|---------|-------|
| MECO_CMD | V90X8569XA | MECO COMMAND FLAG | A/E ATT PROC ABT CNTL SEQ ASC ADI PROC ASC DAP ASC UPP SEQ DL FMT 21/1 G/C STEER GAX GRTLS DAP MPS D/D SEQ MSC OMS RM OVERRIDE SPEC PW RTLS GUID | | BD | | 93017G | * |
| MECO_CONFIRMED | V90X8561X | MECO CONFIRMED FLAG | ABT CNTL SEQ ASC DAP ASC RCS CMD SOP CONT 3E/O GUID DL FMT 21/A GRTLS DAP HORIZ SIT SPEC MSC OMS RM PW CONT GUID PW RTLS GUID XXXXXX TRAJ 2 DISP | | BD | | 93017G | * |
| MECO_PREVLV_CLOSE_DELAY | V96U9761C | MECO PREVLV CLOSE DELAY | MPS D/D SEQ | S | | | 90839 | |
| MESHDNCMD(1) | V90X8370XB | MPS E1 SHUTDOWN CMD | SSME SOP | | | | | |
| MESHDNCMD(2) | V90X8371XB | MPS E2 SHUTDOWN CMD | SSME SOP | | | | | |
| MESHDNCMD(3) | V90X8372XB | MPS E3 SHUTDOWN CMD | SSME SOP | | | | | |
| MESHDNENA(1) | V90X8367XB | MPS E1 SHUTDOWN ENABLE CMD | SSME SOP | | | | | |
| MESHDNENA(2) | V90X8368XB | MPS E2 SHUTDOWN ENABLE CMD | SSME SOP | | | | | |
| MESHDNENA(3) | V90X8369XB | MPS E3 SHUTDOWN ENABLE CMD | SSME SOP | | | | | |
| MPS_ENA(1) | V90X8573X | MPS E1 LIMIT CNTL ENA | SSME SOP | | | | | |
| MPS_ENA(2) | V90X8574X | MPS E2 LIMIT CNTL ENA | SSME SOP | | | | | |
| MPS_ENA(3) | V90X8575X | MPS E3 LIMIT CNTL ENA | SSME SOP | | | | | |
| MPS_INH(1) | V90X8570X | MPS E1 LIMIT CNTL INH | SSME SOP | | | | | |
| MPS_INH(2) | V90X8571X | MPS E2 LIMIT CNTL INH | SSME SOP | | | | | |
| MPS_INH(3) | V90X8572X | MPS E3 LIMIT CNTL INH | SSME SOP | | | | | |
| | V41K1119XA | MPS E1 LH2 PREVLV (PV4) OP CMD A | PCA A1 | | | | 89554A | |
| | V41K1120XA | MPS E1 LH2 PREVLV (PV4) OP CMD B | LCA A1 | | | | 89554A | |
| | V41K1121XA | MPS E1 LH2 PREVLV (PV4) OP CMD C | LCA A2 | | | | 89554A | |
| | V41K1122XA | MPS E1 LH2 PREVLV (PV4) CL CMD A | PCA A1 | | | | 89554A | |
| | V41K1123XA | MPS E1 LH2 PREVLV (PV4) CL CMD B | LCA A1 | | | | 89554A | |
| | V41K1124XA | MPS E1 LH2 PREVLV (PV4) CL CMD C | LCA A2 | | | | 89554A | |
| | V41K1136XA | MPS E1 LO2 PREVLV (PV1) OP CMD A | PCA A1 | | | | 89554A | |

TABLE 4.2.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------|------------------------|-----------------------------|-------------|-------|--------------|------------------|---------|-------------|
| V41K1137XA | MPS E1 | LO2 PREVLV (PV1) OP CMD B | LCA A1 | | | | 89554A | |
| V41K1138XA | MPS E1 | LO2 PREVLV (PV1) OP CMD C | LCA A2 | | | | 89554A | |
| V41K1139XA | MPS E1 | LO2 PREVLV (PV1) CL CMD A | PCA A1 | | | | 89554A | |
| V41K1140XA | MPS E1 | LO2 PREVLV (PV1) CL CMD B | LCA A1 | | | | 89554A | |
| V41K1141XA | MPS E1 | LO2 PREVLV (PV1) CL CMD C | LCA A2 | | | | 89554A | |
| V41K1142XA | MPS E1 | LO2 PREVLV (PV1) CL CMD D | HDWR | | | | 89554A | |
| V41K1143XA | MPS E1 | LO2 PREVLV (PV1) OP CMD D | HDWR | | | | 89554A | |
| V41K1162X | MPS E1 | HE INTCN IN (LV59) OP CMD A | HDWR | | BD | | 89554A | |
| V41K1163X | MPS E1 | HE INTCN IN (LV59) OP CMD B | HDWR | | BD | | 89554A | |
| V41K1219XA | MPS E2 | LH2 PREVLV (PV5) OP CMD A | PCA A2 | | | | 89554A | |
| V41K1220XA | MPS E2 | LH2 PREVLV (PV5) OP CMD B | LCA A2 | | | | 89554A | |
| V41K1221XA | MPS E2 | LH2 PREVLV (PV5) OP CMD C | LCA A3 | | | | 89554A | |
| V41K1222XA | MPS E2 | LH2 PREVLV (PV5) CL CMD A | PCA A2 | | | | 89554A | |
| V41K1223XA | MPS E2 | LH2 PREVLV (PV5) CL CMD B | LCA A2 | | | | 89554A | |
| V41K1224XA | MPS E2 | LH2 PREVLV (PV5) CL CMD C | LCA A3 | | | | 89554A | |
| V41K1236XA | MPS E2 | LO2 PREVLV (PV2) OP CMD A | PCA A2 | | | | 89554A | |
| V41K1237XA | MPS E2 | LO2 PREVLV (PV2) OP CMD B | LCA A2 | | | | 89554A | |
| V41K1238XA | MPS E2 | LO2 PREVLV (PV2) OP CMD C | LCA A3 | | | | 89554A | |
| V41K1239XA | MPS E2 | LO2 PREVLV (PV2) CL CMD A | PCA A2 | | | | 89554A | |
| V41K1240XA | MPS E2 | LO2 PREVLV (PV2) CL CMD B | LCA A2 | | | | 89554A | |
| V41K1241XA | MPS E2 | LO2 PREVLV (PV2) CL CMD C | LCA A3 | | | | 89554A | |
| V41K1242XA | MPS E2 | LO2 PREVLV (PV2) CL CMD D | HDWR | | | | 89554A | |
| V41K1243XA | MPS E2 | LO2 PREVLV (PV2) OP CMD D | HDWR | | | | 89554A | |
| V41K1262XA | MPS E2 | HE INTCN IN (LV61) OP CMD A | HDWR | | | | 89554A | |
| V41K1263XA | MPS E2 | HE INTCN IN (LV61) OP CMD B | HDWR | | | | 89554A | |
| V41K1319XA | MPS E3 | LH2 PREVLV (PV6) OP CMD A | PCA A3 | | | | 89554A | |
| V41K1320XA | MPS E3 | LH2 PREVLV (PV6) OP CMD B | LCA A3 | | | | 89554A | |
| V41K1321XA | MPS E3 | LH2 PREVLV (PV6) OP CMD C | LCA A1 | | | | 89554A | |
| V41K1322XA | MPS E3 | LH2 PREVLV (PV6) CL CMD A | PCA A3 | | | | 89554A | |
| V41K1323XA | MPS E3 | LH2 PREVLV (PV6) CL CMD B | LCA A3 | | | | 89554A | |
| V41K1324XA | MPS E3 | LH2 PREVLV (PV6) CL CMD C | LCA A1 | | | | 89554A | |
| V41K1336XA | MPS E3 | LO2 PREVLV (PV3) OP CMD A | PCA A3 | | | | 89554A | |
| V41K1337XA | MPS E3 | LO2 PREVLV (PV3) OP CMD B | LCA A3 | | | | 89554A | |
| V41K1338XA | MPS E3 | LO2 PREVLV (PV3) OP CMD C | LCA A1 | | | | 89554A | |
| V41K1339XA | MPS E3 | LO2 PREVLV (PV3) CL CMD A | PCA A3 | | | | 89554A | |
| V41K1340XA | MPS E3 | LO2 PREVLV (PV3) CL CMD B | LCA A3 | | | | 89554A | |
| V41K1341XA | MPS E3 | LO2 PREVLV (PV3) CL CMD C | LCA A1 | | | | 89554A | |
| V41K1342XA | MPS E3 | LO2 PREVLV (PV3) CL CMD D | HDWR | | | | 89554A | |
| V41K1343XA | MPS E3 | LO2 PREVLV (PV3) OP CMD D | HDWR | | | | 89554A | |
| V41K1362X | MPS E3 | HE INTCN IN (LV63) OP CMD A | HDWR | | BD | | 89554A | |
| V41K1363X | MPS E3 | HE INTCN IN (LV63) OP CMD B | HDWR | | BD | | 89554A | |
| V41K1421XA | MPS LH2 | 4IN DISC VLV(PD3)OP CMD | HDWR | | BD | | 89554A | |
| V41K1422XA | MPS LH2 | 4IN DISC VLV (PD3) CL CMD | HDWR | | BD | | 89313A | |
| V41K1613XB | MPS REG | HE XOVER VLV (LV10) OP CMD | HDWR | | | | 89554A | |
| V90M2929PC | CGEB_MC1_LG2_FLAG1_HFE | | DL FMT 21/1 | | | | 93017G | * |
| V90M2999P | CGSB_RTLS_CNTL | | DL FMT 21/A | | | | 93017G | * |

TABLE 4.2.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|--------|--------------|-------------|-------|-----------|------------------|---------|-------------|
|-----------|--------|--------------|-------------|-------|-----------|------------------|---------|-------------|

| | | | | | | | | |
|------------|--|---------------------------------|--|--|------------|--|--|--|
| V90X8403XB | | EVENT TIMER START FLAG | | | SYS S/W | | | |
| V90X8568X | | ALL PREVLVS COMMANDED CLOSE IND | | | ET SEP SEQ | | | |
| V97U9831C | | FAST_SEP_LOX_PREVLV_DLY | | | SSME OPS | | | |

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 4.2.1.4-3. SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|--------------------------------|-----------|-----------|----|----|---|---|---------|----|-----|---------|-------------|
| FAST_SEP_ZERO_THRUST_DLY | V97U9833C | SEC | F | D | D | C | G4.165 | 00 | ZSZ | 90007G | |
| LH2_LL_TIME_DELAY_Q | V96U9535C | SEC | F | D | D | C | G4.165 | 00 | QME | DC1800 | |
| ME1_LH2_PREVLV_CLSE_T_DELAY | V97U9741C | SEC | F | D | L | C | G4.165 | 00 | ZSZ | 90007G | |
| ME2_LH2_PREVLV_CLSE_T_DELAY | V97U9745C | SEC | F | D | L | C | G4.165 | 00 | ZSZ | 90007G | |
| ME3_LH2_PREVLV_CLSE_T_DELAY | V97U9749C | SEC | F | D | L | C | G4.165 | 00 | ZSZ | 90007G | |
| MECO_LEAD_TIME | V97U9829C | SEC | F | D | D | C | G4.165 | 00 | ZSZ | 90007G | |
| MPS_E1_T_DELAY_A | V97U9738C | SEC | F | D | D | C | G4.165 | 00 | ZSZ | 90007G | |
| MPS_E1_T_DELAY_C | V97U9740C | SEC | F | D | M | C | G4.165 | 00 | ZSZ | 90007G | |
| MPS_E2_T_DELAY_D | V97U9742C | SEC | F | D | D | C | G4.165 | 00 | ZSZ | 90007G | |
| MPS_E2_T_DELAY_F | V97U9744C | SEC | F | D | M | C | G4.165 | 00 | ZSZ | 90007G | |
| MPS_E3_T_DELAY_G | V97U9746C | SEC | F | D | D | C | G4.165 | 00 | ZSZ | 90007G | |
| MPS_E3_T_DELAY_I | V97U9748C | SEC | F | D | M | C | G4.165 | 00 | ZSZ | 90007G | |
| MPS_HELIUM_SYSTEM_LOW_PRESSURE | V97U9735C | PSIA | F | S | D | C | G4.165 | 00 | ZSZ | 90007G | |
| MPS_STUCK | V97U0797C | PCT | I | S | D | C | G4.165 | 00 | QME | 92670D | |
| NOM_LO2_LL_T_DELAY_L | V97U9863C | SEC | F | D | D | P | G4.165 | 00 | QME | DC1800 | |
| POST_MECO_LH2_PREVLV_TIME_DLY | V97U9648C | SEC | F | D | L | C | G4.165 | 00 | ZSZ | 92743D | |
| PTM_LO2_LL_T_DELAY_N | V97U9865C | SEC | F | D | D | C | G4.165 | 00 | QME | DC1800 | |
| RTLS_LH2_LL_TIME_DELAY_P | V96U9536C | SEC | F | D | D | C | G4.165 | 00 | QME | DC1800 | |
| RTLS_LO2_LL_T_DELAY_M | V97U9864C | SEC | F | D | D | C | G4.165 | 00 | QME | DC1800 | |

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

TABLE 4.2.1.4-4. SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|----------------------------------|-----------|----|---------------------|-----------|----|--------|---|---------|---------|-------------|
| ET_LH2_LO_LVL_LIQ_SES1_DSBL_FLG | V99X8806X | 00 | B'0000000000000000' | ND | BI | | C | G4.165 | 29551B | |
| ET_LH2_LO_LVL_LIQ_SES2_DSBL_FLG | V99X8807X | 00 | B'0000000000000000' | ND | BI | | C | G4.165 | 29551B | |
| ET_LH2_LO_LVL_LIQ_SES3_DSBL_FLG | V99X8808X | 00 | B'0000000000000000' | ND | BI | | C | G4.165 | 29551B | |
| ET_LH2_LO_LVL_LIQ_SES4_DSBL_FLG | V99X8809X | 00 | B'0000000000000000' | ND | BI | | C | G4.165 | 29551B | |
| FAST_SEP_LH2_PREVLV_DLY | V97U9832C | 00 | +2.342 E+00 | SEC | F | S | C | G4.165 | 89278A | |
| FAST_SEP_LOX_PREVLV_DLY | V97U9831C | 00 | +1.5 E+00 | SEC | F | S | P | G4.165 | 90753A | |
| ME_SHTDN_DLY | V97U9830C | 00 | +0.0 E+00 | SEC | F | S | C | G4.165 | 29551B | |
| MPS_LOX_LO_LVL_LIQ_SES1_DSBL_FLG | V99X8814X | 00 | B'0000000000000000' | ND | BI | | C | G4.165 | 29551B | |
| MPS_LOX_LO_LVL_LIQ_SES2_DSBL_FLG | V99X8815X | 00 | B'0000000000000000' | ND | BI | | C | G4.165 | 29551B | |
| MPS_LOX_LO_LVL_LIQ_SES3_DSBL_FLG | V99X8816X | 00 | B'0000000000000000' | ND | BI | | C | G4.165 | 29551B | |
| MPS_LOX_LO_LVL_LIQ_SES4_DSBL_FLG | V99X8817X | 00 | B'0000000000000000' | ND | BI | | C | G4.165 | 29551B | |
| MPS_MECO_E1_T_DELAY_A | V96U9769C | 00 | +1.078 E+00 | SEC | F | S | C | G4.165 | 89108A | |
| MPS_MECO_E2_T_DELAY_D | V96U9771C | 00 | +1.078 E+00 | SEC | F | S | C | G4.165 | 89108A | |
| MPS_MECO_E3_T_DELAY_G | V96U9773C | 00 | +1.078 E+00 | SEC | F | S | C | G4.165 | 89108A | |

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

TABLE 4.2.1.4-5. SPACE SHUTTLE MAIN ENGINE OPERATIONS (G4.165) 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.

4.2.2 SRB Separation Sequence (4.115)

4.2.2.1 Introduction

The solid rocket booster (SRB) separation sequence (SEP SEQ) is used during the ascent phase to separate the expended boosters from the orbiter/external tank. The SRB separation sequence performs the functions of monitoring SRB thrust tailoff, via chamber pressure; controlling the SRB separation process; and generating indicators for proper GN&C moding. The separation process is normally automatic, but in the event of an automatic separation inhibit, the crew is given the capability to manually override the inhibit and to initiate separation.

4.2.2.2 Overview

The SRB separation sequence is initiated at SRB SEP SEQ INITIATION TIME; it is initiated only if MECO has not yet occurred. Upon initiation, the sequence monitors the selected left and right SRB chamber pressure measurements to determine if the primary separation cue has been reached; that is, to determine if both the left and right SRB chamber pressures have decayed to 50 psia. The backup separation cue is reached when the mission elapsed time (MET) exceeds the latest possible time (SRB SEP BACKUP CUE TIME) at which a chamber pressure of 50 psia could occur.

Protection is provided for dual failure in the flight aft MDM's A/D converters or COMMFAULTS in conjunction with MDM failures which would result in premature indication of both left and right SRB chamber pressure at or below 50 psia.

In the event of multiple chamber pressure sensor failures on one SRB to the high state, SRB SEP BACKUP CUE TIME serves as the separation cue. Protection against multiple sensor failures to the low state requires marking the times at which the selected left and right SRB chamber pressure measurements drop below 50 psia and calculating the resultant time differential. If this differential exceeds the predicted maximum (MAX SRB SEP CUE DIFFERENTIAL), the separation cue becomes SRB SEP BACKUP CUE TIME to prevent a separation attempt with excessive SRB thrust.

The forward up-firing RCS jets are fired to protect the forward and the middle window panes against hazing during SRB separation. The hazing is the result of extensive micropitting caused by particle impact from the Booster Separation Motors (BSM) exhaust plumes.

The separation process begins once either the primary or backup separation cue has been reached. PIC arm and GN&C moding indicators are then issued at appropriate times. Following delays to allow the SRM nozzle actuators time to null and SRB thrust time to decay to an acceptable level, the vehicle's dynamic state is compared with criteria which define the capability of the vehicle to perform a safe separation. If the criteria are met, separation is commanded automatically. If the state criteria are exceeded, automatic separation is inhibited. The crew may override this inhibit via the SRB separation mode switch and the SRB separation initiate push button.

4.2.2.3 Detailed Requirements

Step 1 – Monitor Separation Cues. The SRB separation sequence is initiated when mission elapsed time (MET) is \geq SRB SEP SEQ INITIATION TIME, I-loaded, and MECO has not yet occurred. The initiation time is selected to be less than the earliest possible time that the sensed chamber pressure of a fast-burning SRB will be at 50 psia, minus MAX SRB SEP CUE DIFFERENTIAL seconds. This step monitors the selected chamber pressure of each SRB, from select filter, for the primary separation cue and monitors MET for the backup cue. This monitoring occurs only if the cue has not previously been established.

Monitor the following:

- (a) SRB SEPARATION COMMAND FLAG V90X8331X

If (a) is true, proceed to Step 4. If (a) is not true, monitor the following:

- (b) SRB SEPARATION INITIATION FLAG V90X8333X

If (b) is true, proceed to Step 2. If (b) is not true, monitor the following:

- (c) SELECTED LEFT PRESS SRB CHAMBER V90P2535C
(d) SELECTED RIGHT PRESS SRB CHAMBER V90P2536C
(e) MAX_SRB_SEP_CUE_DIFRNTL (I-loaded) V97U9761C

If both (c) and (d) are \leq 50 psia, each for four successive passes, subtract the time the first left or right SRB chamber pressure was first detected to be less than or equal to 50 psia in the set of four passes from the time that the second, left or right, SRB chamber pressure was first less than or equal to 50 psia in a set of four passes. If this differential is \leq (e), set (1) true and proceed to Step 2. If this time differential is $>$ (e), or either (c) or (d) $>$ 50 psia, monitor the following:

- (f) SRB_SEP_BACKUP_CUE_T (I-loaded) V97U9751C

If mission elapsed time $<$ (f), return to the beginning of Step 1.

If mission elapsed time \geq (f), proceed to Step 2.

- (1) LH/RH SRB PC 50 PSI FLAG V90X8332X

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Step 2 – Prepare for Separation. The separation cue having been reached, this step prepares the vehicle for separation by issuing flags which arm the appropriate PIC's, safe the SRB range safety system, null the SRM nozzle actuators, and transition the flight control system configuration. In addition, this step sets a flag which will fire the forward up-firing RCS jets to deflect Booster Separation Motor exhaust particles from orbiter windows. Time delays are incorporated to assure that SRM actuators have adequate time to nullify and that SRM thrust has decayed to an acceptable level before commanding separation in a subsequent step.

Set (1), (2), (3), and (4) true and monitor the following:

- | | |
|---------------------------------------|-----------|
| (a) SRB_SEP_MODING_T_DELAY (I-loaded) | V97U9752C |
|---------------------------------------|-----------|

If (a-0.48) seconds have not elapsed since (1) became true, return to Step 1.

If (a-0.48) seconds have elapsed since (1) became true, set (5) and (6) true and monitor the following:

- | | |
|---|-----------|
| (b) SRB_SEP_COMMAND_T_DELAY (I-loaded) | V97U9753C |
| (c) SRB_SEP_CMD_T_DLY_ABORT (I-loaded) | V99U7589C |
| (d) SRB_SEP_CMD_T_DLY_CONT_ABORT (I-loaded) | V99U7676C |
| (e) MPS E1 FAIL FLAG | V95X1207X |
| (f) MPS E2 FAIL FLAG | V95X1208X |
| (g) MPS E3 FAIL FLAG | V95X1209X |
| (h) WINDOW_PROTECTION_START | V97U9659C |

If (e) and (f), (f) and (g), or (e) and (g) are true, set (9) to false.

If (e) and (f), (f) and (g), or (e) and (g) are true and (d-0.48) seconds have not elapsed since (1) became true, return to Step 1 or if (e) and (f), (f) and (g), or (e) and (g) are true and (d-0.48) seconds have elapsed since (1) became true, set (7) true, set (8) false, and proceed to Step 3.

If (e), (f) or (g) is true, set (9) to false.

If (e), (f) or (g) is true and (c-0.48) seconds have not elapsed since (1) became true, return to Step 1 or if (e), (f) or (g) is true and (c-0.48) seconds have elapsed since (1) became true, set (7) true, set (8) false, and proceed to Step 3.

If (e), (f), and (g) are false and (h-0.48) seconds have elapsed since (1) became true, set (9) true.

If (e), (f) and (g) are false and (b-0.48) seconds have not elapsed since (1) became true, return to Step 1 or if (e), (f) and (g) are false and (b-0.48) seconds have elapsed since (1) became true, set (7) true, set (8) false, and proceed to Step 3.

- | | |
|------------------------------------|-----------|
| (1) SRB SEPARATION INITIATION FLAG | V90X8333X |
| (2) SRB RSS SAFE FLAG | V90X8337X |
| (3) SRB RSS PWR OFF FLAG | V90X8336X |
| (4) ET/ORB SEP CAMERAS ON CMD | V56K0000X |
| (5) SRB SEP PICS ARM FLAG | V90X8335X |
| (6) SRB SEP FUNCTION MODING FLAG | V90X8330X |
| (7) ATVC SRB 26V AC DEADFACE FLAG | V90X8339X |

- | | | |
|-----|-----------------------------|-----------|
| (8) | ATVC SRB IVD PWR ON | V90X8338X |
| (9) | RCS FORWARD JET ON CMD FLAG | V90X1000X |

Step 3 – Check Separation Inhibits. The vehicle is now configured to separate the SRB's. This step compares the vehicle's dynamic state with criteria which define the capability of the vehicle to perform a safe separation. If these criteria are exceeded, an inhibit is imposed which is automatically released once the criteria have been met but which can also be overridden manually by the crew. The separation criteria are defined in terms of vehicle body rate and dynamic pressure limits.

Set (1) false and monitor the following:

- | | | |
|-----|---------------------------------|-----------|
| (a) | SEL SRB SEP MNL/AUTO ENABLE CMD | V90X7571X |
| (b) | SEL SRB SEPARATION INITIATE CMD | V90X7572X |

If (a) and (b) are both true, proceed to Step 4. Otherwise, monitor the following:

- | | | | |
|-------|------------------------------|------------|-----------|
| P: | SELECTED RGA ROLL RATE | | V90R5301C |
| Q: | SELECTED RGA PITCH RATE | | V90R5321C |
| R: | SELECTED RGA YAW RATE | | V90R5341C |
| QBAR: | DERIVED ASCENT DYNAMIC PRESS | | V95P0500C |
| AP: | AP_ROLL_RATE_LMT_SLOPE | (I-loaded) | V97U9754C |
| AQ: | AQ_PITCH_RATE_LMT_SLOPE | (I-loaded) | V97U9755C |
| AR: | AR_YAW_RATE_LMT_SLOPE | (I-loaded) | V97U9756C |
| BP: | BP_ROLL_RATE_LMT_CONSTANT | (I-loaded) | V97U9757C |
| BQ: | BQ_PITCH_RATE_LMT_CONSTANT | (I-loaded) | V97U9758C |
| BR: | BR_YAW_RATE_LMT_CONSTANT | (I-loaded) | V97U9759C |
| DPL: | DYNAMIC_PRS_LMT | (I-loaded) | V97U9760C |

If $QBAR > DPL$

or if $P > AP(QBAR) + BP$

or if $Q > AQ(QBAR) + BQ$

or if $R > AR(QBAR) + BR$, set (1) true and return to Step 1. Otherwise, proceed to Step 4.

- | | | |
|-----|---------------------------------|-----------|
| (1) | SRB AUTO SEP INHIBIT CREW ALERT | V90X8340X |
|-----|---------------------------------|-----------|

Step 4 – Command Separation. This step sets the separation fire flags which, through the MEC SOP, instruct the MEC's to issue fire commands to the separation PIC's. Before the sequence is descheduled, MEC SOP flags are terminated. The MEC SOP is then instructed to issue a MASTER RESET to the MEC's to complete the sequence.

Set (1), (2), and (3) true.

- | | | |
|-----|----------------------------------|-----------|
| (a) | WIN_PROTECTION_POST_SEP_DURATION | V97U9660C |
|-----|----------------------------------|-----------|

If (a) seconds have elapsed since (2) became true, set (13) false.

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If 4 seconds have elapsed since (2) became true, set (1), (2), (4) through (11) and (13) false. One pass later, set (12) true one time only. The sequence is now complete and ready to be descheduled.

| | | |
|------|-------------------------------|-----------|
| (1) | SRB SEP FIRE 1 FLAG | V90X8341X |
| (2) | SRB SEP FIRE 2/3 FLAG | V90X8354X |
| (3) | SRB SEPARATION COMMAND FLAG | V90X8331X |
| (4) | L SRB PWR BUS C RPC A ON CMD | V76K6941X |
| (5) | R SRB PWR BUS C RPC A ON CMD | V76K6942X |
| (6) | L SRB PWR BUS C RPC C ON CMD | V76K6945X |
| (7) | R SRB PWR BUS C RPC C ON CMD | V76K6946X |
| (8) | SRB RSS PWR OFF FLAG | V90X8336X |
| (9) | SRB RSS SAFE FLAG | V90X8337X |
| (10) | SRB SEP PICS ARM FLAG | V90X8335X |
| (11) | ET/ORB SEP CAMERAS ON COMMAND | V56K0000X |
| (12) | MEC 1 & 2 MASTER RESET FLAG | V90X8258X |
| (13) | RCS FORWARD JET ON CMD FLAG | V90X1000X |

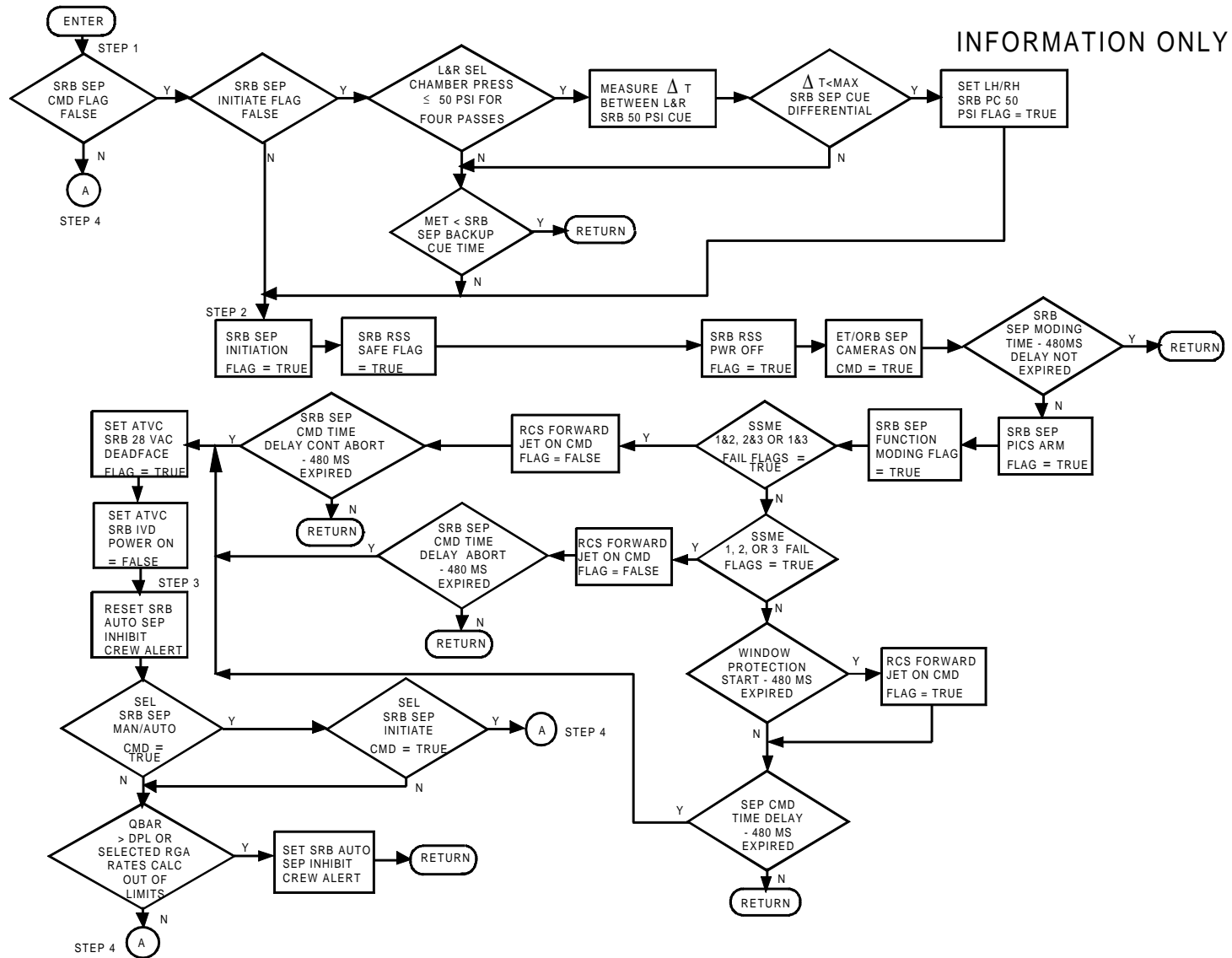


FIGURE 4.115.(1) SRB SEP SEQ (Sheet 1 of 2)

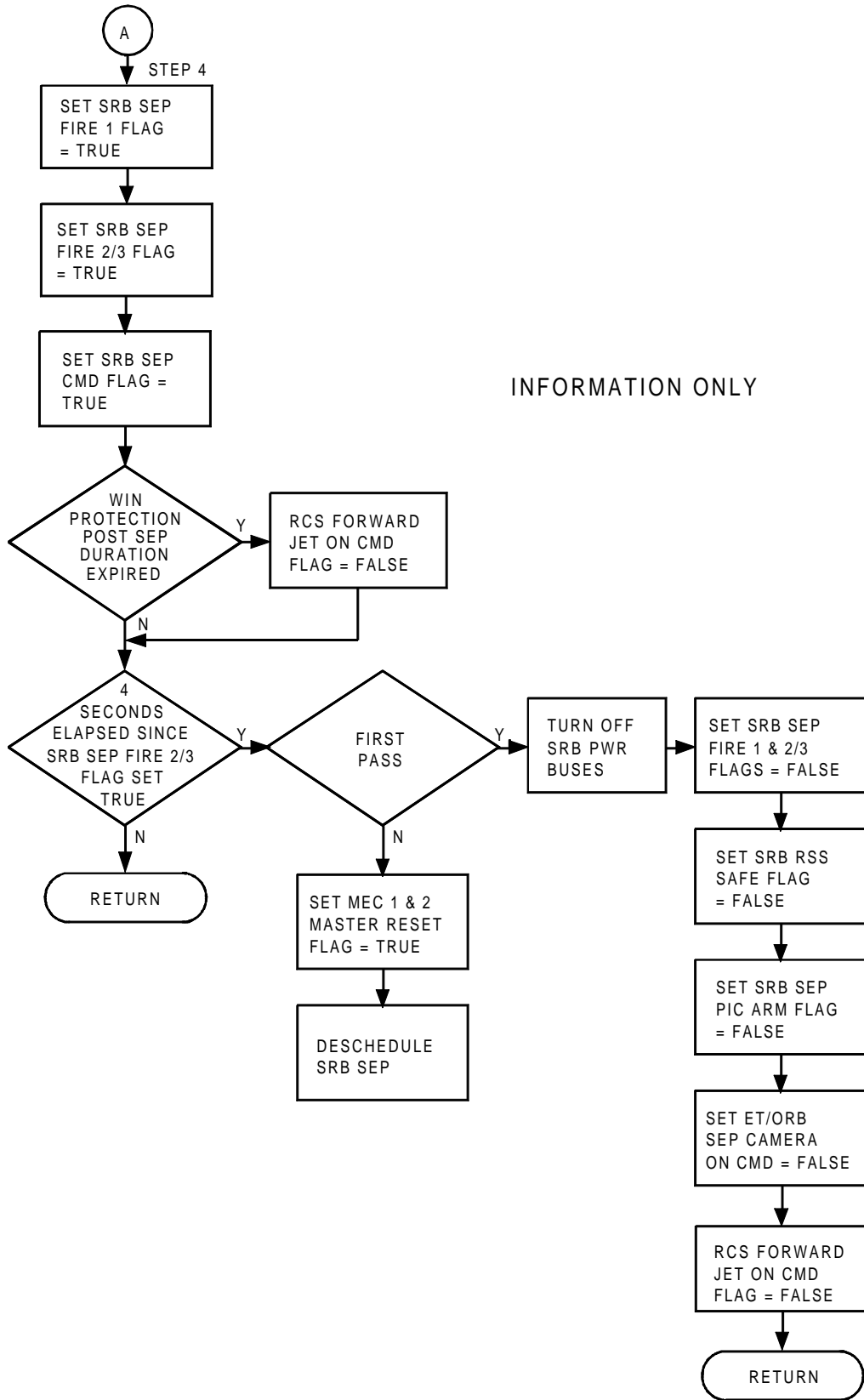


FIGURE 4.115.(2) SRB SEP SEQ (Sheet 2 of 2)

TABLE 4.2.2.4-1. INPUT FUNCTIONAL PARAMETERS FOR SOLID ROCKET BOOSTER SEPARATION SEQUENCER (G4.115)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-------------------|------------|-----------------------------------|------------|--------|-----------|---------|---------|-------|
| 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 | * |
| PC4 | V90P2535C | SELECTED LEFT PRESS SRB CHAMBER | SF | PSIA | | | 89494A | |
| PC5 | V90P2536C | SELECTED RIGHT PRESS SRB CHAMBER | SF | PSIA | | | 89494A | |
| P_ORB | V90R5301CA | SELECTED RGA ROLL RATE | SF | DEG/S | | | 93017G | * |
| Q_BAR_A | V95P0500C | DERIVED ASCENT DYNAMIC PRESS | ASC UPP | LB/FT2 | SPL | | 93017G | * |
| Q_ORB/Q | V90R5321CA | SELECTED RGA PITCH RATE | SF | DEG/S | | | 93017G | * |
| R_ORB | V90R5341CA | SELECTED RGA YAW RATE | SF | DEG/S | | | 93017G | * |
| | V90X7571X | SEL SRB SEPN MNL/AUTO ENABLE CMD | GN&C SW RM | | BD | | 93017G | * |
| | V90X7572X | SEL SRB SEP INITIATE/WOW-WONG CMD | GN&C SW RM | | BD | | 93017G | * |

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

TABLE 4.2.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SOLID ROCKET BOOSTER SEPARATION SEQUENCER (G4.115)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------|------------|---------------------------------|--------------------|-------|-----------|------------------|---------|-------------|
| ATVC_26V_DDFAEC | V90X8339XA | ATVC SRB 26V AC DEADFACE FLAG | MEC SOP | | | | 89456A | |
| ATVC_IVD_PWR | V90X8338XA | ATVC SRB IVD PWR ON FLAG | MEC SOP | | | | 89456A | |
| M_RSET_USER | V90X8258XB | MEC 1&2 MASTER RESET FLAG | MEC SOP | | | | 89456A | |
| SRB_MODING_SEP | V90X8330XA | SRB SEP FUNCTION MODING FLAG | ASC DAP | | | | 90532 | |
| | | | MSC | | | | | |
| SRB_RSS_OFF | V90X8336X | SRB RSS PWR OFF FLAG | MEC SOP | | | | 89456A | |
| SRB_RSS_SAFE | V90X8337X | SRB RSS SAFE FLAG | MEC SOP | | | | 89456A | |
| SRB_SEP_ARM | V90X8335X | SRB SEP PICS ARM FLAG | MEC SOP | | | | 89456A | |
| SRB_SEP_CMD_FLAG | V90X8331XA | SRB SEPARATION COMMAND FLAG | ASC DAP | | | | 93017G | * |
| | | | ASC UPP SEQ | | | | | |
| | | | DL FMT 21/A | | | | | |
| | | | MSC | | | | | |
| | | | RTLS UPP SEQ | | | | | |
| SRB_SEP_FIRE1 | V90X8341X | SRB SEP FIRE 1 FLAG | MEC SOP | | | | 89456A | |
| SRB_SEP_FIRE2/3 | V90X8354X | SRB SEP FIRE 2/3 FLAG | MEC SOP | | | | 89456A | |
| SRB_SEP_INITIATION | V90X8333X | SRB SEPARATION INITIATION FLAG | ASC UPP SEQ | | BD | | 93017G | * |
| | | | DL FMT 21/1 | | | | | |
| | V56K0000XC | ET/ORB SEP CAMERAS ON CMD | HDWR | | | | 92902 | |
| | V76K6941XA | L SRB BUS C RPC A ON CMD | HDWR | | | | 79935H | |
| | V76K6942XA | R SRB BUS C RPC A ON CMD | HDWR | | | | 79935H | |
| | V76K6945XA | L SRB BUS C RPC C ON CMD | HDWR | | | | | |
| | V76K6946XA | R SRB BUS C RPC C ON CMD | HDWR | | | | | |
| | V90M2929PB | CGEB_MC1_LG2_FLAG1_HFE | DL FMT 21/1 | | | | 93017G | * |
| | V90M3129PB | CGSB_SEQ_DL_FLAG_WD | DL FMT 21/A | | | | 93017G | * |
| | V90X1000X | RCS FORWARD JET ON CMD FLAG | ASC RCS CMD SOP | | BD | | 92306A | |
| | V90X8332X | LH/RH SRB PC 50 PSI FLAG | DL FMT 21/A | | BD | | 93017G | * |
| | | | XXXXXX TRAJ 1 DISP | | | | | |
| | V90X8340X | SRB AUTO SEP INHIBIT CREW ALERT | DL FMT 21/A | | BD | | 93017G | * |
| | | | XXXXXX TRAJ 1 DISP | | | | | |

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 4.2.2.4-3. SOLID ROCKET BOOSTER SEPARATION SEQUENCER (G4.115) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|----------------------------------|-----------|------------------|----|----|---|---|---------|----|-----|---------|-------------|
| AP_ROLL_RATE_LMT_SLOPE | V97U9754C | DEG*FT**2/SEC*LB | F | S | D | C | G4.115 | 00 | SRB | 92306A | |
| AQ_PITCH_RATE_LMT_SLOPE | V97U9755C | DEG*FT**2/SEC*LB | F | S | D | C | G4.115 | 00 | SRB | 92306A | |
| AR_YAW_RATE_LMT_SLOPE | V97U9756C | DEG*FT**2/SEC*LB | F | S | D | C | G4.115 | 00 | SRB | 92306A | |
| BP_ROLL_RATE_LMT_CONSTANT | V97U9757C | DEG/SEC | F | S | D | C | G4.115 | 00 | SRB | 92306A | |
| BQ_PITCH_RATE_LMT_CONSTANT | V97U9758C | DEG/SEC | F | S | D | C | G4.115 | 00 | SRB | 92306A | |
| BR_YAW_RATE_LMT_CONSTANT | V97U9759C | DEG/SEC | F | S | D | C | G4.115 | 00 | SRB | 92306A | |
| DYNAMIC_PRS_LMT | V97U9760C | LB/FT**2 | F | S | D | C | G4.115 | 00 | SRB | 92306A | |
| MAX_SRB_SEP_CUE_DIFRNTL | V97U9761C | SEC | F | D | D | P | G4.115 | 00 | SRB | 92306A | |
| SRB_SEP_BACKUP_CUE_T | V97U9751C | SEC | F | D | M | C | G4.115 | 00 | SRB | 92306A | |
| SRB_SEP_CMD_T_DLY_ABORT | V99U7589C | SEC | F | D | M | C | G4.115 | 00 | SRB | 92306A | |
| SRB_SEP_CMD_T_DLY_CONT_ABORT | V99U7676C | SEC | F | D | M | P | G4.115 | 00 | SRB | 92306A | |
| SRB_SEP_COMMAND_T_DELAY | V97U9753C | SEC | F | D | D | C | G4.115 | 00 | SRB | 92306A | |
| SRB_SEP_MODING_T_DELAY | V97U9752C | SEC | F | D | D | C | G4.115 | 00 | SRB | 92306A | |
| WINDOW_PROTECTION_START | V97U9659C | SEC | F | S | D | P | G4.115 | 00 | SRB | 92306A | |
| WIN_PROTECTION_POST_SEP_DURATION | V97U9660C | SEC | F | S | D | P | G4.115 | 00 | SRB | 92443 | |

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

TABLE 4.2.2.4-4. SOLID ROCKET BOOSTER SEPARATION SEQUENCER (G4.115) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD 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.

TABLE 4.2.2.4-5. SOLID ROCKET BOOSTER SEPARATION SEQUENCER (G4.115) 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.

4.2.3 ET Separation Sequence (4.116)

4.2.3.1 Introduction

The external tank (ET) separation sequence is used during the ascent phase to separate the expended fuel tank from the orbiter vehicle. The separation normally occurs automatically, but the crew has the capability to manually inhibit the separation sequence at any point or to manually initiate the separation in the presence of automatic separation inhibits.

4.2.3.2 Overview

The ET separation sequence is initiated by the GN&C moding, sequencing, and control (MSC) function when the SSME OPS sequence has determined that all of the main engines (ME) are in the shutdown or post shutdown phase. It then sets the MECO confirmed flag. The sequence then operates cyclically until just after the ET structural separation fire commands are issued in a nominal/TAL/AOA/ATO mission or until the umbilical doors are closed and latched in an RTLS abort mode.

The sequence accomplishes several major functions. It determines the mode of separation or if the separation is to be manually inhibited, arms the umbilical plate to unlatch PIC's, closes the feed-line disconnect valves, gimbals the SSME nozzles to the proper position; deadfaces the ET-orbiter interface, and unlatches and retracts the umbilical plates.

The sequence arms the structural separation PIC's, performs some limit tests on certain body rates and/or angles, and tests for feed line disconnect valve closure before continuing with an automatic separation. If any of the tests are not satisfied, the separation is inhibited and can occur only if the out-of-tolerance parameter comes back within tolerance or if the crew elects to continue the separation by manually overriding the inhibit. When either of these conditions is satisfied, the structural separation PIC's are fired. The limit tests are bypassed during auto contingency aborts. If an RTLS abort mode has been requested, the ET SEP sequence performs the umbilical closeout door function and is then complete.

The ET SEP sequence also provides a fast separation mode which is activated only during auto contingency aborts or when manual separation is enabled and the ET SEP initiate push button is depressed. The fast separation mode bypasses delays for PIC arm and fire times, feed line disconnect close times, and ET/UMB door retract times. For first stage scenarios where the fast separation mode is invoked, the SRB SEP CMD FLAG and RTLS ABORT DECLARED FLAG are set to initiate the proper software moding. The fast separation function also provides for deadfacing the SRB electrical interfaces.

4.2.3.3 Detailed Requirements

Step 1 – Initiation. When the ET SEP sequence is initiated by the MSC function, the ET SEPARATION CMD flag is monitored. If it has not yet been set, the sequence monitors the separation mode via the GN&C switch processor. If the automatic ET separation mode is selected, the sequence proceeds normally. If the manual enable mode is selected, the sequence will not proceed until the ET SEP INITIATE push button is depressed and latched in software or the automatic mode is selected. If the ET SEPARATION CMD flag has been set, the sequence sets the MEC 1 and 2 MASTER RESET flag. If an RTLS abort has been requested or if a manual request is made, the sequence must also perform the ET umbilical well door-closing function. If a fast separation has been requested, additional moding flags are set and the sequence terminated.

Monitor the following signals:

| | | |
|-----|--------------------------|-----------|
| (a) | ET SEPARATION CMD FLAG | V90X8250X |
| (b) | FAST SEP FLAG | V90X8267X |
| (c) | SEL ET SEP AUTO | V90X7554X |
| (d) | SEL ET SEP MNL ENABLE | V90X7556X |
| (e) | SEL ET SEP INITIATE | V90X7564X |
| (f) | ET SEP MAN INITIATE FLAG | V90X8584X |
| (g) | BACKUP ET MAN SEP CMD | V93X5341X |
| (h) | MAJOR MODE 102 FLAG | V90X8158X |
| (i) | RTLS ABORT DECLARED | V90X8637X |
| (j) | BACKUP ET UMB DOOR CLOSE | V93X5342X |

If (a) and (b) are both false and (f) and (g) are false and (c) and (h) are true, return to Step 1.

If (a) and (b) are both false and (f) and (g) and (h) are false and (c) is true, proceed to Step 2.

If (a) and (b) are both false and (d) and (e) are true or if (f) or (g) is true, latch (f) true and proceed to Step 1A.

If (a) and (b) are both false and (d) is true and (e) and (f) and (g) are false, set output (5) false and return to the beginning of Step 1.

If (a), (b), and (h) are true, set outputs (4) and (6) true and deactivate the sequence.

If (a) and (b) are true and (h) is false, proceed to Step 8.

If (a) is false and (b) is true, proceed to Step 2.

If (a) is true and (b) is false, set outputs (1) through (3) false and return to the beginning of Step 1. On any subsequent passes through this logic, monitor (i) and (j).

If (i) is true, proceed to Step 8.

If (i) and (j) are false, issue output (4) one time only, and proceed to Step 9.

If (j) is true, on the first pass through the logic, restart the timer from the ET/ORB STR SEPN FIRE 2 FLAG in Step 7, then return to Step 1. On subsequent passes, proceed to Step 8.

- | | | |
|-----|-------------------------------|-----------|
| (1) | ET/ORB STR SEPN PICS ARM FLAG | V90X8265X |
| (2) | ET/ORB STR SEPN FIRE 1 FLAG | V90X8244X |
| (3) | ET/ORB STR SEPN FIRE 2/3 FLAG | V90X8241X |
| (4) | MEC 1&2 MASTER RESET FLAG | V90X8258X |
| (5) | ET/ORB SEP CAMERAS ON CMD | V56K0000X |
| (6) | SRB SEP CMD FLAG | V90X8331X |

Step 1a – Fast Separation Initiation. This step determines a fast separation has been requested, and, if so, sets the flags required to initiate the FAST SEP mode.

Monitor the following signal:

- | | | |
|-----|--------------------------|-----------|
| (a) | MM102 FLAG | V90X8158X |
| (b) | MM601 FLAG | V90X8194X |
| (c) | MM103 FLAG | V90X8156X |
| (d) | SECOND SSME FAIL CONFIRM | V90X1721X |

If (c) and (d) are true, set Flags (1), (3), and (4) true and proceed to Step 2.

If (a) or (b) is true, set Flags (1), (2), (3), and (4) true and proceed to Step 2.

- | | | |
|-----|-------------------------------|-----------|
| (1) | FAST SEP FLAG | V90X8267X |
| (2) | RTLS ABORT DECLARED | V90X8637X |
| (3) | ET/ORB STR SEPN PICS ARM FLAG | V90X8265X |
| (4) | ET UMB UNLATCH PIC ARM FLAG | V90X8247X |

Proceed to Step 2.

Step 2 – Preparation and Umbilical Unlatch and Retract. The feed line relief shutoff valve close commands are terminated and the LH₂ RTLS inboard and outboard D/V are commanded open so that these valves can relieve any pressure buildup caused by trapped propellants in the feed line when the ME valves and feed line disconnect valves are closed. Also, the umbilical door centerline latch lock commands are terminated to allow subsequent closure of the umbilical closeout doors.

Monitor (a), (b) and (c) below:

- | | | |
|-----|---------------------|------------|
| (a) | FLAG A | (INTERNAL) |
| (b) | FAST SEP FLAG | V90X8267X |
| (c) | RTLS ABORT DECLARED | V90X8637X |

If (a) is false, set outputs (1) through (14) false and proceed to Step 3.

If (a) is true and (b) is true, proceed to monitor the time elapsed since (b) became true. If it has been less than one second since (b) became true, return to Step 1. If it has been more than one second since (b) became true, on the first pass set output (19) false and outputs (15) and (17) true and proceed to monitor (c). If (c) is true, return to Step 1. Otherwise, set output (27) true

and return to Step 1. On subsequent passes, set outputs (15), (17), and (20) false, set outputs (16) and (18) true and proceed to Step 7.

If (a) is true and (b) is false proceed to monitor (c) and the one second Actuator Vent Down Timer which was set in Step 4. If (c) is false and the one second timer has not expired, then return to Step 1. If (c) is true or the one second timer has expired, set output (19) false and outputs (15) through (18) and (21) through (26) true on the first pass and return to Step 1. On the next pass, set outputs (15) through (18) false and return to Step 1. On all subsequent passes, proceed to Step 5.

| | | |
|------|--|-----------|
| (1) | MPS LH ₂ FDLN RLF S/O VLV CL CMD A | V41K1447X |
| (2) | MPS LH ₂ FDLN RLF S/O VLV CL CMD B | V41K1448X |
| (3) | MPS LH ₂ FDLN RLF S/O VLV CL CMD C | V41K1450X |
| (4) | MPS LO ₂ FDLN RLF S/O VLV CL CMD A | V41K1547X |
| (5) | MPS LO ₂ FDLN RLF S/O VLV CL CMD B | V41K1548X |
| (6) | MPS LO ₂ FDLN RLF S/O VLV CL CMD C | V41K1550X |
| (7) | ET DR C/L LCH 1A1/2A2 FA1 LOCK CMD | V56K1275X |
| (8) | ET DR C/L LCH 1A2/2B1 FA1 LOCK CMD | V56K1276X |
| (9) | ET DR C/L LCH 1A1/2B2 FA2 LOCK CMD | V56K1277X |
| (10) | ET DR C/L LCH 1B2/2A1 FA2 LOCK CMD | V56K1278X |
| (11) | ET DR C/L LCH 1B1/2A2 FA4 LOCK CMD | V56K1375X |
| (12) | ET DR C/L LCH 1A2/2A1 FA4 LOCK CMD | V56K1376X |
| (13) | ET DR C/L LCH 1B1/2B2 FA3 LOCK CMD | V56K1377X |
| (14) | ET DR C/L LCH 1B2/2B1 FA3 LOCK CMD | V56K1378X |
| (15) | ET/UMB UNLATCH FIRE 1 FLAG | V90X8256X |
| (16) | ET/UMB RETRACT FIRE 1 FLAG | V90X8263X |
| (17) | ET/UMB UNLATCH FIRE 2/3 FLAG | V90X8242X |
| (18) | ET/UMB RETRACT FIRE 2/3 FLAG | V90X8243X |
| (19) | ET/UMB UNLATCH PIC ARM FLAG | V90X8247X |
| (20) | ET/ORB STR SEPN PICS ARM FLAG | V90X8265X |
| (21) | MPS LH ₂ RTLS INBD D/V OPEN COMMAND A | V41K1923X |
| (22) | MPS LH ₂ RTLS INBD D/V OPEN COMMAND B | V41K1924X |
| (23) | MPS LH ₂ RTLS INBD D/V OPEN COMMAND C | V41K1925X |
| (24) | MPS LH ₂ RTLS OTBD D/V OP CMD A | V41K1913X |
| (25) | MPS LH ₂ RTLS OTBD D/V OP CMD B | V41K1914X |
| (26) | MPS LH ₂ RTLS OTBD D/V OP CMD C | V41K1915X |
| (27) | SEP MINUS Z CMD | V90X8268X |

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Step 3 – MPS Feed Line Valve Latch Unlock. This step monitors for a flag from the SSME_OPS sequence indicating that all MPS prevalves have been commanded closed. Upon receipt of this flag, the MPS feed line disconnect latches are commanded to the unlock position, and one second delay is allowed for the LH₂ prevalves to close and the latches to unlock. After a one-second delay, the ET/ORB SEP cameras are turned on, and the step is exited to perform voting on the latch position switches.

For FAST SEP missions, commanding of MPS feed line disconnect latches to the unlock position and voting on latch position switches are bypassed, feed line disconnect closure commands are not issued, and the feed line disconnect closure will be accomplished by the backup mechanical feature at ET structural separation.

Monitor the following signals:

- | | | |
|-----|----------------------------------|-----------|
| (a) | ALL PRE VLVS COMMANDED CLOSE IND | V90X8568X |
| (b) | FAST SEP FLAG | V90X8267X |

If (a) is false, return to Step 1.

If (a) is true, and (b) is false, set outputs (1) through (6) false and outputs (7) through (12) true and monitor time elapsed since (a) first became true. Otherwise, monitor time elapsed since (a) first became true.

If at least one second has not elapsed since (a) first became true, return to Step 1.

If at least one second has elapsed since (a) first became true, on first pass set output (13) true and monitor (b). On subsequent passes, monitor (b).

If (b) is true, proceed to Step 3f. On subsequent passes proceed to Step 3f.

If (b) is false, proceed to Step 3a. On subsequent passes proceed to Step 3f.

- | | | |
|------|-------------------------------------|-----------|
| (1) | MPS LO2 17IN (PD1) LATCH LOCK CMD A | V41K1881X |
| (2) | MPS LO2 17IN (PD1) LATCH LOCK CMD B | V41K1882X |
| (3) | MPS LO2 17IN (PD1) LATCH LOCK CMD C | V41K1883X |
| (4) | MPS LH2 17IN (PD2) LATCH LOCK CMD A | V41K1981X |
| (5) | MPS LH2 17IN (PD2) LATCH LOCK CMD B | V41K1982X |
| (6) | MPS LH2 17IN (PD2) LATCH LOCK CMD C | V41K1983X |
| (7) | LO2 17IN (PD1) LTCH UNLOCK CMD A | V41K1884X |
| (8) | LO2 17IN (PD1) LTCH UNLOCK CMD B | V41K1885X |
| (9) | LO2 17IN (PD1) LTCH UNLOCK CMD C | V41K1886X |
| (10) | LH2 17IN (PD2) LTCH UNLOCK CMD A | V41K1984X |
| (11) | LH2 17IN (PD2) LTCH UNLOCK CMD B | V41K1985X |
| (12) | LH2 17IN (PD2) LTCH UNLOCK CMD C | V41K1986X |
| (13) | ET/ORB SEP CAMERAS ON CMD | V56K0000X |

Step 3a – MPS Feed Line Disconnect Orbiter Position Indicator Qualification. The step qualifies MPS LO2/LH2 orbiter feed line disconnect closed position indicators before the disconnects are commanded to close. Qualification of these position indicators before disconnect closure verifications improve the system reliability against position indicator failure during ascent. Otherwise, a prematurely failed “on” closed position indicator will automatically satisfy the disconnect closure verification.

Monitor the following signals:

| | | |
|-----|---|-----------|
| (a) | MPS LO ₂ 17IN DISC VLV(PD1) CL IND A | V41X1530X |
| (b) | MPS LO ₂ 17IN DISC VLV(PD1) CL IND B | V41X1534X |
| (c) | MPS LH ₂ 17IN DISC VLV(PD2) CL IND A | V41X1430X |
| (d) | MPS LH ₂ 17IN DISC VLV(PD2) CL IND B | V41X1434X |
| (e) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (f) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (g) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |

If (a) and (e) are both false, set output (1) true and proceed to monitor (b) and (f). Otherwise, proceed to monitor (b) and (f).

If (b) and (f) are both false, set output (2) true and proceed to monitor (c) and (e). Otherwise, proceed to monitor (c) and (e).

If (c) and (e) are both false, set output (3) true and proceed to monitor (d) and (g). Otherwise, proceed to monitor (d) and (g).

If (d) and (g) are both false, set output (4) true and proceed to Step 3b. Otherwise, proceed to Step 3b.

| | | |
|-----|---|------------|
| (1) | LO ₂ ORB DISC CLOSED IND A QUAL FLAG | (INTERNAL) |
| (2) | LO ₂ ORB DISC CLOSED IND B QUAL FLAG | (INTERNAL) |
| (3) | LH ₂ ORB DISC CLOSED IND A QUAL FLAG | (INTERNAL) |
| (4) | LH ₂ ORB DISC CLOSED IND B QUAL FLAG | (INTERNAL) |

Step 3b – MPS LO₂ Feed Disconnect Latch Unlock Verification. This step verifies that the MPS LO₂ disconnect latch is unlocked. This verification is required prior to the closure of feed disconnect to avoid flapper/latch interference at disconnect closure.

Monitor the following signals:

| | | |
|-----|--|-----------|
| (a) | MPS LO ₂ 17IN(PD1) LATCH LCKED IND A | V41X1891X |
| (b) | MPS LO ₂ 17IN(PD1) LATCH LCKED IND B | V41X1892X |
| (c) | MPS LO ₂ 17IN(PD1) LTCH UNLCKED IND A | V41X1893X |
| (d) | MPS LO ₂ 17IN(PD1) LTCH UNLCKED IND B | V41X1894X |
| (e) | FA1 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2845X |
| (f) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (g) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (h) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |

If (a) and (e) are both false, set output (1) true and proceed to monitor (b) and (f). Otherwise, proceed to monitor (b) and (f).

If (b) and (f) are both false, set output (2) true and proceed to monitor (c) and (g). Otherwise, proceed to monitor (c) and (g).

If (c) is true and (g) is false, set output (3) true and proceed to monitor (d) and (h). Otherwise, proceed to monitor (d) and (h).

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If (d) is true and (h) is false, set output (4) true and proceed to monitor the following outputs (1) through (4). Otherwise, proceed to monitor outputs (1) through (4).

If 3 or more flags of (1) through (4) below are true, proceed to Step 3c. Otherwise, proceed to Step 3d.

- | | | |
|-----|--|------------|
| (1) | LO ₂ LATCH LOCKED A OK FLAG | (INTERNAL) |
| (2) | LO ₂ LATCH LOCKED B OK FLAG | (INTERNAL) |
| (3) | LO ₂ LATCH UNLOCKED A OK FLAG | (INTERNAL) |
| (4) | LO ₂ LATCH UNLOCKED B OK FLAG | (INTERNAL) |

Step 3c – MPS LO₂ Disconnect Closure. This step commands MPS LO₂ feed disconnect to close. The closure of feed disconnect prevents MPS LO₂ propellant residual venting through the disconnect and generating an undesirable propellant thrust during ET separation.

Set following outputs (1) through (3) false, outputs (4) through (6) true, and proceed to Step 3d.

- | | | |
|-----|---|-----------|
| (1) | MPS LO ₂ 17IN DISC VLV(PD1) OP CMD A | V41K1521X |
| (2) | MPS LO ₂ 17IN DISC VLV(PD1) OP CMD B | V41K1522X |
| (3) | MPS LO ₂ 17IN DISC VLV(PD1) OP CMD C | V41K1523X |
| (4) | MPS LO ₂ 17IN DISC VLV(PD1) CL CMD A | V41K1524X |
| (5) | MPS LO ₂ 17IN DISC VLV(PD1) CL CMD B | V41K1525X |
| (6) | MPS LO ₂ 17IN DISC VLV(PD1) CL CMD C | V41K1526X |

Step 3d – MPS LH₂ Feed Disconnect Latch Unlock Verification. This step verifies that the MPS LH₂ disconnect latch is unlocked. This verification is required prior to the closure of feed disconnect to avoid flapper/latch interference at disconnect closure.

Monitor the following signals:

- | | | |
|-----|--|-----------|
| (a) | MPS LH ₂ 17IN(PD2) LATCH LCKED IND A | V41X1991X |
| (b) | MPS LH ₂ 17IN(PD2) LATCH LCKED IND B | V41X1992X |
| (c) | MPS LH ₂ 17IN(PD2) LTCH UNLCKED IND A | V41X1993X |
| (d) | MPS LH ₂ 17IN(PD2) LTCH UNLCKED IND B | V41X1994X |
| (e) | FA1 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2845X |
| (f) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (g) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (h) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |

If (a) and (e) are both false, set output (1) true and proceed to monitor (b) and (f). Otherwise, proceed to monitor (b) and (f).

If (b) and (f) are both false, set output (2) true and proceed to monitor (c) and (g). Otherwise, proceed to monitor (c) and (g).

If (c) is true and (g) is false, set output (3) true and proceed to monitor (d) and (h). Otherwise, proceed to monitor (d) and (h).

If (d) is true and (h) is false, set output (4) true and proceed to monitor the following outputs (1) through (4). Otherwise, proceed to monitor outputs (1) through (4).

If 3 or more flags of (1) through (4) below are true, proceed to Step 3e. Otherwise, proceed to Step 3f.

- | | | |
|-----|--|------------|
| (1) | LH ₂ LATCH LOCKED A OK FLAG | (INTERNAL) |
| (2) | LH ₂ LATCH LOCKED B OK FLAG | (INTERNAL) |
| (3) | LH ₂ LATCH UNLOCKED A OK FLAG | (INTERNAL) |
| (4) | LH ₂ LATCH UNLOCKED B OK FLAG | (INTERNAL) |

Step 3e – MPS LH₂ Disconnect Closure. This step commands MPS LH₂ feed disconnect to close. The closure of feed disconnect prevents MPS LH₂ propellant residual venting through the disconnect and generating an undesirable propellant thrust during ET separation.

Set following outputs (1) through (3) false, outputs (4) through (6) true, and proceed to Step 3f.

- | | | |
|-----|---|-----------|
| (1) | MPS LH ₂ 17IN DISC VLV(PD2) OP CMD A | V41K1413X |
| (2) | MPS LH ₂ 17IN DISC VLV(PD2) OP CMD B | V41K1414X |
| (3) | MPS LH ₂ 17IN DISC VLV(PD2) OP CMD C | V41K1415X |
| (4) | MPS LH ₂ 17IN DISC VLV(PD2) CL CMD A | V41K1416X |
| (5) | MPS LH ₂ 17IN DISC VLV(PD2) CL CMD B | V41K1417X |
| (6) | MPS LH ₂ 17IN DISC VLV(PD2) CL CMD C | V41K1418X |

Step 3f – SRB Deadfacing and SSME Gimbal Position. This step deadfaces the SRB electrical interfaces if a FAST SEP is in progress and sends a flag to MPS TVC CMD SOP to position the SSME nozzles.

Monitor the following signals:

- | | | |
|-----|---------------------|-----------|
| (a) | FAST SEP FLAG | V90X8267X |
| (b) | RTLS ABORT DECLARED | V90X8637X |
| (c) | TAL ABORT DECLARED | V90X8658X |

If (a) is true, set outputs (1) through (4) false and outputs (7) through (9) true and monitor (a), (b), and (c). Otherwise, set output (9) true and monitor (a), (b), and (c).

If (a), (b), or (c) is true, set output (6) true and output (5) false and proceed to Step 3g. Otherwise, set output (5) true and output (6) false and proceed to Step 3g.

- | | | |
|-----|------------------------------|-----------|
| (1) | L SRB BUS C RPC A ON CMD | V76K6941X |
| (2) | R SRB BUS C RPC A ON CMD | V76K6942X |
| (3) | L SRB BUS C RPC C ON CMD | V76K6945X |
| (4) | R SRB BUS C RPC C ON CMD | V76K6946X |
| (5) | MPS DUMP GIMBAL POS FLAG | V90X8253X |
| (6) | ENTRY STOW GIMBAL POS FLAG | V90X8254X |
| (7) | SRB SEP FUNCTION MODING FLAG | V90X8330X |
| (8) | ATVC SRB IVD PWR ON FLAG | V90X8338X |
| (9) | SRB PWR ON | V90X8343X |

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Step 3g – ET/UMB PIC ARM. The sequence sets the ET/UMB UNLATCH PICS ARM FLAG for the MEC SOP, which then issues the proper four-digit hexadecimal code for the command data word arm commands. The PIC's are required to be armed at least 1.5 seconds prior to the fire commands.

Monitor the following signals:

- | | | |
|-----|----------------------------------|-----------|
| (a) | FAST SEP FLAG | V90X8267X |
| (b) | ALL PRE VLVS COMMANDED CLOSE IND | V90X8568X |

If ((a) is true) or ((a) is false and at least 3.3 seconds have elapsed since (b) first became true), set output (1) below true and proceed to Step 4. Otherwise, return to Step 1.

- | | | |
|-----|-----------------------------|-----------|
| (1) | ET/UMB UNLATCH PIC ARM FLAG | V90X8247X |
|-----|-----------------------------|-----------|

Step 4 - ET/ORB Umbilical Plate Deadfacing and Remove MPS Disconnect Close Commands. This step waits for 3.8 seconds to elapse after the MPS feed line disconnect valves were commanded closed before deadfacing the ET/Orbiter umbilical plate and removing the MPS disconnect close commands. This delay is needed to allow the valves time to fully close. If a FAST SEP has been requested, the sequence bypasses this delay and removes all the electrical power supplies to the ET/orbiter umbilical interface before umbilical plate separation. The close commands of the MPS feed disconnect valves are removed to reduce disconnect linkage impact loads during disconnect backup mechanical closure operation. This backup disconnect closure mode is activated by the movement of the ET/ORB umbilical plate retraction when the disconnect fails in the open position. A one second delay timer is provided to vent down disconnect close actuator pneumatic pressure. This timer is monitored in Step 2.

Monitor signal below:

- | | | |
|-----|-----------------------------|-----------|
| (a) | FAST SEP FLAG | V90X8267X |
| (b) | ET/UMB UNLATCH PIC ARM FLAG | V90X8247X |

If (a) is true, then set outputs (1) through (4) false and set output (11) true, then return to Step 1.

If (a) is false, and at least 1.5 seconds have elapsed since (b) was first set true in Step 3g, on first pass, set outputs (5) through (10) false, start the ACT Vent Down Delay Timer (1 second), set outputs (1) through (4) false and set output (11) true, then return to Step 1. Otherwise, return to Step 1.

If (a) is false and at least 1.5 seconds have not elapsed since (b) was first set true in Step 3g, then return to Step 1.

- | | | |
|-----|-------------------------------------|-----------|
| (1) | MPS SIG COND PWR 1 ON | V41K0075X |
| (2) | MPS SIG COND PWR 2 ON | V41K0076X |
| (3) | MPS SIG COND PWR 3 ON | V41K0077X |
| (4) | ET DFI PWR ON FLAG | V90X8255X |
| (5) | MPS LO2 17IN DISC VLV(PD1) CL CMD A | V41K1524X |
| (6) | MPS LO2 17IN DISC VLV(PD1) CL CMD B | V41K1525X |
| (7) | MPS LO2 17IN DISC VLV(PD1) CL CMD C | V41K1526X |
| (8) | MPS LH2 17IN DISC VLV(PD2) CL CMD A | V41K1416X |
| (9) | MPS LH2 17IN DISC VLV(PD2) CL CMD B | V41K1417X |

- (10) MPS LH2 17IN DISC VLV (PD2) CL CMD C
- (11) FLAG A

V41K1418X
(INTERNAL)

Step 5 – Automatic Separation Inhibits Before ET Structural Separation. This step arms the ET/orbiter structural separation PIC's after a 5.5 second time delay has elapsed, since the umbilical retract fire commands were issued, to allow time for the LO₂ and LH₂ umbilical plates to retract and latch. If an RTLS abort has been requested, this time delay is reduced to 1.2 seconds as the separation cannot be delayed longer due to the buildup of dynamic pressure caused by entry.

After an additional 1.5 second delay for PIC charging and if a 3 E/O Contingency Abort is not in progress, tests are made on some specific vehicle parameters to determine if separation can be performed safely with the automatic sequence. Parameters checked include roll, pitch, yaw body rates, and MPS feed line disconnect valve closed status. During RTLS aborts, angle of attack and sideslip angle are checked in addition to the other parameters. If a roll, pitch, yaw body rate or sideslip angle fails to satisfy the predefined limits, or the MPS feed line disconnect valve is not closed, the crew is alerted and the sequence inhibits automatic separation from occurring. If, in an RTLS, the angle of attack fails to satisfy its predefined limits, the sequence inhibits automatic separation from occurring, but the crew is not alerted to the angle of attack failure. The inhibit will be in effect until the criteria that created the inhibit is within limits or the timer exceeds the ETSEP Inhibit Time (V97U1580C). The crew may then elect to initiate the separation manually. The time delays and vehicle parameter tests are bypassed during FAST SEP mode to achieve the most efficient separation time.

Monitor the following signals:

- (a) RTLS ABORT DECLARED V90X8637X
- (b) ET/UMB RETRACT FIRE 1 FLAG V90X8263X
- (c) ET/UMB RETRACT FIRE 2/3 FLAG V90X8243X
- (d) FIRE SEQUENCE FL (INTERNAL)
- (e) SELECTED RGA ROLL RATE V90R5301C
- (f) SELECTED RGA PITCH RATE V90R5321C
- (g) SELECTED RGA YAW RATE V90R5341C
- (h) NAV DERIVED ANGLE OF ATTACK V90H2246C
- (i) INERTIAL SIDESLIP ANGLE V90H2249C
- (j) NOM_BODY_PLUS_PITCH_RATE_LMT V97U9762C
- (k) NOM_BODY_NEG_PITCH_RATE_LMT V97U9763C
- (l) NOM_BODY_PLUS_ROLL_RATE_LMT V97U9764C
- (m) NOM_BODY_NEG_ROLL_RATE_LMT V97U9765C
- (n) NOM_BODY_PLUS_YAW_RATE_LMT V97U9766C
- (o) NOM_BODY_NEG_YAW_RATE_LMT V97U9767C
- (p) RTLS_BODY_PLUS_PITCH_RATE_LMT V97U9768C
- (q) RTLS_BODY_NEG_PITCH_RATE_LMT V97U9769C
- (r) RTLS_BODY_PLUS_ROLL_RATE_LMT V97U9770C
- (s) RTLS_BODY_NEG_ROLL_RATE_LMT V97U9771C
- (t) RTLS_BODY_PLUS_YAW_RATE_LMT V97U9772C
- (u) RTLS_BODY_NEG_YAW_RATE_LMT V97U9773C
- (v) RTLS_PLUS_ANGLE_OF_ATTK_LMT V97U9774C
- (w) RTLS_NEG_ANGLE_OF_ATTK_LMT V97U9775C
- (x) RTLS_PLUS_SIDESLIP_ANGLE_LMT V97U9776C
- (y) RTLS_NEG_SIDESLIP_ANGLE_LMT V97U9777C

(z) CONT_3EO_START

V90X0909X

If (a) is true and 1.2 seconds have not elapsed since (b) and (c) were set true in Step 2, return to Step 1.

If (a) is true and at least 1.2 seconds have elapsed since (b) and (c) were set true in Step 2, set output (1) true and return to Step 1.

If (a) is true and 1.5 seconds have not elapsed since output (1) was set true, return to Step 1.

If (a) is true and at least 1.5 seconds have elapsed since output (1) was set true, set output (2) and (3) false and proceed to monitor signal (z).

If (a) is true and at least 1.5 seconds have elapsed since output (1) was set true, and (z) is false, proceed to monitor signals (e) through (i) and (p) through (y). Otherwise, if (z) is true, return to step (1).

If (h) > (v) or (h) < (w), set (3) true and proceed to monitor signals (e) through (g), (i), (p) through (u), (x) and (y). If [(f) < (p) and (f) > (q)] and [(e) < (r) and (e) > (s)] and [(g) < (t) and (g) > (u)] and [(i) < (x) and (i) > (y)], then proceed to Step 5a. Otherwise, set output (2) true and proceed to Step 5a.

If (a) is false and 5.5 seconds have not elapsed since (b) and (c) were set true in Step 2, return to Step 1.

If (a) is false and at least 5.5 seconds have elapsed since (b) and (c) were set true in Step 2, set output (1) true and proceed to monitor (d). If (d) is true, proceed to Step 7.

If (d) is false and at least 1.5 seconds have not elapsed since output (1) was set true, return to Step 1. Otherwise, set output (2) false and then monitor signals (e) through (g) and (j) through o.

If [(f) < (j) and (f) > (k)] and [(e) < (l) and (e) > (m)] and [(g) < (n) and (g) > (o)], then proceed to Step 5a. Otherwise, set output (2) true to generate a CRT message line and a Class 3 alert light and tone, and then proceed to Step 5a.

- (1) ET/ORB STR SEPN PICS ARM FLAG
- (2) ET AUTO SEP INHIBIT CREW ALERT
- (3) ET AUTO SEP ALPHA INHIBIT

V90X8265X
V90X8259X
(INTERNAL)

Step 5a – Orbiter Feedline Disconnect Valve Closure Verification. This step monitors the closure of the MPS orbiter feed disconnects. Orbiter disconnects can be closed with either pneumatic closure actuating force or orbiter umbilical retraction movement. If both close position indicators on either LO₂ or LH₂ valves fails to indicate closure, an appropriate fail flag will be set for the separation inhibit logic in Step 5b.

Monitor the following:

- (a) MPS LO₂ 17IN DISC VLV(PD1) CL IND A
- (b) MPS LO₂ 17IN DISC VLV(PD1) CL IND B

V41X1530X
V41X1534X

| | | |
|-----|---|------------|
| (c) | MPS LH ₂ 17IN DISC VLV(PD2) CL IND A | V41X1430X |
| (d) | MPS LH ₂ 17IN DISC VLV(PD2) CL IND B | V41X1434X |
| (e) | LO ₂ ORB DISC CLOSED IND A QUAL FLAG | (INTERNAL) |
| (f) | LO ₂ ORB DISC CLOSED IND B QUAL FLAG | (INTERNAL) |
| (g) | LH ₂ ORB DISC CLOSED IND A QUAL FLAG | (INTERNAL) |
| (h) | LH ₂ ORB DISC CLOSED IND B QUAL FLAG | (INTERNAL) |
| (i) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (j) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (k) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |

If (a) is true and (i) is false and (e) is true, proceed to monitor (c), (i) and (g). Otherwise, monitor (b), (j) and (f).

If (b) is true and (j) is false and (f) is true, proceed to monitor (c), (i) and (g). Otherwise, set output (1) below true and proceed to monitor (c), (i) and (g).

If (c) is true and (i) is false and (g) is true, proceed to Step 5b. Otherwise, monitor (d), (k) and (h).

If (d) is true and (k) is false and (h) is true, proceed to Step 5b. Otherwise, set output (2) true and proceed to Step 5b.

| | | |
|-----|-------------------------------------|------------|
| (1) | LO ₂ DISC FAIL OPEN FLAG | (INTERNAL) |
| (2) | LH ₂ DISC FAIL OPEN FLAG | (INTERNAL) |

Step 5b – Crew Alert for MPS Feed Disconnect Failure. This step generates a fail flag and crew alert if any one of the MPS LO₂/LH₂ ET or orbiter disconnect valve is determined to be failed open in Step 4 or 5a.

Monitor the following:

| | | |
|-----|-------------------------------------|------------|
| (a) | LO ₂ DISC FAIL OPEN FLAG | (INTERNAL) |
| (b) | LH ₂ DISC FAIL OPEN FLAG | (INTERNAL) |
| (c) | ET AUTO SEP INHIBIT CREW ALERT | V90X8259X |

If (a) is true, set outputs (1) and (3) true and proceed to monitor (b). Otherwise, proceed to monitor (b).

If (b) is true, set outputs (2) and (3) true and proceed to monitor (c). Otherwise, proceed to monitor (c).

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If (c) is true, set output (4) false one time only and proceed to Step 6. Otherwise, proceed to Step 6.

| | | |
|-----|--|-----------|
| (1) | MPS LO ₂ FEED DISC FAIL OPEN FLAG | V90X5964X |
| (2) | MPS LH ₂ FEED DISC FAIL OPEN FLAG | V90X5963X |
| (3) | ET AUTO SEP INHIBIT CREW ALERT | V90X8259X |
| (4) | ET/ORB SEP CAMERAS ON CMD | V56K0000X |

Step 6 – Manual Separation. This sequence now monitors the manual ET separation switch. If the automatic mode is selected and none of the ET SEP inhibit test conditions failed, the sequence proceeds with the structural separation. If any of the inhibit test conditions were not satisfied and an RTLS or TAL abort has not been requested, the sequence turns off the ET/ORB separation cameras to conserve film, but will not proceed until the test condition is satisfied or is manually overridden by the crew.

If an RTLS abort has been requested, and one of the separation inhibit test conditions was not satisfactory, the ET/ORB separation cameras are turned off and the sequence continues to test the automatic separation inhibits and monitor the SEP switches for ETSEP INHIBIT TIME. If the inhibit becomes satisfied within this time or the crew manually overrides, the separation is performed. If the separation inhibit is still present after ETSEP INHIBIT TIME, the sequence automatically bypasses the inhibit and performs the separation. The separation cannot be delayed longer due to the pressure buildup caused by entry.

If a TAL abort has been requested and one of the MPS feed disconnect valves was determined to be failed open, after the TAL_ABORT_DELAY_TIME expires, the sequence will automatically bypass the inhibit and proceed with the separation. The TAL_ABORT_DELAY timer is needed to reduce the recontact risk with the 17” disconnect. If the inhibit condition was caused by the violation of the vehicle body rate limits, the sequence will not proceed until the test vehicle rate condition is satisfied or is manually overridden by the crew.

In the manual separation mode, the sequence looks for the ET SEP MAN INITIATE FLAG, latched in software. If true, the structural separation is accomplished, bypassing the conditions that caused the automatic separation to be inhibited.

Monitor the following signals:

| | | |
|-----|--|------------|
| (a) | ET SEP MAN INITIATE FLAG | V90X8584X |
| (b) | RTLS ABORT DECLARED | V90X8637X |
| (c) | ET AUTO SEP INHIBIT CREW ALERT | V90X8259X |
| (d) | TAL ABORT DECLARED | V90X8658X |
| (e) | MPS LH ₂ FEED DISC FAIL OPEN FLAG | V90X5963X |
| (f) | MPS LO ₂ FEED DISC FAIL OPEN FLAG | V90X5964X |
| (g) | TAL ABORT DELAY TIME | V97U9717C |
| (h) | ETSEP INHIBIT TIME | V97U1580C |
| (i) | ET AUTO SEP ALPHA INHIBIT | (INTERNAL) |

If (a) is true, proceed to Step 7. If (a) is false, proceed to monitor (c) and (i).

If (c) and (i) are false, proceed to Step 7.

If (c) or (i) is true, proceed to monitor (b).

If (b) is true and (h) has not elapsed since (c) or (i) first became true, set output (1) false and return to Step 1.

If (b) is true and at least (h) has elapsed since (c) or (i) first became true, proceed to Step 7.

If (b) is false, proceed to monitor (d) through (f).

If (d) is true, and either (e) or (f) is true, and (g) has elapsed since (c) first became true, proceed to Step 7.

If (d) is true, and either (e) or (f) is true, and (g) has not elapsed since (c) first became true, set output (1) below false and return to Step 1. Otherwise, set output (1) below false and return to Step 1.

(1) ET/ORB SEP CAMERA ON CMD V56K0000X

Step 7 – ET Structural Separation. In this step, the sequence commands the ET/ORB separation cameras on to make certain they are on in the event that an automatic separation inhibit had caused them to be turned off previously. If an RTLS abort is not requested, a command is set for the Transition DAP to fire during structural separation to prevent possible recontact between the orbiter and ET.

The sequence then sets the ET/ORB structural separation fire 1 and 2/3 flags for the MEC SOP and the ET separation command flag. This flag is a cue to other functions that the ET separation has occurred.

Monitor the following:

(a) RTLS ABORT DECLARED V90X8637X
(b) FAST SEP FLAG V90X8267X

If (a) or (b) is true, set outputs (2) through (5) true and return to Step 1.

If (a) and (b) are false, set outputs (1) and (6) listed below true and return to Step 1. On next pass through this logic set flags (2) through (5) true and return to Step 1.

(1) SEP MINUS Z CMD V90X8268X
(2) ET/ORB SEP CAMERAS ON CMD V56K0000X
(3) ET/ORB STR SEPN FIRE 1 FLAG V90X8244X
(4) ET/ORB STR SEPN FIRE 2/3 FLAG V90X8241X
(5) ET SEPARATION CMD FLAG V90X8250X
(6) FIRE SEQUENCE FL (INTERNAL)

Step 8 – ET Umbilical Doors Closure. This function is accomplished when either a manual ET umbilical door closure is required or an RTLS abort has been requested. In this mode, the umbilical door centerline latches are stowed, the umbilical doors are closed, and the umbilical doors are latched, all with the proper timing constraints.

If less than 2 seconds have elapsed since the structural separation fire 2/3 flag was set true, return to Step 1.

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If at least 2 seconds have elapsed since the structural separation fire 2/3 flag was set true, set output commands (1) through (8) to true (STOW). Six seconds later:

Set output commands (9) through (16) true (ARM/CLOSE).

If 12 seconds have elapsed since the stow commands, (1) through (8), were set true, set output commands (1) through (8) false.

If 48 seconds have elapsed since output commands (9) through (16) were set true, set output commands (12) through (16) false, and set output commands (17) through (24) true (LATCH).

If 12 seconds have elapsed since output commands (17) through (24) were set true, set output commands (9) through (11) and (17) through (24) false and (25) true.

Proceed to Step 9.

| | | |
|------|------------------------------------|-----------|
| (1) | ET DR CL LCH 1A1/2A2 FA1 STOW CMD | V56K1271X |
| (2) | ET DR CL LCH 1A2/2A1 FA1 STOW CMD | V56K1272X |
| (3) | ET DR CL LCH 1A1/2B2 FA2 STOW CMD | V56K1273X |
| (4) | ET DR CL LCH 1B2/2B1 FA2 STOW CMD | V56K1274X |
| (5) | ET DR CL LCH 1B1/2A2 FA4 STOW CMD | V56K1371X |
| (6) | ET DR CL LCH 1A2/2B1 FA4 STOW CMD | V56K1372X |
| (7) | ET DR CL LCH 1B1/2B2 FA3 STOW CMD | V56K1373X |
| (8) | ET DR CL LCH 1B2/2A1 FA3 STOW CMD | V56K1374X |
| (9) | ET DR DRV & CL LCH DC ARM AMCA 1/2 | V56K0141X |
| (10) | ET DR DRV & CL LCH DC ARM AMCA 1/3 | V56K0142X |
| (11) | ET DR DRV & CL LCH DC ARM AMCA 2/3 | V56K0143X |
| (12) | ET UMB DR L-B2/R-B1 CLOSE CMD | V56K3111X |
| (13) | ET UMB DR R-B2 CLOSE CMD | V56K3112X |
| (14) | ET UMB DR R-B1/B2 CLOSE CMD | V56K4121X |
| (15) | ET UMB DR L-B1 CLOSE CMD | V56K4122X |
| (16) | ET UMB DR L-B1/B2 CLOSE CMD | V56K0140X |
| (17) | ET L UMB COUT DOOR LATCH FA1 CMD | V56K3531X |
| (18) | ET R UMB COUT DOOR LATCH FA1 CMD | V56K3532X |
| (19) | ET L UMB COUT DOOR LATCH FA4 CMD | V56K3533X |
| (20) | ET R UMB COUT DOOR LATCH FA4 CMD | V56K3534X |
| (21) | ET L UMB COUT DOOR LATCH FA3 CMD | V56K4531X |
| (22) | ET R UMB COUT DOOR LATCH FA3 CMD | V56K4532X |
| (23) | ET L UMB COUT DOOR LATCH FA2 CMD | V56K4533X |
| (24) | ET R UMB COUT DOOR LATCH FA2 CMD | V56K4534X |
| (25) | MEC 1 & 2 MASTER RESET FLAG | V90X8258X |

Step 9 – MPS Feed Line Disconnect Valve Command Cleanup. This step terminates unneeded feed line disconnect latch unlock commands. The ET SEP sequence is then terminated.

Set outputs (1) through (6) below false and deschedule the ET SEP sequence.

- | | | |
|-----|--|-----------|
| (1) | LO ₂ FDLN DISC LATCH UNLOCK CMD A | V41K1884X |
| (2) | LO ₂ FDLN DISC LATCH UNLOCK CMD B | V41K1885X |
| (3) | LO ₂ FDLN DISC LATCH UNLOCK CMD C | V41K1886X |
| (4) | LH ₂ FDLN DISC LATCH UNLOCK CMD A | V41K1984X |
| (5) | LH ₂ FDLN DISC LATCH UNLOCK CMD B | V41K1985X |
| (6) | LH ₂ FDLN DISC LATCH UNLOCK CMD C | V41K1986X |

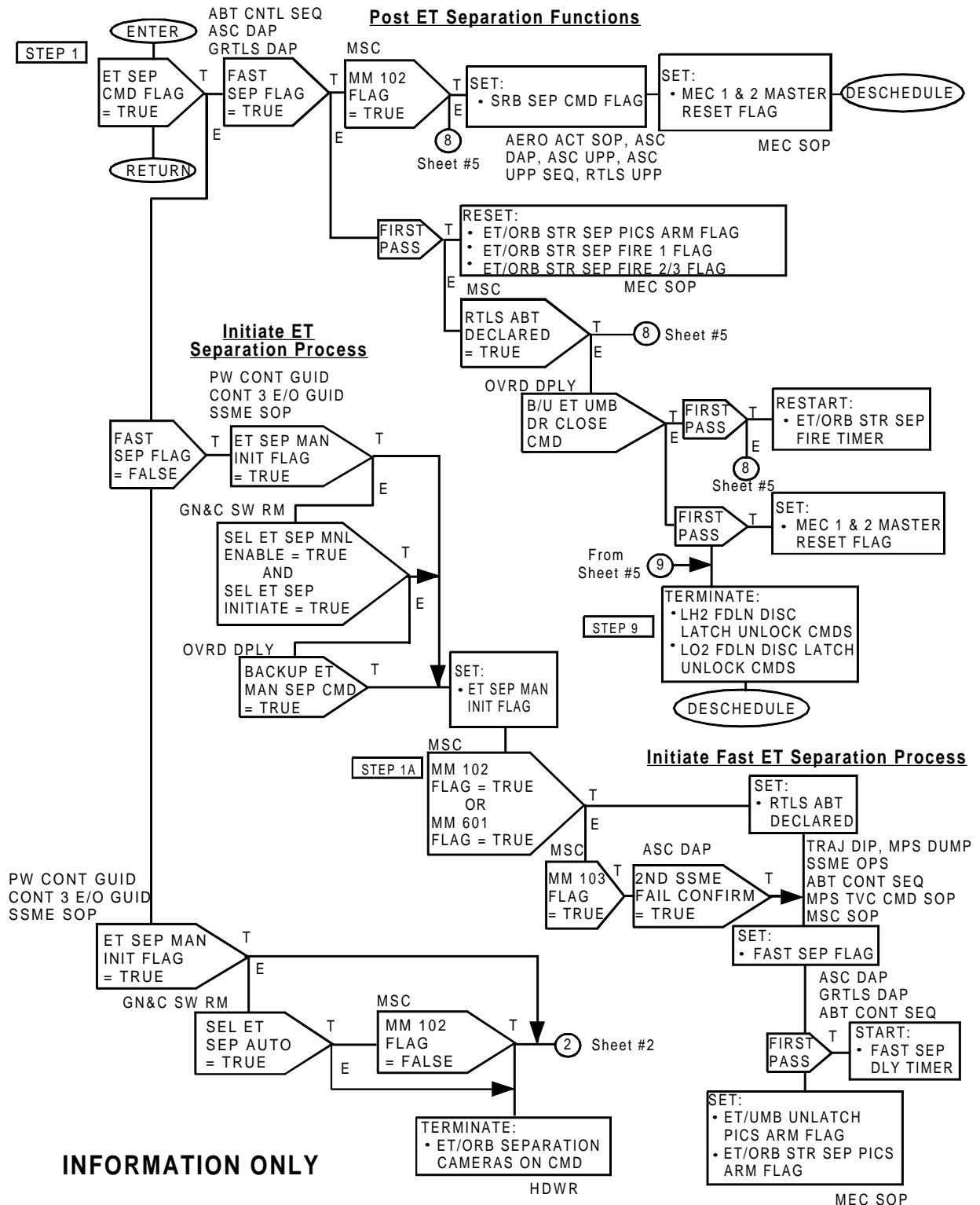
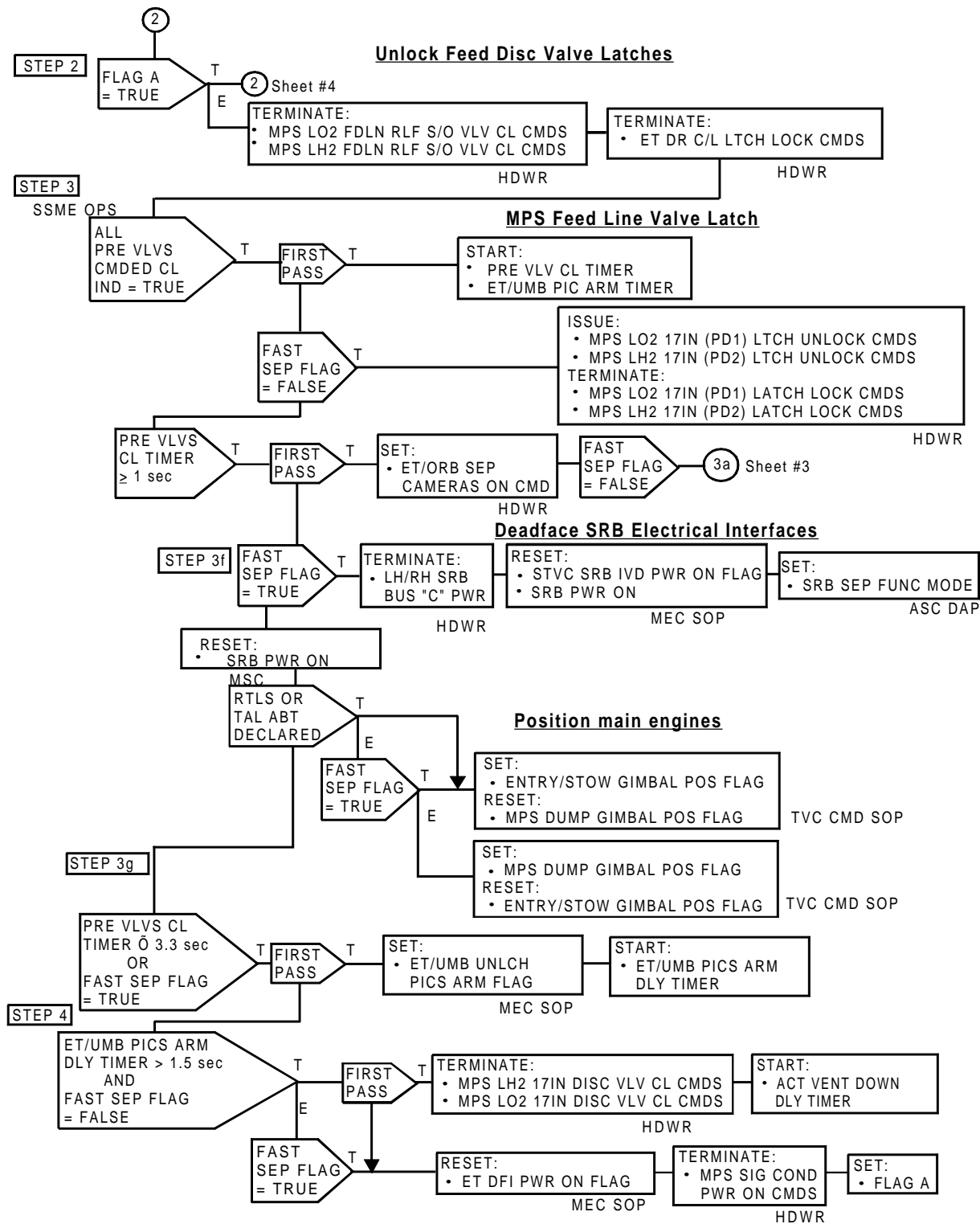


FIGURE 4.116.(1) ET Separation Sequence (Sheet 1 of 5)



INFORMATION ONLY

FIGURE 4.116.(2) ET Separation Sequence (Sheet 2 of 5)

Quality Feed Disc Valves Indicators

INFORMATION ONLY

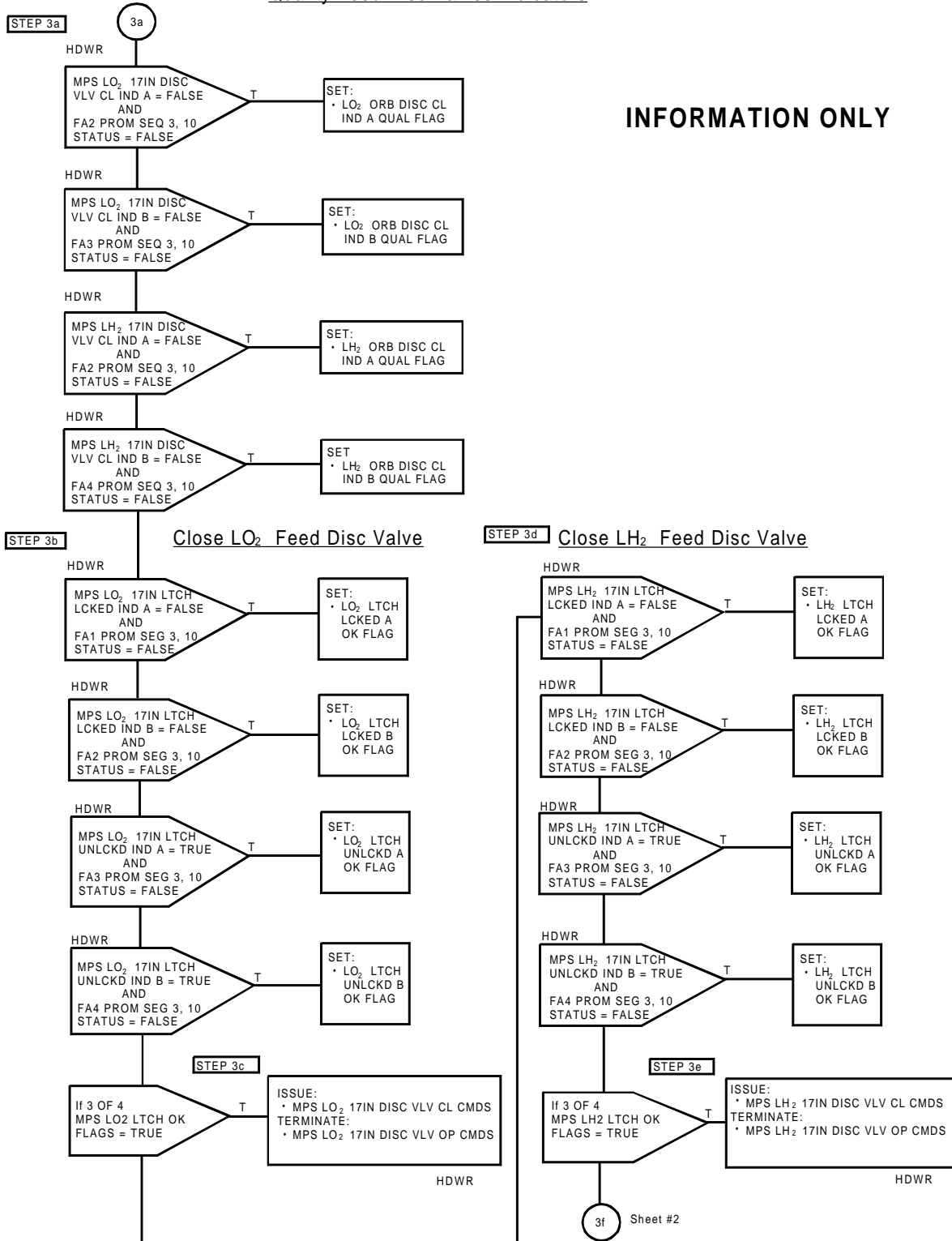


FIGURE 4.116.(3) ET Separation Sequence (Sheet 3 of 5)

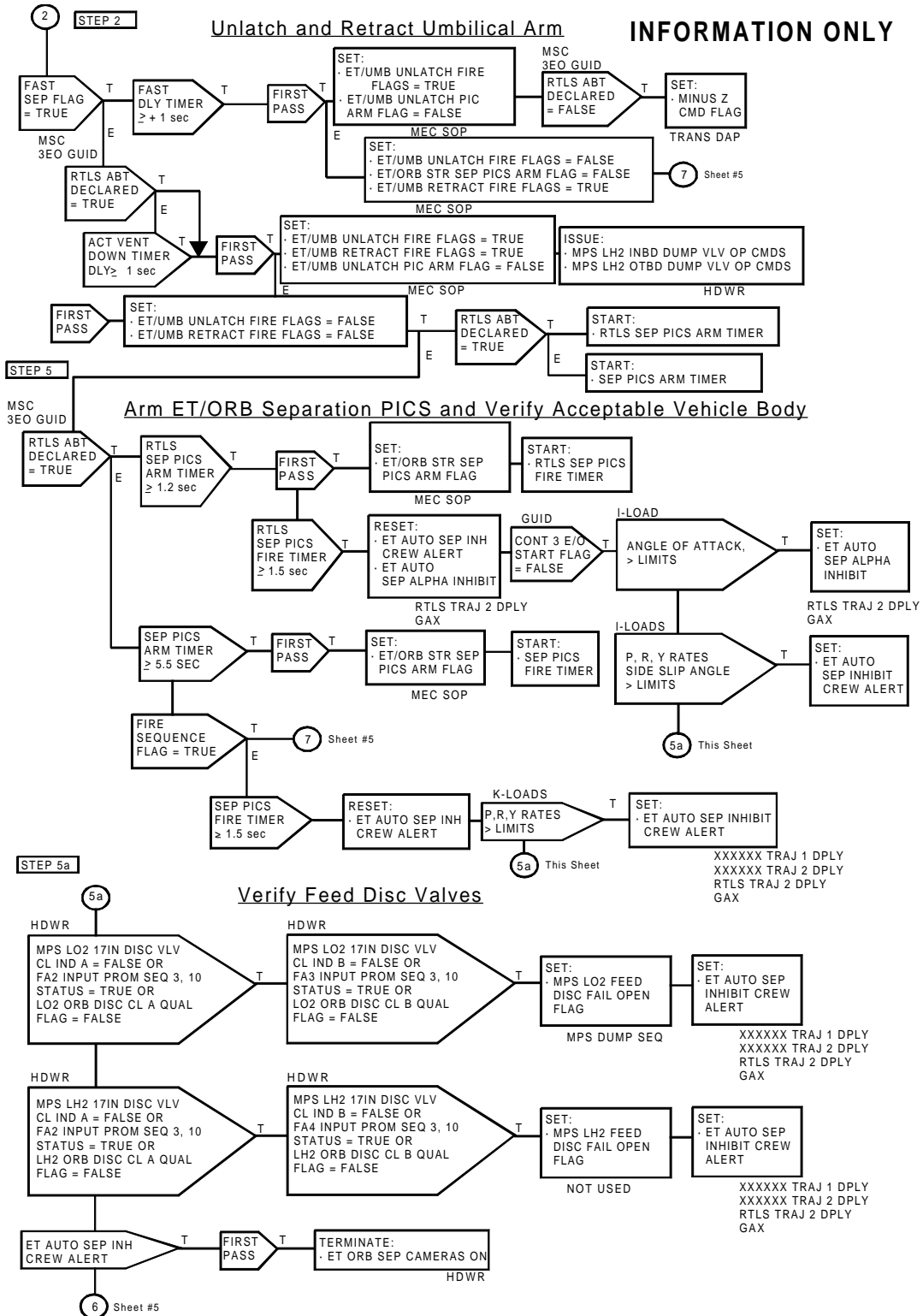


FIGURE 4.116.(4) ET Separation Sequence (Sheet 4 of 5)

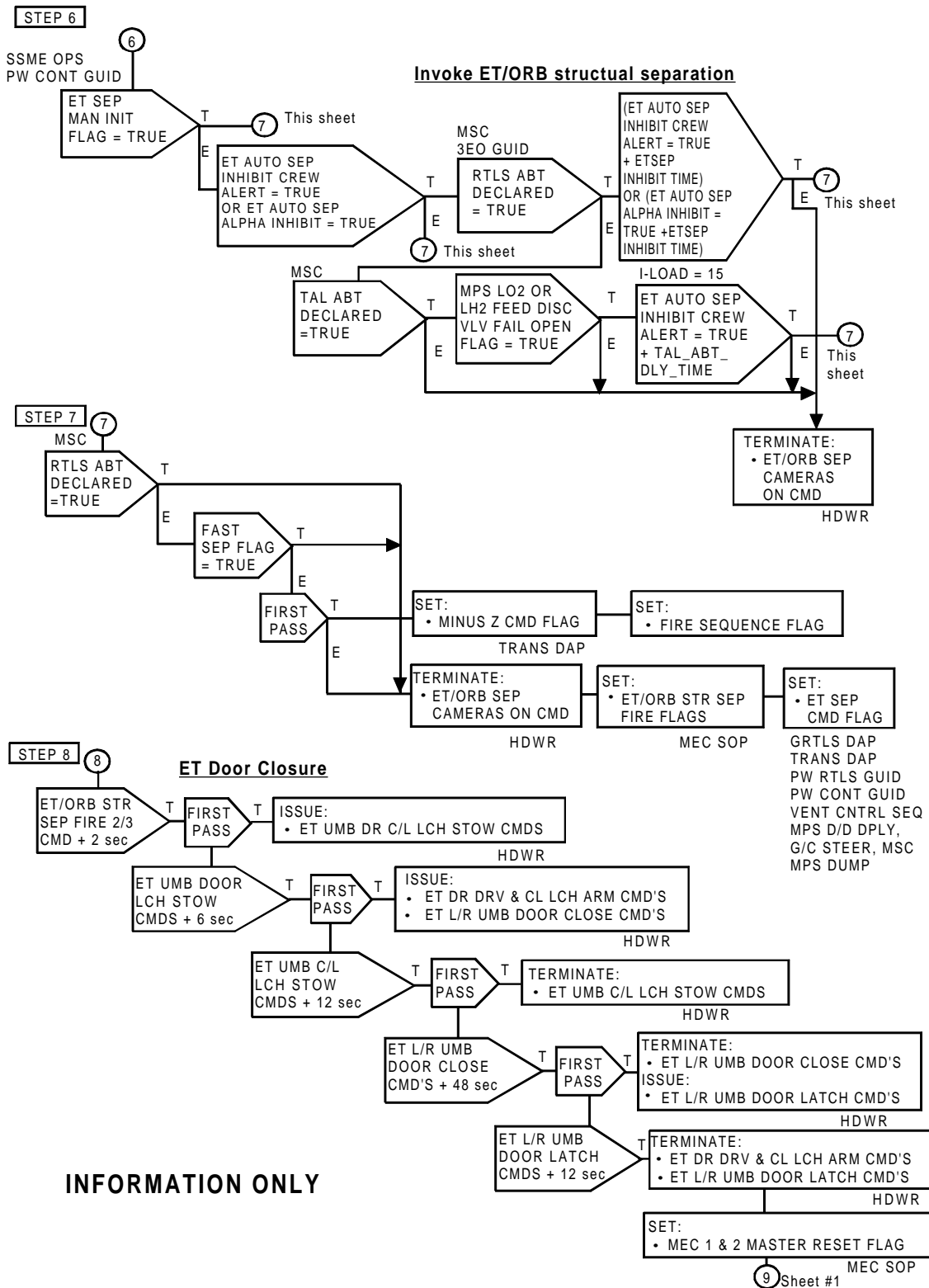


FIGURE 4.116.(5) ET Separation Sequence (Sheet 5 of 5)

TABLE 4.2.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR EXTERNAL TANK SEPARATION SEQUENCER (G4.116)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------------|------------|------------------------------------|----------------|-------|-----------|---------|---------|-------|
| ALPHA_N | V90H2246C | NAV DERIVED ANGLE OF ATTACK | A/E ATT PROC | DEG | SPL | | 93017G | * |
| BETA_N | V90H2249C | INERTIAL SIDESLIP ANGLE | A/E ATT PROC | DEG | SPL | | 93017G | * |
| CONT_3EO_START | V90X0909X | CONTINGENCY 3 E/O START FLAG | CONT 3E/O GUID | | BD | | 93017G | * |
| ET_SEP_MAN_INITIATE | V90X8584XA | ET SEP MAN INITIATE FLAG | SSME OPS | | BD | | 90964 | |
| ET_SEP_MAN_INITIATE | V90X8584XB | ET SEP MAN INITIATE FLAG | PW CONT GUID | | BD | | 90964 | |
| ET_SEP_MAN_INITIATE | V90X8584XC | ET SEP MAN INITIATE FLAG | CONT 3E/O GUID | | BD | | 90964 | |
| MM_CODE_102/MM_102 | V90X8158X | MAJOR MODE 102 FLAG | MSC | | | | 93012D | |
| MM_CODE_103/MM_103 | V90X8156X | MAJOR MODE 103 FLAG | MSC | | | | 93012D | |
| MM_CODE_601/MM_601 | V90X8194X | MAJOR MODE 601 FLAG | MSC | | BD | | 93012D | |
| P_ORB | V90R5301CA | SELECTED RGA ROLL RATE | SF | DEG/S | | | 93017G | * |
| Q_ORB/Q | V90R5321CA | SELECTED RGA PITCH RATE | SF | DEG/S | | | 93017G | * |
| RTLS_ABORT_DECLARED | V90X8637XA | RTLS ABORT DECLARED | MSC | | BD | | 93167A | * |
| RTLS_ABORT_DECLARED | V90X8637XC | RTLS ABORT DECLARED | CONT 3E/O GUID | | BD | | 93167A | * |
| R_ORB | V90R5341CA | SELECTED RGA YAW RATE | SF | DEG/S | | | 93017G | * |
| SEC_ME_FL_CNFM | V90X1721X | 2ND SSME FAIL CONFIRM | ASC DAP | | | | 89990E | |
| TAL_ABORT_DECLARED | V90X8658X | TAL ABORT DECLARED | MSC | | | | 93090E | |
| | V41X1430X | MPS LH2 17IN DISC VLV(PD2)CL IND A | HDWR | | BD | | 93017G | * |
| | V41X1434X | MPS LH2 17IN DISC VLV(PD2)CL IND B | HDWR | | BD | | 93017G | * |
| | V41X1530X | MPS LO2 17IN DISC VLV(PD1)CL IND A | HDWR | | BD | | 93017G | * |
| | V41X1534X | MPS LO2 17IN DISC VLV(PD1)CL IND B | HDWR | | BD | | 93017G | * |
| | V41X1891X | MPS LO2 17IN(PD1)LATCH LCKED IND A | HDWR | | BD | | 93017G | * |
| | V41X1892X | MPS LO2 17IN(PD1)LATCH LCKED IND B | HDWR | | BD | | 93017G | * |
| | V41X1893X | MPS LO2 17IN(PD1)LTCH UNLCKD IND A | HDWR | | BD | | 93017G | * |
| | V41X1894X | MPS LO2 17IN(PD1)LTCH UNLCKD IND B | HDWR | | BD | | 93017G | * |
| | V41X1991X | MPS LH2 17IN(PD2)LATCH LCKED IND A | HDWR | | BD | | 93017G | * |
| | V41X1992X | MPS LH2 17IN(PD2)LATCH LCKED IND B | HDWR | | BD | | 93017G | * |
| | V41X1993X | MPS LH2 17IN(PD2)LTCH UNLCKD IND A | HDWR | | BD | | 93017G | * |
| | V41X1994X | MPS LH2 17IN(PD2)LTCH UNLCKD IND B | HDWR | | BD | | 93017G | * |
| | V90X7554X | SEL ET SEP AUTO | GN&C SW RM | | BD | | 93017G | * |
| | V90X7556X | SEL ET SEP MNL ENABLE | GN&C SW RM | | BD | | 93017G | * |
| | V90X7564X | SEL ET SEP INITIATE/WOW-WONG CMD | GN&C SW RM | | BD | | 93017G | * |
| | V90X8568X | ALL PREVLVS COMMANDED CLOSE IND | SSME OPS | | | | | |
| | V91X2845X | FA1 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 89991E | |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2848X | FA4 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 92316B | |
| | V93X5341X | BACKUP ET MAN SEP CMD | OVERRIDE DISP | | BD | | 93064D | |
| | V93X5342X | BACKUP ET UMB DR CLOSE CMD | OVERRIDE DISP | | BD | | 93064D | |

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

TABLE 4.2.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM EXTERNAL TANK SEPARATION SEQUENCER (G4.116)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|----------------------|------------|-------------------------------|---|-------|--------------|------------------|---------|-------------|
| ATVC_IVD_PWR | V90X8338XB | ATVC SRB IVD PWR ON FLAG | MEC SOP | | | | 89456A | |
| ENT_STOW_GIM_POSN | V90X8254XB | ENTRY STOW GIMBAL POS FLAG | MPS TVC CMD SOP | | BD | | | |
| ET_DFI_PWR | V90X8255X | ET DFI PWR ON FLAG | MEC SOP | | | | 89456A | |
| ET_SEP_ARM | V90X8265X | ET/ORB STR SEPN PICS ARM FLAG | MEC SOP | | | | 89456A | |
| ET_SEP_CMD | V90X8250X | ET SEPARATION CMD FLAG | CONT 3E/O GUID DL FMT 21/A G/C STEER GRTLS DAP MPS D/D SEQ MPS DUMP MSC PW CONT GUID PW RTLS GUID TRANS DAP VENT CNTL SEQ | | BD | | 93017G | * |
| ET_SEP_FIRE1 | V90X8244X | ET/ORB STR SEPN FIRE 1 FLAG | MEC SOP | | | | 89456A | |
| ET_SEP_FIRE2/3 | V90X8241X | ET/ORB STR SEPN FIRE 2/3 FLAG | MEC SOP | | | | 89456A | |
| ET_SEP_MAN_INITIATE | V90X8584XD | ET SEP MAN INITIATE FLAG | CONT 3E/O GUID | | BD | | 90964 | |
| ET_UMB_RETR_CMD1 | V90X8263X | ET/UMB RETRACT FIRE 1 FLAG | MEC SOP | | | | 92157 | |
| ET_UMB_RETR_CMD2/3 | V90X8243X | ET/UMB RETRACT FIRE 2/3 FLAG | MEC SOP | | | | 89456A | |
| ET_UMB_UNLCH_ARM | V90X8247X | ET/UMB UNLATCH PICS ARM FLAG | MEC SOP | | | | 89456A | |
| ET_UMB_UNLCH_FIRE1 | V90X8256X | ET/UMB UNLATCH FIRE 1 FLAG | MEC SOP | | | | 92157 | |
| ET_UMB_UNLCH_FIRE2/3 | V90X8242X | ET/UMB UNLATCH FIRE 2/3 FLAG | MEC SOP | | | | 92157 | |
| FAST_SEP_FLAG | V90X8267X | FAST SEPARATION FLAG | ABT CNTL SEQ ASC DAP GRTLS DAP | | | | 79643A | |
| M_RSET_USER | V90X8258XA | MEC 1&2 MASTER RESET FLAG | MEC SOP | | | | 89456A | |
| RTLS_ABORT_DECLARED | V90X8637XB | RTLS ABORT DECLARED | ABT CNTL SEQ ASC BRG DISP ASC BRG SPEC MEDS FC GNC XFER MPS DUMP MPS TVC CMD SOP MSC SSME OPS XXXXXX TRAJ DIP TRANS DAP | | BD | | 93167A | * |
| SEP_MINUSZ_CMD | V90X8268X | SEPARATION MINUS Z CMD | ASC DAP | | | | | |
| SRB_MODING_SEP | V90X8330XB | SRB SEP FUNCTION MODING FLAG | MEC SOP | | | | 89456A | |
| SRB_PWR_ON | V90X8343X | SRB POWER ON | ASC DAP | | | | 93064D | |
| SRB_SEP_CMD_FLAG | V90X8331XB | SRB SEPARATION COMMAND FLAG | ASC UPP ASC UPP SEQ MSC RTLS UPP SEQ | | | | | |
| | V41K0075X | MPS SIG COND PWR 1 ON | LCA A1 | | BD | | | |
| | V41K0076X | MPS SIG COND PWR 2 ON | LCA A2 | | BD | | | |

TABLE 4.2.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM EXTERNAL TANK SEPARATION SEQUENCER (G4.116)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|-------------|-------|-----------|---------|---------|-------|
| | V41K0077X | MPS SIG COND PWR 3 ON | LCA A3 | | BD | | | |
| | V41K1413X | MPS LH2 17IN DISC VLV(PD2)OP CMD A | HDWR | | BD | | 90726C | |
| | V41K1414X | MPS LH2 17IN DISC VLV(PD2)OP CMD B | HDWR | | BD | | 90726C | |
| | V41K1415X | MPS LH2 17IN DISC VLV(PD2)OP CMD C | HDWR | | BD | | 90726C | |
| | V41K1416X | MPS LH2 17IN DISC VLV(PD2)CL CMD A | HDWR | | BD | | 90726C | |
| | V41K1417X | MPS LH2 17IN DISC VLV(PD2)CL CMD B | HDWR | | BD | | 90726C | |
| | V41K1418X | MPS LH2 17IN DISC VLV(PD2)CL CMD C | HDWR | | BD | | 90726C | |
| | V41K1447X | MPS LH2 FDLN RLF SOV(PV8)CL CMD A | LCA A3 | | BD | | 89554A | |
| | V41K1448X | MPS LH2 FDLN RLF SOV(PV8)CL CMD B | HDWR | | BD | | 89554A | |
| | V41K1450X | MPS LH2 FDLN RLF SOV(PV8)CL CMD C | HDWR | | BD | | 89554A | |
| | V41K1521X | MPS LO2 17IN DISC VLV(PD1)OP CMD A | HDWR | | BD | | 90726C | |
| | V41K1522X | MPS LO2 17IN DISC VLV(PD1)OP CMD B | HDWR | | BD | | 90726C | |
| | V41K1523X | MPS LO2 17IN DISC VLV(PD1)OP CMD C | HDWR | | BD | | 90726C | |
| | V41K1524X | MPS LO2 17IN DISC VLV(PD1)CL CMD A | HDWR | | BD | | 90726C | |
| | V41K1525X | MPS LO2 17IN DISC VLV(PD1)CL CMD B | HDWR | | BD | | 90726C | |
| | V41K1526X | MPS LO2 17IN DISC VLV(PD1)CL CMD C | HDWR | | BD | | 90726C | |
| | V41K1547X | MPS LO2 FDLN RLF SOV(PV7)CL CMD A | HDWR | | BD | | 89554A | |
| | V41K1548X | MPS LO2 FDLN RLF SOV(PV7)CL CMD B | LCA A1 | | BD | | 89554A | |
| | V41K1550X | MPS LO2 FDLN RLF SOV(PV7)CL CMD C | HDWR | | BD | | 89554A | |
| | V41K1881X | MPS LO2 17IN(PD1) LATCH LOCK CMD A | HDWR | | | | 89554A | |
| | V41K1882X | MPS LO2 17IN(PD1) LATCH LOCK CMD B | HDWR | | | | 89554A | |
| | V41K1883X | MPS LO2 17IN(PD1) LATCH LOCK CMD C | HDWR | | | | 89554A | |
| | V41K1884X | MPS LO2 17IN(PD1)LTCH UNLOCK CMD A | HDWR | | | | 89554A | |
| | V41K1885X | MPS LO2 17IN(PD1)LTCH UNLOCK CMD B | HDWR | | | | 89554A | |
| | V41K1886X | MPS LO2 17IN(PD1)LTCH UNLOCK CMD C | HDWR | | | | 89554A | |
| | V41K1913XB | MPS LH2 RTLS OTBD DV(PV18)OP CMD A | HDWR | | | | 89554A | |
| | V41K1914XB | MPS LH2 RTLS OTBD DV(PV18)OP CMD B | HDWR | | | | 89554A | |
| | V41K1915XB | MPS LH2 RTLS OTBD DV(PV18)OP CMD C | HDWR | | | | 89554A | |
| | V41K1923XB | MPS LH2 RTLS INBD DV(PV17)OP CMD A | HDWR | | | | 89554A | |
| | V41K1924XB | MPS LH2 RTLS INBD DV(PV17)OP CMD B | HDWR | | | | 89554A | |
| | V41K1925XB | MPS LH2 RTLS INBD DV(PV17)OP CMD C | HDWR | | | | 89554A | |
| | V41K1981X | MPS LH2 17IN(PD2) LATCH LOCK CMD A | HDWR | | | | 89554A | |
| | V41K1982X | MPS LH2 17IN(PD2) LATCH LOCK CMD B | HDWR | | | | 89554A | |
| | V41K1983X | MPS LH2 17IN(PD2) LATCH LOCK CMD C | HDWR | | | | 89554A | |
| | V41K1984X | MPS LH2 17IN(PD2)LTCH UNLOCK CMD A | HDWR | | | | 89554A | |
| | V41K1985X | MPS LH2 17IN(PD2)LTCH UNLOCK CMD B | HDWR | | | | 89554A | |
| | V41K1986X | MPS LH2 17IN(PD2)LTCH UNLOCK CMD C | HDWR | | | | 89554A | |
| | V56K0000XA | ET/ORB SEP CAMERAS ON CMD | HDWR | | | | 92902 | |
| | V56K0140X | ET UMB DR L-B1/B2 CLOSE CMD | HDWR | | BD | | 89599C | |
| | | | TLM | | | | | |
| | V56K0141X | ET DR DVR & CL LCH DC ARM A MCA1/2 | HDWR | | BD | | 89599C | |
| | V56K0142X | ET DR DVR & CL LCH DC ARM A MCA1/3 | HDWR | | BD | | 89599C | |
| | V56K0143X | ET DR DVR & CL LCH DC ARM A MCA2/3 | HDWR | | BD | | | |
| | V56K1271X | ET DR C/L LCH 1A1/2A2 FA1 STOW CMD | HDWR | | BD | | | |
| | V56K1272X | ET DR C/L LCH 1A2/2A1 FA1 STOW CMD | HDWR | | BD | | | |
| | V56K1273X | ET DR C/L LCH 1A1/2B2 FA2 STOW CMD | HDWR | | BD | | | |

TABLE 4.2.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM EXTERNAL TANK SEPARATION SEQUENCER (G4.116)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------|----------------------------------|--------------------------|-----------------|--------|--------------|------------------|---------|-------------|
| V56K1274X | ET DR C/L | LCH 1B2/2B1 FA2 STOW CMD | HDWR | | BD | | | |
| V56K1275X | ET DR C/L | LCH 1A1/2A2 FA1 LOCK CMD | HDWR | | BD | | | |
| V56K1276X | ET DR C/L | LCH 1A2/2B1 FA1 LOCK CMD | HDWR | | BD | | | |
| V56K1277X | ET DR C/L | LCH 1A1/2B2 FA2 LOCK CMD | HDWR | | BD | | | |
| V56K1278X | ET DR C/L | LCH 1B2/2A1 FA2 LOCK CMD | HDWR | | BD | | | |
| V56K1371X | ET DR C/L | LCH 1B1/2A2 FA4 STOW CMD | HDWR | | BD | | | |
| V56K1372X | ET DR C/L | LCH 1A2/2B1 FA4 STOW CMD | HDWR | | BD | | | |
| V56K1373X | ET DR C/L | LCH 1B1/2B2 FA3 STOW CMD | HDWR | | BD | | | |
| V56K1374X | ET DR C/L | LCH 1B2/2A1 FA3 STOW CMD | HDWR | | BD | | | |
| V56K1375X | ET DR C/L | LCH 1B1/2A2 FA4 LOCK CMD | HDWR | | BD | | | |
| V56K1376X | ET DR C/L | LCH 1A2/2A1 FA4 LOCK CMD | HDWR | | BD | | | |
| V56K1377X | ET DR C/L | LCH 1B1/2B2 FA3 LOCK CMD | HDWR | | BD | | | |
| V56K1378X | ET DR C/L | LCH 1B2/2B1 FA3 LOCK CMD | HDWR | | BD | | | |
| V56K3111X | ET UMB DR | L-B2/R-B1 CLOSE CMD | HDWR | | BD | | | |
| V56K3112X | ET UMB DR | R-B2 CLOSE CMD | HDWR | | BD | | | |
| V56K3531X | ET L UMB | COUT DOOR LATCH FA1 CMD | HDWR | | BD | | | |
| V56K3532X | ET R UMB | COUT DOOR LATCH FA1 CMD | HDWR | | BD | | | |
| V56K3533X | ET L UMB | COUT DOOR LATCH FA4 CMD | HDWR | | BD | | | |
| V56K3534X | ET R UMB | COUT DOOR LATCH FA4 CMD | HDWR | | BD | | | |
| V56K4121X | ET UMB DR | R-B1/B2 CLOSE CMD | HDWR | | BD | | | |
| V56K4122X | ET UMB DR | L-B1 CLOSE CMD | HDWR | | BD | | | |
| V56K4531X | ET L UMB | COUT DOOR LATCH FA3 CMD | HDWR | | BD | | | |
| V56K4532X | ET R UMB | COUT DOOR LATCH FA3 CMD | HDWR | | BD | | | |
| V56K4533X | ET L UMB | COUT DOOR LATCH FA2 CMD | HDWR | | BD | | | |
| V56K4534X | ET R UMB | COUT DOOR LATCH FA2 CMD | HDWR | | BD | | | |
| V76K6941XB | L SRB BUS | C RPC A ON CMD | HDWR | | | | 79935H | |
| V76K6942XB | R SRB BUS | C RPC A ON CMD | HDWR | | | | 79935H | |
| V76K6945XB | L SRB BUS | C RPC C ON CMD | HDWR | | | | | |
| V76K6946XB | R SRB BUS | C RPC C ON CMD | HDWR | | | | | |
| V90M2857PB | CGEB_IPA_LG2_FLAG_WD1_HFE | | DL FMT | 21/A | | | 93017G | * |
| V90M2939PB | CGEB_FLT_LG2_FLAG_HFE | | DL FMT | 21/1 | | | 93017G | * |
| V90X5964X | MPS LO2 FEED DISC FAIL OPEN FLAG | | MPS DUMP | | BD | | 90007G | |
| V90X8253X | MPS DUMP GIMBAL POS FLAG | | MPS TVC CMD SOP | | | | | |
| V90X8259X | ET AUTO SEP INHIBIT CREW ALERT | | DL FMT | 21/1 | BD | | 93017G | * |
| | | | GAX | | | | | |
| | | | RTLS TRAJ | 2 DISP | | | | |
| | | | XXXXXX TRAJ | 1 DISP | | | | |
| | | | XXXXXX TRAJ | 2 DISP | | | | |

TABLE 4.2.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM EXTERNAL TANK SEPARATION SEQUENCER (G4.116)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|--------|--------------|-------------|-------|-----------|------------------|---------|-------------|
|-----------|--------|--------------|-------------|-------|-----------|------------------|---------|-------------|

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 4.2.3.4-3. EXTERNAL TANK SEPARATION SEQUENCER (G4.116) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|-------------------------------|-----------|-----------|----|----|---|---|---------|----|-----|---------|-------------|
| ETSEP_INHIBIT_TIME | V97U1580C | SEC | F | S | D | C | G4.116 | 00 | RES | 93087E | |
| RTLS_BODY_NEG_PITCH_RATE_LMT | V97U9769C | DEG/SEC | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_BODY_NEG_ROLL_RATE_LMT | V97U9771C | DEG/SEC | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_BODY_NEG_YAW_RATE_LMT | V97U9773C | DEG/SEC | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_BODY_PLUS_PITCH_RATE_LMT | V97U9768C | DEG/SEC | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_BODY_PLUS_ROLL_RATE_LMT | V97U9770C | DEG/SEC | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_BODY_PLUS_YAW_RATE_LMT | V97U9772C | DEG/SEC | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_NEG_ANGLE_OF_ATTACK_LMT | V97U9775C | DEG | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_NEG_SIDESLIP_ANGLE_LMT | V97U9777C | DEG | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_PLUS_ANGLE_OF_ATTACK_LMT | V97U9774C | DEG | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| RTLS_PLUS_SIDESLIP_ANGLE_LMT | V97U9776C | DEG | F | S | D | C | G4.116 | 00 | RES | 91013D | |
| TAL_ABORT_DELAY_TIME | V97U9717C | SEC | F | D | L | C | G4.116 | 00 | ZSZ | 90007G | |

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

TABLE 4.2.3.4-4. EXTERNAL TANK SEPARATION SEQUENCER (G4.116) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|------------------------------|-----------|----|-------------|-----------|---------|--------|---|----------|---------|-------------|
| NOM_BODY_NEG_PITCH_RATE_LMT | V97U9763C | 00 | -7.0 | E-01 | DEG/SEC | F | S | C G4.116 | 79928 | |
| NOM_BODY_NEG_ROLL_RATE_LMT | V97U9765C | 00 | -7.0 | E-01 | DEG/SEC | F | S | C G4.116 | 79928 | |
| NOM_BODY_NEG_YAW_RATE_LMT | V97U9767C | 00 | -7.0 | E-01 | DEG/SEC | F | S | C G4.116 | 79928 | |
| NOM_BODY_PLUS_PITCH_RATE_LMT | V97U9762C | 00 | +7.0 | E-01 | DEG/SEC | F | S | C G4.116 | 79928 | |
| NOM_BODY_PLUS_ROLL_RATE_LMT | V97U9764C | 00 | +7.0 | E-01 | DEG/SEC | F | S | C G4.116 | 79928 | |
| NOM_BODY_PLUS_YAW_RATE_LMT | V97U9766C | 00 | +7.0 | E-01 | DEG/SEC | F | S | C G4.116 | 79928 | |

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

TABLE 4.2.3.4-5. EXTERNAL TANK SEPARATION SEQUENCER (G4.116) 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.

4.2.4 MPS Dump Sequence (4.70)

4.2.4.1 Introduction

The MPS dump sequence performs the function of expelling the LO₂ and LH₂ trapped in the orbiter propellant lines and in the main engines after the main engines have been shutdown. The propellants are dumped overboard to minimize hazardous conditions upon atmospheric reentry, to reduce landing weight, and to improve orbiter center of gravity considerations.

4.2.4.2 Overview

For nominal missions, the MPS dump sequence is scheduled at a frequency of 1.04 Hz by the GN&C moding, sequencing, and control (MSC) function from MECO confirmed plus an I-load time delay and continues until OPS 2 or 3 transition. The actual propellant dump starts automatically 100 seconds after the sequence is scheduled. The crew, however, has the capability to initiate the dump earlier by placing the "PRPLT Dump Seq" switch on panel R2 to the start position. Also, if the LH₂ manifold pressure exceeds 60 psia, the propellant dump will automatically start.

The crew has the capability to open and close the MPS LH₂ RTLS dump valves after completion of the automatic dump using the MPS backup LH₂ valve switch on panel R2.

The nominal LH₂ dump sequence consists of opening LH₂ propellant valves to perform an unpressurized LH₂ dump through the fill and drain valves for 120 seconds. The LO₂ dump sequence consists of opening the LO₂ prevalues and SSME MOVs to perform a pressurized LO₂ dump through the SSMEs for 90 seconds. This is followed by 30 seconds of unpressurized LO₂ dump, after which the MOVs are closed.

After a 15 minute heat soak back period in which the LO₂ and LH₂ is allowed to sublime, a 2 minute vacuum inert of the LO₂ and LH₂ manifolds is automatically initiated. This allows any residual H₂ and O₂ gases to disperse into space.

At MM 106 transition, a second vacuum inert of the LH₂ manifold is automatically initiated. This allows any residual H₂ gases to disperse into space. Once the second vacuum inert is completed, the MPS LH₂ feed and pressurization systems are pressurized with helium for an in-flight system decay check.

When a transition to OPS 2 or OPS 3 is initiated, certain valves used by the MPS Dump Sequence are closed prior to leaving OPS 1. This is done to ensure appropriate valve configuration in case the transition occurred while the dump sequence was in progress.

When an RTLS abort has been declared, the MPS dump sequence is scheduled by the MSC function at the transition to Major Mode (MM) 602, and the propellant dump is automatically started. The sequence operates until the OPS 9 transition.

During an intact RTLS abort, the LH₂ dump sequence consists of opening LH₂ propellant valves at MM 602 to perform a 20 second unpressurized LH₂ dump. The LH₂ inboard fill/drain valve is then closed and the propellant lines are purged with pressurized helium for 80 seconds. The system pressure is then allowed to vent down before the propellant valves are closed when the Ground relative velocity (GRV) cue is equal to or less than 3,800 ft/sec. The LO₂ dump sequence consists of an unpressurized LO₂ dump through the LO₂ prevalues and SSME MOVs at MM 602 transition plus an I-loaded time delay. Once the LO₂ dump is initiated, the MPS LO₂ DUMP START flag is set true. Additional unpressurized LO₂ dump is performed through the LO₂ fill/drain line when dynamic pressure is at or greater than 20 lb/ft² after an

I-load time delay has elapsed since MPS LO2 DUMP START is set true. All propellant valves are closed when the GRV cue is equal to or less than 3800 ft/sec.

For RTLS contingency abort, the unpressurized LO2 dump occurs through the SSME MOVs at MM602 transition. Once the LO2 dump has begun, the MPS LO2 DUMP START flag is set true. An additional unpressurized LO2 dump is performed through the LO2 fill/drain line when dynamic pressure is at or greater than 20 lb/ft² after an I-load time delay has elapsed since MPS LO2 DUMP START is set true. The LH2 MPS dump sequence is the same as intact RTLS abort.

During an intact RTLS abort or an RTLS contingency abort, the MPS manifolds and feedlines are pressurized, and a helium purge of the aft compartment, OMS PODS, and ET Umbilical Cavity is performed to prevent ingestion of contaminants and to inert the environment.

4.2.4.3 Detailed Requirements

Step 1. This step controls initial branching within the MPS dump sequence.

On first entry into this step, set outputs (1) through (10) and (13), (14) true, and proceed to monitor signal (a). On subsequent passes, proceed to monitor signal (a).

If (a) is true, on first pass, start timer (b) and proceed to Step 7. On subsequent passes, proceed to Step 7. Otherwise proceed to monitor signal (c).

| | | |
|-----|----------------------|------------|
| (a) | RTLS ABORT DECLARED | V90X8637X |
| (b) | MPS PRPLT DUMP TIMER | (INTERNAL) |
| (c) | OPS 201 Pro flag | V93X0006X |
| (d) | OPS 301 Pro flag | V93X0004X |

If (c) is true, set (5) through (10), (15) false and deactivate sequence. Otherwise, proceed to monitor signal (d).

If (d) is true, set outputs (11) and (12) false, and deactivate sequence. Otherwise proceed to Step 2.

| | | |
|------|--------------------------------------|-----------|
| (1) | MPS E1 HE INTCN OUT (LV60) OP CMD A | V41K1168X |
| (2) | MPS E2 HE INTCN IN (LV61) OP CMD A | V41K1262X |
| (3) | MPS E2 HE INTCN IN (LV61) OP CMD B | V41K1263X |
| (4) | MPS E3 HE INTCN OUT (LV64) OP CMD A | V41K1368X |
| (5) | MPS LH2 RTLS INBD DV (PV17) OP CMD A | V41K1923X |
| (6) | MPS LH2 RTLS INBD DV (PV17) OP CMD B | V41K1924X |
| (7) | MPS LH2 RTLS INBD DV (PV17) OP CMD C | V41K1925X |
| (8) | MPS LH2 RTLS OTBD DV (PV18) OP CMD A | V41K1913X |
| (9) | MPS LH2 RTLS OTBD DV (PV18) OP CMD B | V41K1914X |
| (10) | MPS LH2 RTLS OTBD DV (PV18) OP CMD C | V41K1915X |
| (11) | MPS LO2 MANF REPRSS 1 (LV40) OP CMD | V41K1535X |
| (12) | MPS LO2 MANF REPRSS 2 (LV41) OP CMD | V41K1537X |
| (13) | MPS PNEU HE ISO VLV 1 (LV7) OP CMD | V41K1607X |
| (14) | MPS PNEU HE ISO VLV 2 (LV8) OP CMD | V41K1608X |
| (15) | ET/ORB SEP CAMERAS ON CMD | V56K0000X |

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Step 2. This step provides for initiation of the MPS dump procedure in non-RTLS cases.

On first pass into this step, start timer (a) and proceed to monitor signal (b). On subsequent passes, proceed to monitor signal (b).

| | | |
|-----|-------------------------------------|------------|
| (a) | MPS DUMP INIT DELAY TIMER | (INTERNAL) |
| (b) | MPS DUMP STARTED FLAG | (INTERNAL) |
| (c) | MPS LH2 17IN FEED MANF PRESS | V41P1433C |
| (d) | FA1 INPUT PROM SEG 1,2 STATUS (MFE) | V91X2841X |
| (e) | SEL MPS PRPLT DUMP SEQ START | V90X7559X |
| (f) | SEL MPS PRPLT DUMP SEQ STOP | V90X7567X |

If (b) is true, proceed to Step 3. Otherwise proceed to monitor signals (e) and (f).

If (f) is false and (e) is true, proceed to Step 3. If (e) and (f) are both false or if (e) and (f) are both true, then proceed to monitor signals (c) and (d). If (f) is true and (e) is false, return to Step 1.

If ((60 psia < (c) <= 90 psia) and (d) is false), proceed to Step 3. Otherwise proceed to monitor timer (a).

If 100 or more seconds have elapsed since timer (a) started, proceed to Step 3. Otherwise return to Step 1.

Step 3. This step starts the MPS dump procedure in non-RTLS cases.

On first pass into this step, set outputs (1), and (4) through (29) true, and outputs (30) and (31) false, start timer (32) and proceed to monitor signal (a) below. On subsequent passes, proceed to Step 4.

If (a) is false set outputs (2) and (3) true and return to Step 1. Otherwise, return to Step 1.

| | | |
|------|-------------------------------------|------------|
| (a) | MPS LO2 FEED DISC FAIL OPEN FLAG | V90X5964X |
| (1) | MPS DUMP STARTED FLAG | (INTERNAL) |
| (2) | MPS LO2 MANF REPRSS 1 (LV40) OP CMD | V41K1535X |
| (3) | MPS LO2 MANF REPRSS 2 (LV41) OP CMD | V41K1537X |
| (4) | MPS LO2 DUMP START | V90X8301X |
| (5) | MPS E1 LO2 PREVLV (PV1) OP CMD A | V41K1136X |
| (6) | MPS E1 LO2 PREVLV (PV1) OP CMD B | V41K1137X |
| (7) | MPS E1 LO2 PREVLV (PV1) OP CMD C | V41K1138X |
| (8) | MPS E1 LO2 PREVLV (PV1) OP CMD D | V41K1143X |
| (9) | MPS E2 LO2 PREVLV (PV2) OP CMD A | V41K1236X |
| (10) | MPS E2 LO2 PREVLV (PV2) OP CMD B | V41K1237X |
| (11) | MPS E2 LO2 PREVLV (PV2) OP CMD C | V41K1238X |
| (12) | MPS E2 LO2 PREVLV (PV2) OP CMD D | V41K1243X |
| (13) | MPS E3 LO2 PREVLV (PV3) OP CMD A | V41K1336X |
| (14) | MPS E3 LO2 PREVLV (PV3) OP CMD B | V41K1337X |
| (15) | MPS E3 LO2 PREVLV (PV3) OP CMD C | V41K1338X |
| (16) | MPS E3 LO2 PREVLV (PV3) OP CMD D | V41K1343X |
| (17) | MPS LH2 OTBD F/D VLV (PV11) OP CMD | V41K1391X |
| (18) | MPS LH2 INBD F/D (PV12) OP CMD A | V41K1401X |
| (19) | MPS LH2 INBD F/D (PV12) OP CMD B | V41K1402X |
| (20) | MPS LH2 TOPPING VALVE (PV13) OP CMD | V41K1411X |
| (21) | MPS E1 LH2 PREVLV (PV4) OP CMD A | V41K1119X |

| | | |
|------|------------------------------------|------------|
| (22) | MPS E1 LH2 PREVLV (PV4) OP CMD B | V41K1120X |
| (23) | MPS E1 LH2 PREVLV (PV4) OP CMD C | V41K1121X |
| (24) | MPS E2 LH2 PREVLV (PV5) OP CMD A | V41K1219X |
| (25) | MPS E2 LH2 PREVLV (PV5) OP CMD B | V41K1220X |
| (26) | MPS E2 LH2 PREVLV (PV5) OP CMD C | V41K1221X |
| (27) | MPS E3 LH2 PREVLV (PV6) OP CMD A | V41K1319X |
| (28) | MPS E3 LH2 PREVLV (PV6) OP CMD B | V41K1320X |
| (29) | MPS E3 LH2 PREVLV (PV6) OP CMD C | V41K1321X |
| (30) | MPS LH2 INBD F/D (PV12) CL CMD | V41K1412X |
| (31) | MPS LH2 OTBD F/D VLV (PV11) CL CMD | V41K1393X |
| (32) | MPS PRPLT DUMP TIMER | (INTERNAL) |

Step 4. This step removes LO₂ manifold repressurization at the end of the LO₂ pressurized dump and provides for MPS dump termination.

Monitor the following:

| | | |
|-----|----------------------------------|------------|
| (a) | MPS PRPLT DUMP TIMER | (INTERNAL) |
| (b) | SEL MPS PRPLT DUMP BU LH2 VLV CL | V90X7742X |
| (c) | SEL MPS PRPLT DUMP BU LH2 VLV OP | V90X7557X |
| (d) | MPS LH2 RTLS DV OP FLAG | (INTERNAL) |

If 90 or more seconds have elapsed since starting timer (a), on first pass, set outputs (1) and (2) false, and proceed to monitor timer (a). Otherwise proceed to monitor timer (a).

If 120 or more seconds have elapsed since starting timer (a), on first pass, set outputs (3), (4) and (27) true and outputs (5) through (26) false and proceed to Step 10. On subsequent passes, monitor signals (b), (c) and (d). Otherwise return to Step 1.

If (b) and (d) are both true, set outputs (7) through (12) and (28) false and proceed to monitor signals (c) and (d). Otherwise proceed to monitor signals (c) and (d).

If (c) is true and (d) is false, set outputs (7) through (12) and (28) true and proceed to step 5. Otherwise proceed to step 5.

| | | |
|------|--------------------------------------|-----------|
| (1) | MPS LO2 MANF REPRSS 1 (LV40) OP CMD | V41K1535X |
| (2) | MPS LO2 MANF REPRSS 2 (LV41) OP CMD | V41K1537X |
| (3) | MPS LO2 DUMP STOP | V90X8302X |
| (4) | MPS LH2 OTBD F/D VLV (PV11) CL CMD | V41K1393X |
| (5) | MPS LH2 TOPPING VALVE (PV13) OP CMD | V41K1411X |
| (6) | MPS LH2 OTBD F/D VLV (PV11) OP CMD | V41K1391X |
| (7) | MPS LH2 RTLS INBD DV (PV17) OP CMD A | V41K1923X |
| (8) | MPS LH2 RTLS INBD DV (PV17) OP CMD B | V41K1924X |
| (9) | MPS LH2 RTLS INBD DV (PV17) OP CMD C | V41K1925X |
| (10) | MPS LH2 RTLS OTBD DV (PV18) OP CMD A | V41K1913X |
| (11) | MPS LH2 RTLS OTBD DV (PV18) OP CMD B | V41K1914X |
| (12) | MPS LH2 RTLS OTBD DV (PV18) OP CMD C | V41K1915X |
| (13) | MPS E1 HE INTCN OUT (LV60) OP CMD A | V41K1168X |
| (14) | MPS E2 HE INTCN IN (LV61) OP CMD A | V41K1262X |

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| | | |
|------|-------------------------------------|------------|
| (15) | MPS E2 HE INTCN IN (LV61) OP CMD B | V41K1263X |
| (16) | MPS E3 HE INTCN OUT (LV64) OP CMD A | V41K1368X |
| (17) | MPS E1 HE ISO VLV B (LV2) OP CMD A | V41K1156X |
| (18) | MPS E1 HE ISO VLV B (LV2) OP CMD B | V41K1157X |
| (19) | MPS E1 HE ISO VLV A (LV1) OP CMD | V41K1155X |
| (20) | MPS E2 HE ISO VLV B (LV4) OP CMD A | V41K1256X |
| (21) | MPS E2 HE ISO VLV B (LV4) OP CMD B | V41K1257X |
| (22) | MPS E2 HE ISO VLV A (LV3) OP CMD | V41K1255X |
| (23) | MPS E3 HE ISO VLV B (LV6) OP CMD A | V41K1356X |
| (24) | MPS E3 HE ISO VLV B (LV6) OP CMD B | V41K1357X |
| (25) | MPS E3 HE ISO VLV A (LV5) OP CMD | V41K1355X |
| (26) | MPS REG HE XOVER VLV (LV10) OP CMD | V41K1613X |
| (27) | ENTRY STOW GIMBAL POS FLAG | V90X8254X |
| (28) | MPS LH2 RTLS DV OP FLAG | (INTERNAL) |

Step 5. This step provides for vacuum inert capability after the propellant dump has been performed.

Monitor the following:

| | | |
|-----|-------------------------------------|------------|
| (a) | MPS LO2 17IN FEED MANF DISC PRESS | V41P1533C |
| (b) | FA2 INPUT PROM SEG 1,2 STATUS (MFE) | V91X2842X |
| (c) | MPS PRPLT DUMP TIMER | (INTERNAL) |
| (d) | MPS LH2 17IN FEED MANF PRESS | V41P1433C |
| (e) | FA1 INPUT PROM SEG 1,2 STATUS (MFE) | V91X2841X |
| (f) | MPS LH2 RTLS DV OPEN INITIATED FLAG | (INTERNAL) |

If ((a) < 30 psia) and (b) is false) and 1020 or more seconds and less than 1140 seconds have elapsed since starting timer (c), on first pass, set outputs (1) through (3) true and outputs (4) and (5) false, and proceed to monitor (c), (d), (e) and (f). Otherwise proceed to monitor (c), (d), (e) and (f).

If (60 psia < (d) <= 90 psia) and (e) and (f) are false, on first pass, set outputs (6) and (7) true and output (8) false, and proceed to monitor timer (c). Otherwise proceed to monitor timer (c).

If 1020 or more seconds have elapsed since starting timer (c), on first pass, set outputs (6) and (9) through (15) true and proceed to monitor timer (c). Otherwise proceed to monitor timer (c).

If 1140 or more seconds have elapsed since starting timer (c), on first pass, set outputs (1), (6), (7) and (9) through (14) false and outputs (4) and (8) true, and return to Step 1. On subsequent passes proceed to Step 6.

| | | |
|------|--------------------------------------|-----------|
| (1) | MPS LO2 OTBD F/D VLV (PV9) OP CMD | V41K1518X |
| (2) | MPS LO2 INBD F/D (PV10) OP CMD A | V41K1501X |
| (3) | MPS LO2 INBD F/D (PV10) OP CMD B | V41K1502X |
| (4) | MPS LO2 OTBD F/D VLV (PV9) CL CMD | V41K1515X |
| (5) | MPS LO2 INBD F/D VLV (PV10) CL CMD | V41K1512X |
| (6) | MPS LH2 TOPPING VALVE (PV13) OP CMD | V41K1411X |
| (7) | MPS LH2 OTBD F/D VLV (PV11) OP CMD | V41K1391X |
| (8) | MPS LH2 OTBD F/D VLV (PV11) CL CMD | V41K1393X |
| (9) | MPS LH2 RTLS INBD DV (PV17) OP CMD A | V41K1923X |
| (10) | MPS LH2 RTLS INBD DV (PV17) OP CMD B | V41K1924X |

| | | |
|------|--------------------------------------|------------|
| (11) | MPS LH2 RTLS INBD DV (PV17) OP CMD C | V41K1925X |
| (12) | MPS LH2 RTLS OTBD DV (PV18) OP CMD A | V41K1913X |
| (13) | MPS LH2 RTLS OTBD DV (PV18) OP CMD B | V41K1914X |
| (14) | MPS LH2 RTLS OTBD DV (PV18) OP CMD C | V41K1915X |
| (15) | MPS LH2 RTLS DV OPEN INITIATED FLAG | (INTERNAL) |

Step 6. This step protects against failure of the outboard fill and drain valves to close after the vacuum inert in Step 5.

Monitor timer (a) below:

| | | |
|-----|---------------------------------------|------------|
| (a) | MPS PRPLT DUMP TIMER | (INTERNAL) |
| (b) | MPS LO2 OTBD F/D VLV (PV9) CL IND | V41X1514X |
| (c) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (d) | MPS LH2 OTBD F/D VLV (PV11) CL IND | V41X1389X |
| (e) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |

If 1160 or more seconds have elapsed since starting timer (a), on first pass, proceed to monitor signals (b) and (c). On subsequent passes proceed to monitor timer (a). Otherwise return to Step 1.

If (b) is false or (c) is true, set outputs (1) and (2) false and output (5) true, and proceed to monitor signals (d) and (e). Otherwise proceed to monitor signals (d) and (e).

If (d) is false or (e) is true, set outputs (3) and (4) false and output (6) true and return to Step 1. Otherwise, return to Step 1.

If 1180 or more seconds have elapsed since starting timer (a), on first pass, set outputs (1) through (8) false and return to Step 1. On subsequent passes proceed to Step 6A.

| | | |
|-----|------------------------------------|-----------|
| (1) | MPS LO2 INBD F/D (PV10) OP CMD A | V41K1501X |
| (2) | MPS LO2 INBD F/D (PV10) OP CMD B | V41K1502X |
| (3) | MPS LH2 INBD F/D (PV12) OP CMD A | V41K1401X |
| (4) | MPS LH2 INBD F/D (PV12) OP CMD B | V41K1402X |
| (5) | MPS LO2 INBD F/D VLV (PV10) CL CMD | V41K1512X |
| (6) | MPS LH2 INBD F/D (PV12) CL CMD | V41K1412X |
| (7) | MPS LH2 OTBD F/D VLV (PV11) CL CMD | V41K1393X |
| (8) | MPS LO2 OTBD F/D VLV (PV9) CL CMD | V41K1515X |

Step 6A. This step performs the second LH2 vacuum inert, repressurizes the LH2 manifold, and removes pneumatic pressure.

Monitor the following:

| | | |
|-----|---------------------------------------|------------|
| (a) | MAJOR MODE 106 FLAG | V90X8153X |
| (b) | 2 nd VACUUM INERT TIMER | (INTERNAL) |
| (c) | MPS LH2 RTLS INBD DV(PV17)CL IND | V41X1929X |
| (d) | MPS LH2 RTLS OTBD DV(PV18) CL IND | V41X1919X |
| (e) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (f) | FA4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |

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If (a) is true, on first pass, start timer (b) and set outputs (1) through (7) true and return to Step 1. On subsequent passes, proceed to monitor timer (b). Otherwise return to Step 1.

If 120 or more seconds have elapsed since starting timer (b), on first pass, set outputs (1) through (7) false and output (8) true, and return to Step 1. On subsequent passes, proceed to monitor (b), (c), (d), (e) and (f). Otherwise return to Step 1.

If (((c) is true and (f) is false) or ((d) is true and (e) is false)) and 130 or more seconds and less than 140 seconds have elapsed since starting timer (b), on first pass, set outputs (9) and (10) true, and proceed to monitor timer (b). Otherwise proceed to monitor timer (b).

If 140 or more seconds have elapsed since starting timer (b), on first pass, set outputs (9) and (10) false and return to Step 1. On subsequent passes, proceed to monitor (b). Otherwise return to Step 1.

If 160 or more seconds have elapsed since starting timer (b), on first pass, set outputs (8), (11), and (12) false and return to Step 1. Otherwise return to Step 1.

| | | |
|------|--------------------------------------|-----------|
| (1) | MPS LH2 TOPPING VALVE (PV13) OP CMD | V41K1411X |
| (2) | MPS LH2 RTLS INBD DV (PV17) OP CMD A | V41K1923X |
| (3) | MPS LH2 RTLS INBD DV (PV17) OP CMD B | V41K1924X |
| (4) | MPS LH2 RTLS INBD DV (PV17) OP CMD C | V41K1925X |
| (5) | MPS LH2 RTLS OTBD DV (PV18) OP CMD A | V41K1913X |
| (6) | MPS LH2 RTLS OTBD DV (PV18) OP CMD B | V41K1914X |
| (7) | MPS LH2 RTLS OTBD DV (PV18) OP CMD C | V41K1915X |
| (8) | MPS E1 HE INTCN OUT (LV60) OP CMD A | V41K1168X |
| (9) | MPS LH2 MANF REPRESS 1 (LV42) OP CMD | V41K1435X |
| (10) | MPS LH2 MANF REPRESS 2 (LV43) OP CMD | V41K1437X |
| (11) | MPS PNEU HE ISO VLV 1 (LV7) OP CMD | V41K1607X |
| (12) | MPS PNEU HE ISO VLV 2 (LV8) OP CMD | V41K1608X |

Step 7. This step provides for automatic RTLS MPS dump operation.

On first pass into this step, start timer (f), set outputs (14) through (26) true and outputs (33) and (39) false and proceed to monitor (f) and (g). Otherwise proceed to monitor (f) and (g).

| | | |
|-----|--------------------------------|------------|
| (a) | MPS PRPLT DUMP TIMER | (INTERNAL) |
| (b) | GN&C DYNAMIC PRESSURE | V95P3011C |
| (c) | RTLS_LO_F_D_DELAY | V97U9743C |
| (d) | RTLS LO FILL/DRAIN DELAY TIMER | (INTERNAL) |
| (e) | RTLS_MOV_DELAY | V97U9730C |
| (f) | RTLS MOV DELAY TIMER | (INTERNAL) |
| (g) | GLIDE_RTLS_INHIBIT | V90X2090X |
| (h) | RTLS MPS DUMP STOP FLAG | (INTERNAL) |
| (i) | RTLS MPS DUMP START FLAG | (INTERNAL) |

If (f) >= (e) or (g) is true, on first pass, start timer (d), set outputs (1) through (13) and (40) true, and proceed to monitor timer (a). On subsequent passes, monitor timer (a). Otherwise, proceed to monitor timer (a).

If twenty or more seconds have elapsed since timer (a) was started, on first pass, set outputs (27) through (33) true and outputs (15) and (16) false, and return to step 1. On subsequent passes, proceed to monitor signals (b), (d), (h) and (i). Otherwise, return to Step 1.

If (i) is true and (b) $\geq 20 \text{ lb/ft}^2$ and (d) \geq (c) and (h) is false, on first pass, set outputs (34) through (36) true and outputs (37) and (38) false, and proceed to Step 8. On subsequent passes, proceed to Step 8. Otherwise proceed to Step 8.

| | | |
|------|--------------------------------------|------------|
| (1) | MPS LO2 DUMP START | V90X8301X |
| (2) | MPS E1 LO2 PREVLV (PV1) OP CMD A | V41K1136X |
| (3) | MPS E1 LO2 PREVLV (PV1) OP CMD B | V41K1137X |
| (4) | MPS E1 LO2 PREVLV (PV1) OP CMD C | V41K1138X |
| (5) | MPS E1 LO2 PREVLV (PV1) OP CMD D | V41K1143X |
| (6) | MPS E2 LO2 PREVLV (PV2) OP CMD A | V41K1236X |
| (7) | MPS E2 LO2 PREVLV (PV2) OP CMD B | V41K1237X |
| (8) | MPS E2 LO2 PREVLV (PV2) OP CMD C | V41K1238X |
| (9) | MPS E2 LO2 PREVLV (PV2) OP CMD D | V41K1243X |
| (10) | MPS E3 LO2 PREVLV (PV3) OP CMD A | V41K1336X |
| (11) | MPS E3 LO2 PREVLV (PV3) OP CMD B | V41K1337X |
| (12) | MPS E3 LO2 PREVLV (PV3) OP CMD C | V41K1338X |
| (13) | MPS E3 LO2 PREVLV (PV3) OP CMD D | V41K1343X |
| (14) | MPS LH2 OTBD F/D VLV (PV11) OP CMD | V41K1391X |
| (15) | MPS LH2 INBD F/D (PV12) OP CMD A | V41K1401X |
| (16) | MPS LH2 INBD F/D (PV12) OP CMD B | V41K1402X |
| (17) | MPS LH2 TOPPING VALVE (PV13) OP CMD | V41K1411X |
| (18) | MPS E1 LH2 PREVLV (PV4) OP CMD A | V41K1119X |
| (19) | MPS E1 LH2 PREVLV (PV4) OP CMD B | V41K1120X |
| (20) | MPS E1 LH2 PREVLV (PV4) OP CMD C | V41K1121X |
| (21) | MPS E2 LH2 PREVLV (PV5) OP CMD A | V41K1219X |
| (22) | MPS E2 LH2 PREVLV (PV5) OP CMD B | V41K1220X |
| (23) | MPS E2 LH2 PREVLV (PV5) OP CMD C | V41K1221X |
| (24) | MPS E3 LH2 PREVLV (PV6) OP CMD A | V41K1319X |
| (25) | MPS E3 LH2 PREVLV (PV6) OP CMD B | V41K1320X |
| (26) | MPS E3 LH2 PREVLV (PV6) OP CMD C | V41K1321X |
| (27) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD A | V41K1905X |
| (28) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD A | V41K1906X |
| (29) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD B | V41K1907X |
| (30) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD B | V41K1908X |
| (31) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD C | V41K1909X |
| (32) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD C | V41K1910X |
| (33) | MPS LH2 INBD F/D (PV12) CL CMD | V41K1412X |
| (34) | MPS LO2 OTBD F/D VLV (PV9) OP CMD | V41K1518X |
| (35) | MPS LO2 INBD F/D (PV10) OP CMD A | V41K1501X |
| (36) | MPS LO2 INBD F/D (PV10) OP CMD B | V41K1502X |
| (37) | MPS LO2 INBD F/D VLV (PV10) CL CMD | V41K1512X |
| (38) | MPS LO2 OTBD F/D VLV (PV9) CL CMD | V41K1515X |
| (39) | MPS LH2 OTBD F/D VLV (PV11) CL CMD | V41K1393X |
| (40) | RTLS MPS DUMP START FLAG | (INTERNAL) |

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Step 8. This step controls the helium purge and terminates the RTLS propellant dump.

Monitor the following:

- | | | |
|-----|-------------------------------------|------------|
| (a) | MPS LH2 17IN FEED MANF DISC PRESS | V41P1433C |
| (b) | FA1 INPUT PROM SEG 1,2 STATUS (MFE) | V91X2841X |
| (c) | MPS PRPLT DUMP TIMER | (INTERNAL) |

If ((60 psia < (a) <= 90 psia) and (b) is false) or 100 or more seconds have elapsed since starting timer (c), on first pass, set outputs (1) through (6) false, and proceed to monitor signal (d). Otherwise proceed to monitor signal (d).

- | | | |
|-----|----------------------------------|------------|
| (d) | GND REL VEL MAGNITUDE IN M50 SYS | V95L0151C |
| (e) | HE PURGE TIMER | (INTERNAL) |
| (f) | HE_PURGE_VEL | V96U8958C |

If (d) <= (f), on first pass, set outputs (7) and (8) true, start timer (e), and proceed to monitor signal (d). Otherwise proceed to monitor signal (d).

If (d) <= 3,800 ft/sec, on first pass, set outputs (9) through (27) and (52) true and outputs (28) through (34) and (36) through (48) false, start timer (g) and return to Step 1. On subsequent passes, proceed to monitor timer (g). Otherwise return to Step 1.

- | | | |
|-----|---------------------------------------|------------|
| (g) | 20 SEC FILL/DRAIN TIMER | (INTERNAL) |
| (h) | MPS LO2 OTBD F/D VLV (PV9) CL IND | V41X1514X |
| (i) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (j) | MPS LH2 OTBD F/D VLV (PV11) CL IND | V41X1389X |
| (k) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |

If twenty or more seconds have elapsed since starting timer (g), on first pass, proceed to monitor signal (h) and (i). On subsequent passes, proceed to Step 9. Otherwise return to Step 1.

If (h) is false or (i) is true, set output (49) true and outputs (50) and (51) false, and proceed to monitor signals (j) and (k). Otherwise proceed to monitor signals (j) and (k).

If (j) is false or (k) is true, set output (35) false and return to Step 1. Otherwise return to Step 1.

- | | | |
|------|--------------------------------------|-----------|
| (1) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD A | V41K1905X |
| (2) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD A | V41K1906X |
| (3) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD B | V41K1907X |
| (4) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD B | V41K1908X |
| (5) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD C | V41K1909X |
| (6) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD C | V41K1910X |
| (7) | MPS HE SPLY BLWDWN 1 (LV26) OP CMD | V41K1631X |
| (8) | MPS HE SPLY BLWDWN 2 (LV27) OP CMD | V41K1633X |
| (9) | MPS LO2 DUMP STOP | V90X8302X |
| (10) | MPS LH2 OTBD F/D VLV (PV11) CL CMD | V41K1393X |
| (11) | MPS LO2 OTBD F/D VLV (PV9) CL CMD | V41K1515X |
| (12) | MPS LH2 MANF REPRSS 1 (LV42) OP CMD | V41K1435X |
| (13) | MPS LH2 MANF REPRSS 2 (LV43) OP CMD | V41K1437X |
| (14) | MPS E1 LO2 PREVLV (PV1) CL CMD A | V41K1139X |

| | | |
|------|--------------------------------------|------------|
| (15) | MPS E1 LO2 PREVLV (PV1) CL CMD B | V41K1140X |
| (16) | MPS E1 LO2 PREVLV (PV1) CL CMD C | V41K1141X |
| (17) | MPS E1 LO2 PREVLV (PV1) CL CMD D | V41K1142X |
| (18) | MPS E2 LO2 PREVLV (PV2) CL CMD A | V41K1239X |
| (19) | MPS E2 LO2 PREVLV (PV2) CL CMD B | V41K1240X |
| (20) | MPS E2 LO2 PREVLV (PV2) CL CMD C | V41K1241X |
| (21) | MPS E2 LO2 PREVLV (PV2) CL CMD D | V41K1242X |
| (22) | MPS E3 LO2 PREVLV (PV3) CL CMD A | V41K1339X |
| (23) | MPS E3 LO2 PREVLV (PV3) CL CMD B | V41K1340X |
| (24) | MPS E3 LO2 PREVLV (PV3) CL CMD C | V41K1341X |
| (25) | MPS E3 LO2 PREVLV (PV3) CL CMD D | V41K1342X |
| (26) | MPS LO2 MANF REPRSS 1 (LV40) OP CMD | V41K1535X |
| (27) | MPS LO2 MANF REPRSS 2 (LV41) OP CMD | V41K1537X |
| (28) | MPS LH2 RTLS INBD DV (PV17) OP CMD A | V41K1923X |
| (29) | MPS LH2 RTLS INBD DV (PV17) OP CMD B | V41K1924X |
| (30) | MPS LH2 RTLS INBD DV (PV17) OP CMD C | V41K1925X |
| (31) | MPS LH2 RTLS OTBD DV (PV18) OP CMD A | V41K1913X |
| (32) | MPS LH2 RTLS OTBD DV (PV18) OP CMD B | V41K1914X |
| (33) | MPS LH2 RTLS OTBD DV (PV18) OP CMD C | V41K1915X |
| (34) | MPS LH2 OTBD F/D VLV (PV11) OP CMD | V41K1391X |
| (35) | MPS LH2 TOPPING VALVE (PV13) OP CMD | V41K1411X |
| (36) | MPS LO2 OTBD F/D VLV (PV9) OP CMD | V41K1518X |
| (37) | MPS E1 LO2 PREVLV (PV1) OP CMD A | V41K1136X |
| (38) | MPS E1 LO2 PREVLV (PV1) OP CMD B | V41K1137X |
| (39) | MPS E1 LO2 PREVLV (PV1) OP CMD C | V41K1138X |
| (40) | MPS E1 LO2 PREVLV (PV1) OP CMD D | V41K1143X |
| (41) | MPS E2 LO2 PREVLV (PV2) OP CMD A | V41K1236X |
| (42) | MPS E2 LO2 PREVLV (PV2) OP CMD B | V41K1237X |
| (43) | MPS E2 LO2 PREVLV (PV2) OP CMD C | V41K1238X |
| (44) | MPS E2 LO2 PREVLV (PV2) OP CMD D | V41K1243X |
| (45) | MPS E3 LO2 PREVLV (PV3) OP CMD A | V41K1336X |
| (46) | MPS E3 LO2 PREVLV (PV3) OP CMD B | V41K1337X |
| (47) | MPS E3 LO2 PREVLV (PV3) OP CMD C | V41K1338X |
| (48) | MPS E3 LO2 PREVLV (PV3) OP CMD D | V41K1343X |
| (49) | MPS LO2 INBD F/D VLV (PV10) CL CMD | V41K1512X |
| (50) | MPS LO2 INBD F/D (PV10) OP CMD A | V41K1501X |
| (51) | MPS LO2 INBD F/D (PV10) OP CMD B | V41K1502X |
| (52) | RTLS MPS DUMP STOP FLAG | (INTERNAL) |

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Step 9. This step terminates the RTLS helium purge of the aft compartment, and de-energizes the MPS LO2 inboard fill and drain open commands.

- | | | |
|-----|----------------|------------|
| (a) | HE_PURGE_TIME | V96U8959C |
| (b) | HE PURGE TIMER | (INTERNAL) |

If (b) ≥ (a), set outputs (1) through (4) false, and proceed to Step 10. Otherwise return to Step 1.

- | | | |
|-----|------------------------------------|-----------|
| (1) | MPS HE SPLY BLWDWN 1 (LV26) OP CMD | V41K1631X |
| (2) | MPS HE SPLY BLWDWN 2 (LV27) OP CMD | V41K1633X |
| (3) | MPS LO2 INBD F/D (PV10) OP CMD A | V41K1501X |
| (4) | MPS LO2 INBD F/D (PV10) OP CMD B | V41K1502X |

Step 10. This step de-energizes a portion of the MPS.

- | | | |
|-----|------------------------|-----------|
| (a) | ET SEPARATION CMD FLAG | V90X8250X |
|-----|------------------------|-----------|

Set outputs (1) through (32) and (34) through (45) false. If (a) is true, set output (33) false. Return to Step 1.

- | | | |
|------|-----------------------------------|-----------|
| (1) | MPS E1 LH2 PREVLV (PV4) OP CMD A | V41K1119X |
| (2) | MPS E1 LH2 PREVLV (PV4) OP CMD B | V41K1120X |
| (3) | MPS E1 LH2 PREVLV (PV4) OP CMD C | V41K1121X |
| (4) | MPS E2 LH2 PREVLV (PV5) OP CMD A | V41K1219X |
| (5) | MPS E2 LH2 PREVLV (PV5) OP CMD B | V41K1220X |
| (6) | MPS E2 LH2 PREVLV (PV5) OP CMD C | V41K1221X |
| (7) | MPS E3 LH2 PREVLV (PV6) OP CMD A | V41K1319X |
| (8) | MPS E3 LH2 PREVLV (PV6) OP CMD B | V41K1320X |
| (9) | MPS E3 LH2 PREVLV (PV6) OP CMD C | V41K1321X |
| (10) | MPS LH2 4IN DISC VLV (PD3) CL CMD | V41K1422X |
| (11) | MPS LO2 OVBD B/V (PV19) CL CMD A | V41K1584X |
| (12) | MPS LO2 OVBD B/V (PV19) CL CMD B | V41K1585X |
| (13) | MPS LO2 OVBD B/V (PV19) CL CMD C | V41K1586X |
| (14) | MPS E1 LO2 PREVLV (PV1) OP CMD A | V41K1136X |
| (15) | MPS E1 LO2 PREVLV (PV1) OP CMD B | V41K1137X |
| (16) | MPS E1 LO2 PREVLV (PV1) OP CMD C | V41K1138X |
| (17) | MPS E1 LO2 PREVLV (PV1) OP CMD D | V41K1143X |
| (18) | MPS E2 LO2 PREVLV (PV2) OP CMD A | V41K1236X |
| (19) | MPS E2 LO2 PREVLV (PV2) OP CMD B | V41K1237X |
| (20) | MPS E2 LO2 PREVLV (PV2) OP CMD C | V41K1238X |
| (21) | MPS E2 LO2 PREVLV (PV2) OP CMD D | V41K1243X |
| (22) | MPS E3 LO2 PREVLV (PV3) OP CMD A | V41K1336X |
| (23) | MPS E3 LO2 PREVLV (PV3) OP CMD B | V41K1337X |
| (24) | MPS E3 LO2 PREVLV (PV3) OP CMD C | V41K1338X |
| (25) | MPS E3 LO2 PREVLV (PV3) OP CMD D | V41K1343X |
| (26) | REPLACE LH2 ULL PRESS XDCR 1 CMD | V41K1700X |
| (27) | REPLACE LH2 ULL PRESS XDCR 2 CMD | V41K1701X |
| (28) | REPLACE LH2 ULL PRESS XDCR 3 CMD | V41K1702X |
| (29) | REPLACE LO2 ULL PRESS XDCR 1 CMD | V41K1750X |

| | | |
|------|-----------------------------------|-----------|
| (30) | REPLACE LO2 ULL PRESS XDCR 2 CMD | V41K1751X |
| (31) | REPLACE LO2 ULL PRESS XDCR 3 CMD | V41K1752X |
| (32) | ET/ORB SEP CAMERAS ON CMD | V56K0000X |
| (33) | ET/ORB SEP CAMERAS-HTR/PWR ON CMD | V56K0010X |
| (34) | MPS E1 LO2 PREVLV (PV1) CL CMD A | V41K1139X |
| (35) | MPS E1 LO2 PREVLV (PV1) CL CMD B | V41K1140X |
| (36) | MPS E1 LO2 PREVLV (PV1) CL CMD C | V41K1141X |
| (37) | MPS E1 LO2 PREVLV (PV1) CL CMD D | V41K1142X |
| (38) | MPS E2 LO2 PREVLV (PV2) CL CMD A | V41K1239X |
| (39) | MPS E2 LO2 PREVLV (PV2) CL CMD B | V41K1240X |
| (40) | MPS E2 LO2 PREVLV (PV2) CL CMD C | V41K1241X |
| (41) | MPS E2 LO2 PREVLV (PV2) CL CMD D | V41K1242X |
| (42) | MPS E3 LO2 PREVLV (PV3) CL CMD A | V41K1339X |
| (43) | MPS E3 LO2 PREVLV (PV3) CL CMD B | V41K1340X |
| (44) | MPS E3 LO2 PREVLV (PV3) CL CMD C | V41K1341X |
| (45) | MPS E3 LO2 PREVLV (PV3) CL CMD D | V41K1342X |

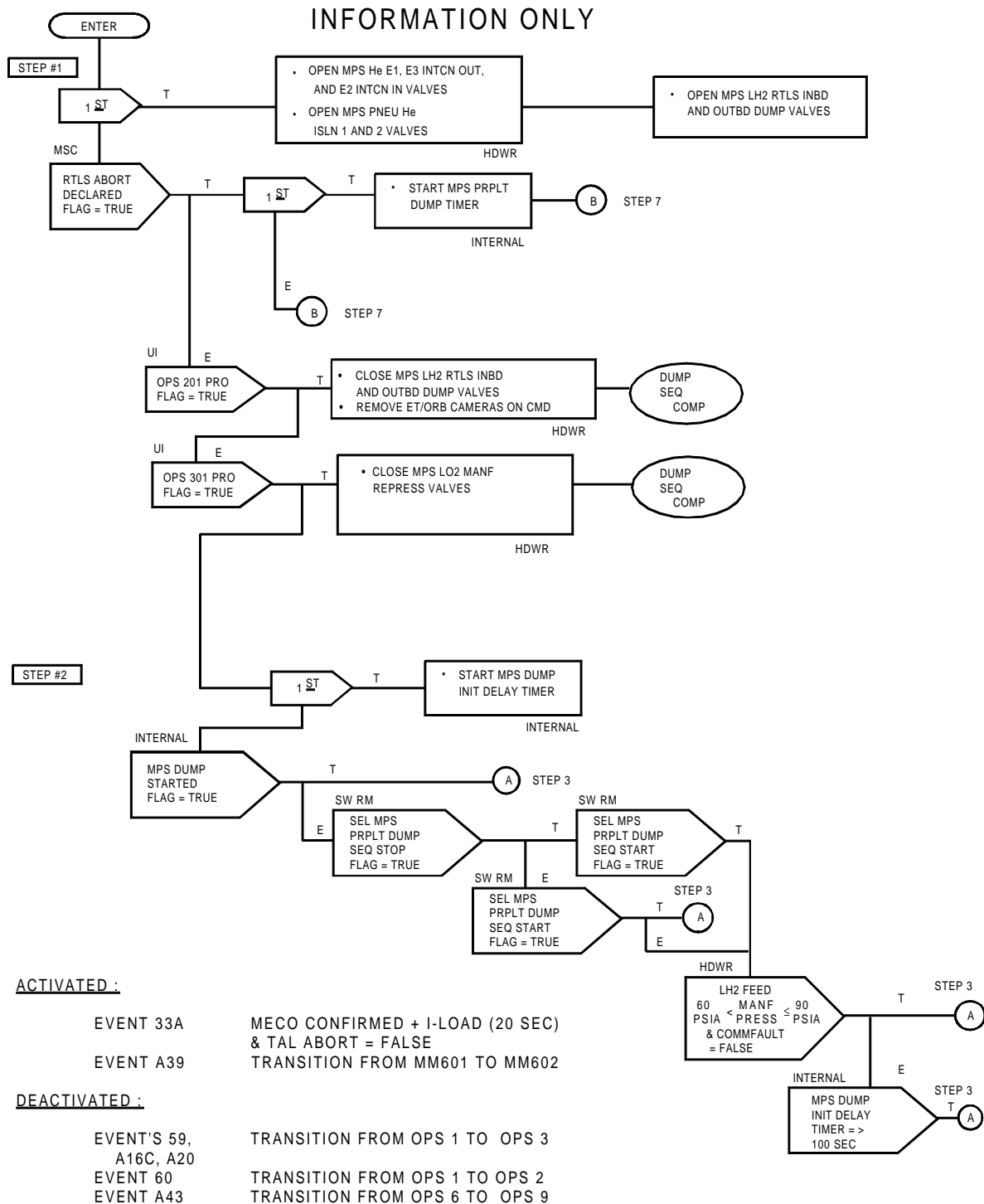


FIGURE 4.70.(1) MPS Dump Sequencer System Overview (1 of 5)

INFORMATION ONLY

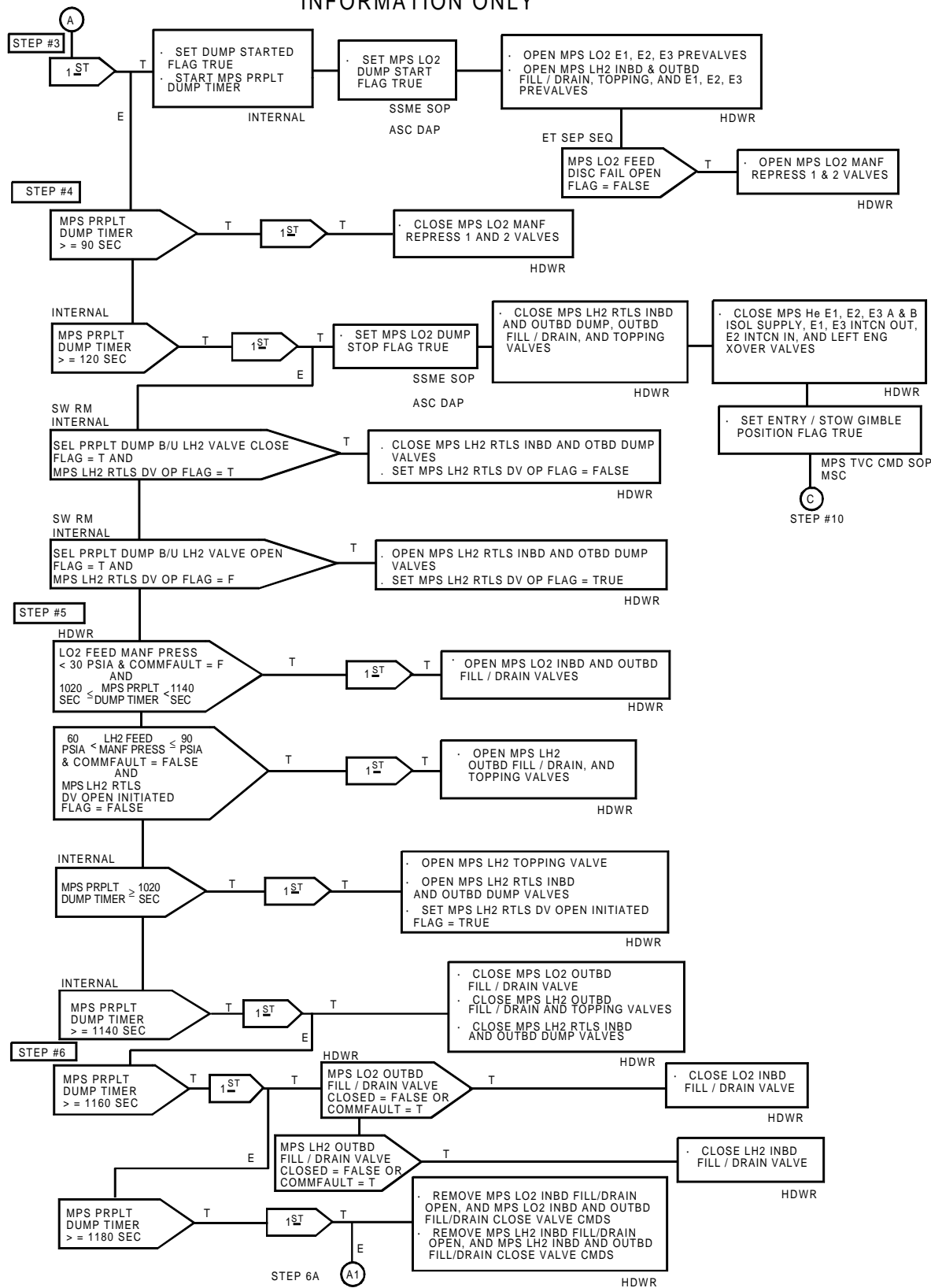


FIGURE 4.70.(2) MPS Dump Sequencer System Overview (2 of 5)

INFORMATION ONLY

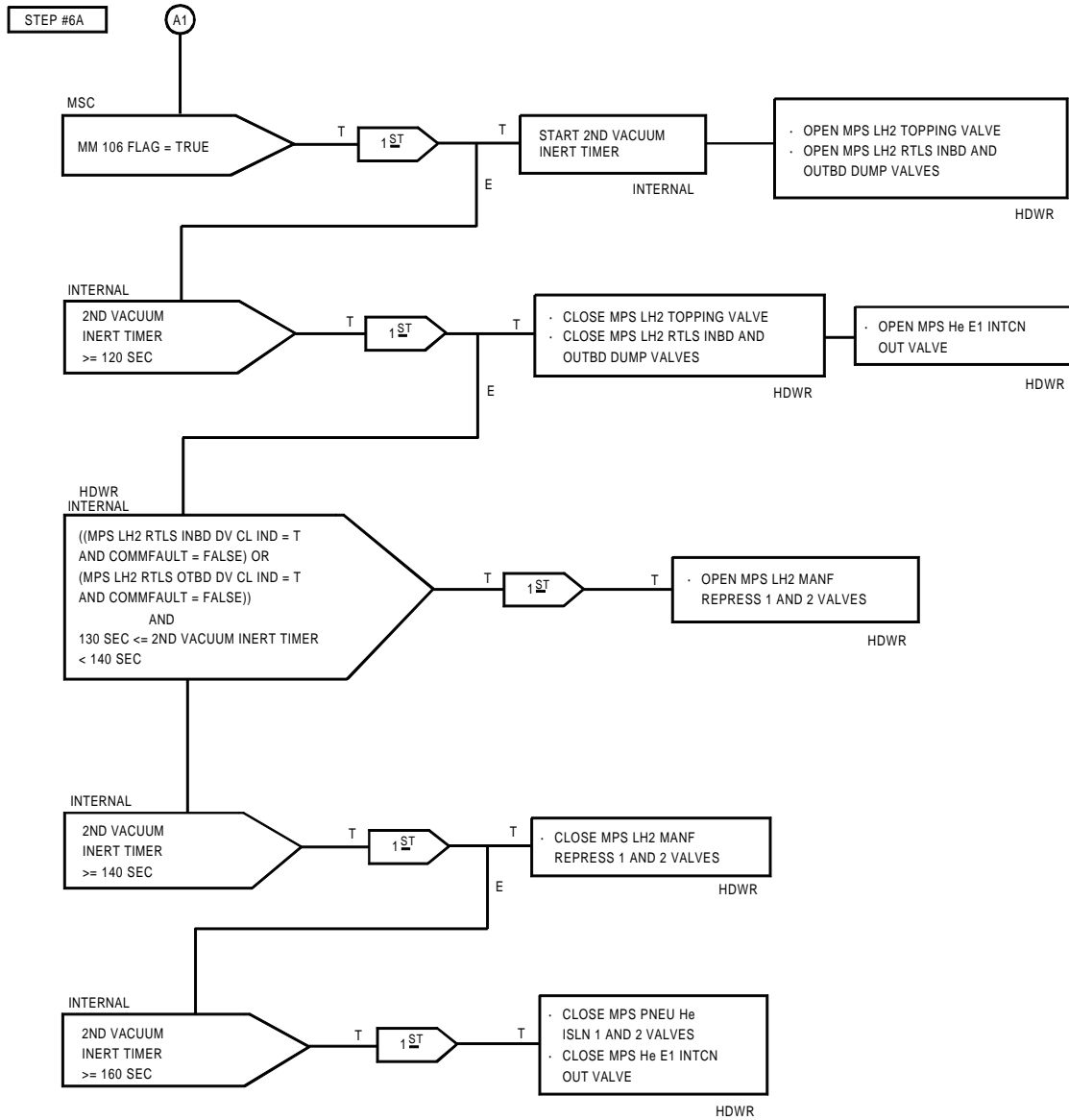


FIGURE 4.70.(3) MPS Dump Sequencer System Overview (3 of 5)

INFORMATION ONLY

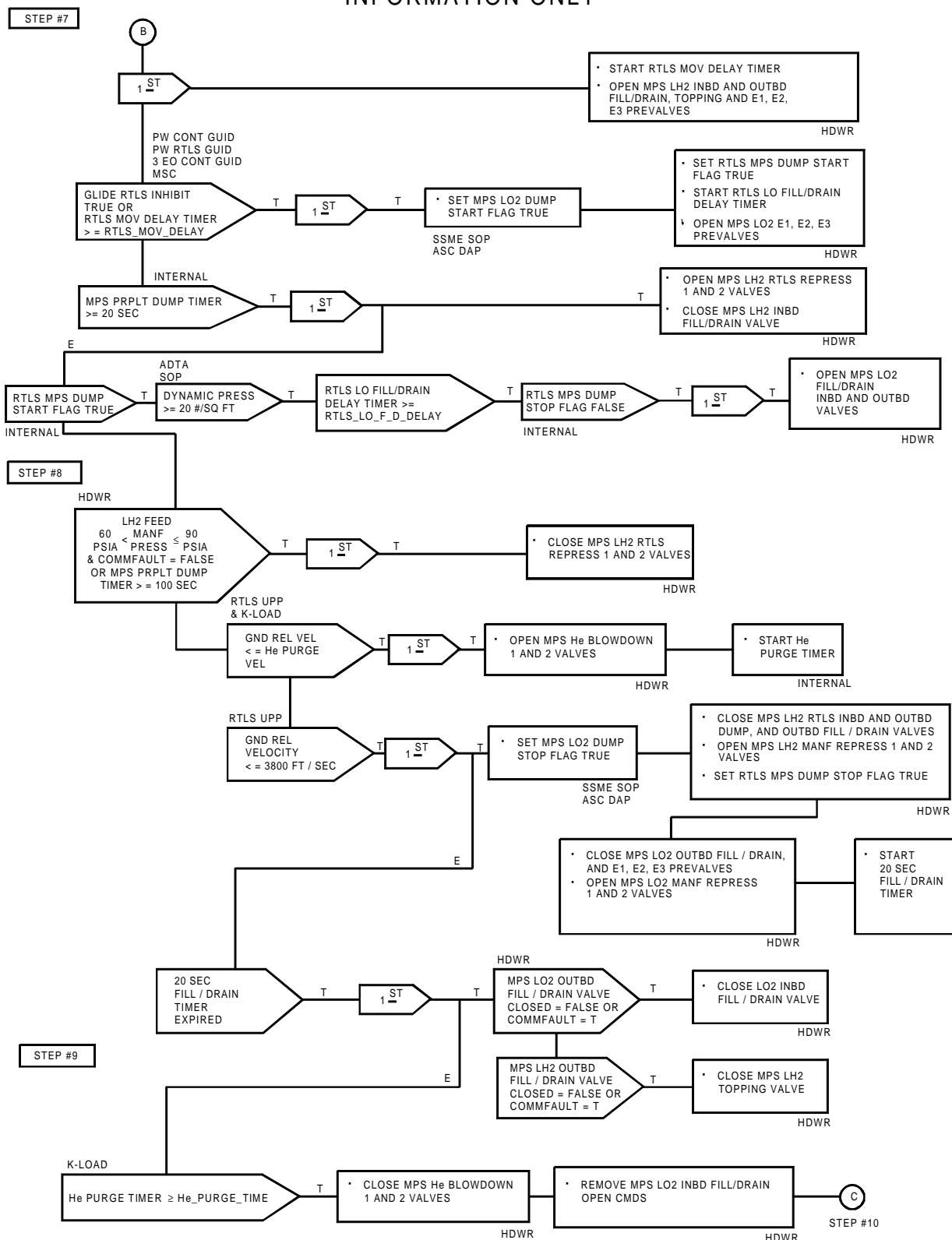


FIGURE 4.70.(4) MPS Dump Sequencer System Overview (4 of 5)

INFORMATION ONLY

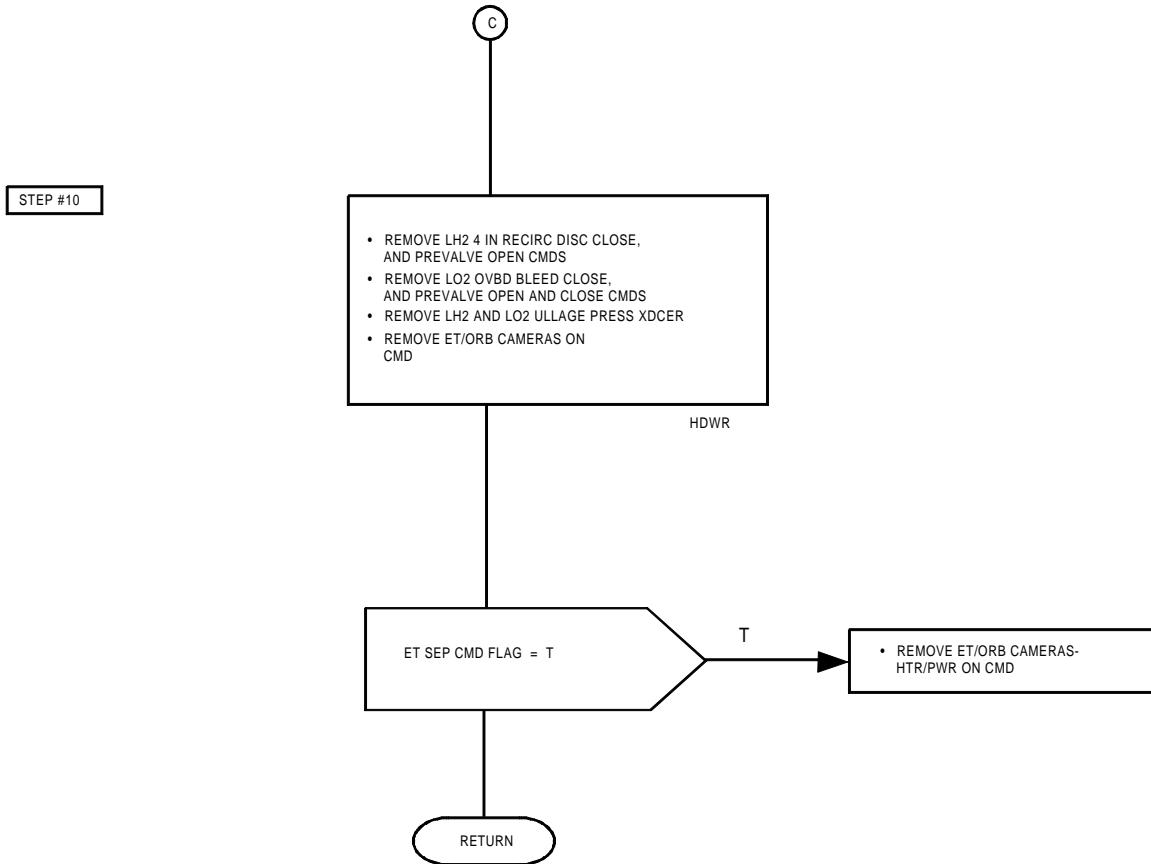


FIGURE 4.70.(5) MPS Dump Sequencer System Overview (5 of 5)

TABLE 4.2.4.4-1. INPUT FUNCTIONAL PARAMETERS FOR MAIN PROPULSION SYSTEM DUMP SEQUENCER (G4.70)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------------|------------|------------------------------------|----------------|---------|-----------|---------|---------|-------|
| ET_SEP_CMD | V90X8250X | ET SEPARATION CMD FLAG | ET SEP SEQ | | BD | | 93017G | * |
| 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 | * |
| MM_CODE_106/MM_106 | V90X8153X | MAJOR MODE 106 FLAG | MSC | | | | 92355B | |
| OPS_PRO_FLAG_201 | V93X0006X | OPS 201 PRO FLAG | UI | | | | 92157 | |
| OPS_PRO_FLAG_301 | V93X0004X | OPS 301 PRO FLAG | UI | | | | 92157 | |
| QBAR/QBAR_AD | V95P3011C | GN&C DYNAMIC PRESSURE | ADTA SOP | LBF/FT2 | SPL | | 93017G | * |
| REL_VEL_MAG | V95L0151CA | GND REL VEL MAGNITUDE IN M50 SYS | RTLS UPP | FT/S | SPL | | 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 | * |
| RTLS_LO_F_D_DELAY | V97U9743C | RTLS LO2 FILL/DRAIN DELAY TIME | CONT 3E/O GUID | SEC | SPL | | 90705H | |
| | V41P1433C | MPS LH2 17IN FEED MANF PRESS | HDWR | | AMU | | 93017G | * |
| | V41P1533C | MPS LO2 17IN FEED MANF PRESS | HDWR | | AMU | | 93017G | * |
| | V41X1389X | MPS LH2 OTBD F/D VLV (PV11) CL IND | LH2 OTBD VLV | | BD | | 93017G | * |
| | V41X1514X | MPS LO2 OTBD F/D VLV (PV9) CL IND | LO2 OTBD VLV | | BD | | 93017G | * |
| | V41X1919X | MPS LH2 RTLS OTBD DV (PV18) CL IND | HDWR | | BD | | 93017G | * |
| | V41X1929X | MPS LH2 RTLS INBD DV (PV17) CL IND | HDWR | | BD | | 93017G | * |
| | V90X5964X | MPS LO2 FEED DISC FAIL OPEN FLAG | ET SEP SEQ | | BD | | 90007G | |
| | V90X7557X | SEL MPS PRPLT DUMP BU LH2 VLV OP | GN&C SW RM | | | | | |
| | V90X7559X | SEL MPS PRPLT DUMP SEQ START | GN&C SW RM | | | | | |
| | V90X7567X | SEL MPS PRPLT DUMP SEQ STOP | GN&C SW RM | | | | | |
| | V90X7742X | SEL MPS PRPLT DUMP BU LH2 VLV CL | GN&C SW RM | | | | 92317B | |
| | V91X2841X | FA1 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2842X | FA2 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2848X | FA4 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 92316B | |

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

TABLE 4.2.4.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MAIN PROPULSION SYSTEM DUMP SEQUENCER (G4.70)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------|------------|------------------------------------|-----------------|-------|--------------|------------------|---------|-------------|
| ENT_STOW_GIM_POSN | V90X8254XA | ENTRY STOW GIMBAL POS FLAG | MPS TVC CMD SOP | | BD | | | |
| | | | MSC | | | | | |
| | | | TLM | | | | | |
| MPS_LO2_DUMP_START | V90X8301X | MPS LO2 DUMP START | ASC DAP | | | | 89598A | |
| | | | SSME SOP | | | | | |
| MPS_LO2_DUMP_STOP | V90X8302X | MPS LO2 DUMP STOP | ASC DAP | | | | | |
| | | | SSME SOP | | | | | |
| | V41K1119XB | MPS E1 LH2 PREVLV (PV4) OP CMD A | PCA A1 | | | | 89554A | |
| | V41K1120XB | MPS E1 LH2 PREVLV (PV4) OP CMD B | LCA A1 | | | | 89554A | |
| | V41K1121XB | MPS E1 LH2 PREVLV (PV4) OP CMD C | LCA A2 | | | | 89554A | |
| | V41K1136XB | MPS E1 LO2 PREVLV (PV1) OP CMD A | PCA A1 | | | | 89554A | |
| | V41K1137XB | MPS E1 LO2 PREVLV (PV1) OP CMD B | LCA A1 | | | | 89554A | |
| | V41K1138XB | MPS E1 LO2 PREVLV (PV1) OP CMD C | LCA A2 | | | | 89554A | |
| | V41K1139XB | MPS E1 LO2 PREVLV (PV1) CL CMD A | PCA A1 | | | | 89554A | |
| | V41K1140XB | MPS E1 LO2 PREVLV (PV1) CL CMD B | LCA A1 | | | | 89554A | |
| | V41K1141XB | MPS E1 LO2 PREVLV (PV1) CL CMD C | LCA A2 | | | | 89554A | |
| | V41K1142XC | MPS E1 LO2 PREVLV (PV1) CL CMD D | HDWR | | | | 89554A | |
| | V41K1143XC | MPS E1 LO2 PREVLV (PV1) OP CMD D | HDWR | | | | 89554A | |
| | V41K1155X | MPS E1 HE ISO VLV A (LV1) OP CMD | HDWR | | BD | | 89554A | |
| | V41K1156X | MPS E1 HE ISO VLV B (LV2) OP CMD A | HDWR | | BD | | 89554A | |
| | V41K1157X | MPS E1 HE ISO VLV B (LV2) OP CMD B | HDWR | | BD | | 89554A | |
| | V41K1168XA | MPS E1 HE INTCN OUT(LV60) OP CMD A | HDWR | | | | 89554A | |
| | V41K1219XB | MPS E2 LH2 PREVLV (PV5) OP CMD A | PCA A2 | | | | 89554A | |
| | V41K1220XB | MPS E2 LH2 PREVLV (PV5) OP CMD B | LCA A2 | | | | 89554A | |
| | V41K1221XB | MPS E2 LH2 PREVLV (PV5) OP CMD C | LCA A3 | | | | 89554A | |
| | V41K1236XB | MPS E2 LO2 PREVLV (PV2) OP CMD A | PCA A2 | | | | 89554A | |
| | V41K1237XB | MPS E2 LO2 PREVLV (PV2) OP CMD B | LCA A2 | | | | 89554A | |
| | V41K1238XB | MPS E2 LO2 PREVLV (PV2) OP CMD C | LCA A3 | | | | 89554A | |
| | V41K1239XB | MPS E2 LO2 PREVLV (PV2) CL CMD A | PCA A2 | | | | 89554A | |
| | V41K1240XB | MPS E2 LO2 PREVLV (PV2) CL CMD B | LCA A2 | | | | 89554A | |
| | V41K1241XB | MPS E2 LO2 PREVLV (PV2) CL CMD C | LCA A3 | | | | 89554A | |
| | V41K1242XC | MPS E2 LO2 PREVLV (PV2) CL CMD D | HDWR | | | | 89554A | |
| | V41K1243XC | MPS E2 LO2 PREVLV (PV2) OP CMD D | HDWR | | | | 89554A | |
| | V41K1255X | MPS E2 HE ISO VLV A (LV3) OP CMD | HDWR | | BD | | 89554A | |
| | V41K1256XA | MPS E2 HE ISO VLV B (LV4) OP CMD A | HDWR | | | | 89554A | |
| | V41K1257XA | MPS E2 HE ISO VLV B (LV4) OP CMD B | HDWR | | | | 89554A | |
| | V41K1262XD | MPS E2 HE INTCN IN(LV61)OP CMD A | HDWR | | | | 90007G | |
| | V41K1263XD | MPS E2 HE INTCN IN(LV61)OP CMD B | HDWR | | | | 90007G | |
| | V41K1319XB | MPS E3 LH2 PREVLV (PV6) OP CMD A | PCA A3 | | | | 89554A | |
| | V41K1320XB | MPS E3 LH2 PREVLV (PV6) OP CMD B | LCA A3 | | | | 89554A | |
| | V41K1321XB | MPS E3 LH2 PREVLV (PV6) OP CMD C | LCA A1 | | | | 89554A | |
| | V41K1336XB | MPS E3 LO2 PREVLV (PV3) OP CMD A | PCA A3 | | | | 89554A | |
| | V41K1337XB | MPS E3 LO2 PREVLV (PV3) OP CMD B | LCA A3 | | | | 89554A | |
| | V41K1338XB | MPS E3 LO2 PREVLV (PV3) OP CMD C | LCA A1 | | | | 89554A | |
| | V41K1339XB | MPS E3 LO2 PREVLV (PV3) CL CMD A | PCA A3 | | | | 89554A | |
| | V41K1340XB | MPS E3 LO2 PREVLV (PV3) CL CMD B | LCA A3 | | | | 89554A | |

TABLE 4.2.4.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MAIN PROPULSION SYSTEM DUMP SEQUENCER (G4.70)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------|----------|-----------------------------|-------------|-------|-----------|---------|---------|-------|
| V41K1341XB | MPS E3 | LO2 PREVLV (PV3) CL CMD C | LCA A1 | | | | 89554A | |
| V41K1342XC | MPS E3 | LO2 PREVLV (PV3) CL CMD D | HDWR | | | | 89554A | |
| V41K1343XC | MPS E3 | LO2 PREVLV (PV3) OP CMD D | HDWR | | | | 89554A | |
| V41K1355X | MPS E3 | HE ISO VLV A (LV5) OP CMD | HDWR | | BD | | 89554A | |
| V41K1356X | MPS E3 | HE ISO VLV B (LV6) OP CMD A | HDWR | | BD | | 89554A | |
| V41K1357X | MPS E3 | HE ISO VLV B (LV6) OP CMD B | HDWR | | BD | | 89554A | |
| V41K1368XA | MPS E3 | HE INTCN OUT(LV64) OP CMD A | HDWR | | | | 89554A | |
| V41K1391XB | MPS LH2 | OTBD F/D VLV (PV11) OP CMD | LCA A2 | | | | 89554A | |
| V41K1393XA | MPS LH2 | OTBD F/D VLV (PV11) CL CMD | LCA A2 | | | | 89554A | |
| V41K1401XA | MPS LH2 | INBD F/D (PV12) OP CMD A | LCA A1 | | | | 89554A | |
| V41K1402XA | MPS LH2 | INBD F/D (PV12) OP CMD B | LCA A1 | | | | 89554A | |
| V41K1411XA | MPS LH2 | TOPPING VLV (PV13) OP CMD | LCA A1 | | | | 89554A | |
| V41K1412XA | MPS LH2 | INBD F/D (PV12) CL CMD | LCA A1 | | | | 89554A | |
| V41K1422XB | MPS LH2 | 4IN DISC VLV (PD3) CL CMD | HDWR | | BD | | 89313A | |
| V41K1435XA | MPS LH2 | MANF REPRSS 1(LV42) OP CMD | LCA A2 | | | | 89554A | |
| V41K1437XA | MPS LH2 | MANF REPRSS 2(LV43) OP CMD | LCA A2 | | | | 89554A | |
| V41K1501XA | MPS LO2 | INBD F/D (PV10) OP CMD A | LCA A2 | | | | 89554A | |
| V41K1502XA | MPS LO2 | INBD F/D (PV10) OP CMD B | LCA A2 | | | | 89554A | |
| V41K1512XA | MPS LO2 | INBD F/D VLV (PV10) CL CMD | LCA A2 | | | | 89554A | |
| V41K1515XA | MPS LO2 | OTBD F/D VLV (PV9) CL CMD | LCA A3 | | | | 89554A | |
| V41K1518XA | MPS LO2 | OTBD F/D VLV (PV9) OP CMD | LCA A3 | | | | 89554A | |
| V41K1535XA | MPS LO2 | MANF REPRSS 1(LV40) OP CMD | LCA A3 | | | | 89554A | |
| V41K1537XA | MPS LO2 | MANF REPRSS 2(LV41) OP CMD | LCA A3 | | | | 89554A | |
| V41K1584XB | MPS LO2 | OVBD B/V (PV19) CL CMD A | PCA A3 | | | | 89554A | |
| V41K1585XB | MPS LO2 | OVBD B/V (PV19) CL CMD B | LCA A3 | | | | 89554A | |
| V41K1586XB | MPS LO2 | OVBD B/V (PV19) CL CMD C | LCA A2 | | | | 89554A | |
| V41K1607XA | MPS PNEU | HE ISO VLV 1 (LV7) OP CMD | HDWR | | | | 89554A | |
| V41K1608XA | MPS PNEU | HE ISO VLV 2 (LV8) OP CMD | HDWR | | | | 89554A | |
| V41K1613XA | MPS REG | HE XOVER VLV (LV10) OP CMD | HDWR | | | | 89554A | |
| V41K1631XA | MPS HE | SPLY BLWDWN 1 (LV26) OP CMD | HDWR | | | | 89554A | |
| V41K1633XA | MPS HE | SPLY BLWDWN 2 (LV27) OP CMD | HDWR | | | | 89554A | |
| V41K1700X | REPLACE | LH2 ULL PRESS XDCR 1 CMD | LCA A1 | | BD | | 89554A | |
| V41K1701X | REPLACE | LH2 ULL PRESS XDCR 2 CMD | LCA A2 | | BD | | 89554A | |
| V41K1702X | REPLACE | LH2 ULL PRESS XDCR 3 CMD | LCA A3 | | BD | | 89554A | |
| V41K1750X | REPLACE | LO2 ULL PRESS XDCR 1 CMD | LCA A1 | | BD | | 89554A | |
| V41K1751X | REPLACE | LO2 ULL PRESS XDCR 2 CMD | LCA A2 | | BD | | 89554A | |
| V41K1752X | REPLACE | LO2 ULL PRESS XDCR 3 CMD | LCA A3 | | BD | | 89554A | |
| V41K1905X | MPS LH2 | RTLS REPRS 1(LV74)OP CMD A | PCA A3 | | BD | | 89554A | |
| V41K1906X | MPS LH2 | RTLS REPRS 2(LV75)OP CMD A | PCA A3 | | BD | | 89554A | |
| V41K1907X | MPS LH2 | RTLS REPRS 1(LV74)OP CMD B | PCA A1 | | BD | | 89554A | |
| V41K1908X | MPS LH2 | RTLS REPRS 2(LV75)OP CMD B | PCA A1 | | BD | | 89554A | |
| V41K1909X | MPS LH2 | RTLS REPRS 1(LV74)OP CMD C | LCA A1 | | BD | | 89554A | |
| V41K1910X | MPS LH2 | RTLS REPRS 2(LV75)OP CMD C | LCA A1 | | BD | | 89554A | |
| V41K1913XA | MPS LH2 | RTLS OTBD DV(PV18)OP CMD A | HDWR | | | | 89554A | |
| V41K1914XA | MPS LH2 | RTLS OTBD DV(PV18)OP CMD B | HDWR | | | | 89554A | |
| V41K1915XA | MPS LH2 | RTLS OTBD DV(PV18)OP CMD C | HDWR | | | | 89554A | |

TABLE 4.2.4.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MAIN PROPULSION SYSTEM DUMP SEQUENCER (G4.70)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|-------------|-------|-----------|------------------|---------|-------------|
| | V41K1923XA | MPS LH2 RTLS INBD DV(PV17)OP CMD A | HDWR | | | | 89554A | |
| | V41K1924XA | MPS LH2 RTLS INBD DV(PV17)OP CMD B | HDWR | | | | 89554A | |
| | V41K1925XA | MPS LH2 RTLS INBD DV(PV17)OP CMD C | HDWR | | | | 89554A | |
| | V56K0000XB | ET/ORB SEP CAMERAS ON CMD | HDWR | | | | 92902 | |
| | V56K0010XB | ET/ORB SEP CAMERAS-HTR/PWR ON CMD | HDWR | | | | 92902 | |

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 4.2.4.4-3. MAIN PROPULSION SYSTEM DUMP SEQUENCER (G4.70) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|-------------------|-----------|-----------|----|----|---|---|---------|----|-----|---------|-------------|
| RTLS_LO_F_D_DELAY | V97U9743C | SEC | F | S | M | C | G4.70 | 00 | MES | 92515B | |
| RTLS_MOV_DELAY | V97U9730C | SEC | F | S | M | C | G4.70 | 00 | MES | 90914C | |

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

TABLE 4.2.4.4-4. MAIN PROPULSION SYSTEM DUMP SEQUENCER (G4.70) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--------------------------|-----------|----|-------------|-------------|----|--------|---|----------------|---------|-------------|
| HE_PURGE_TIME | V96U8959C | 00 | +6.50 | E+02 SEC | F | D | C | G4.69 G4.70 | 90007G | |
| HE_PURGE_VEL | V96U8958C | 00 | +5.3 | E+03 FT/SEC | F | S | C | G4.69 G4.70 | 90007G | |

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

TABLE 4.2.4.4-5. MAIN PROPULSION SYSTEM DUMP SEQUENCER (G4.70) 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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4.3 ABORT

4.3.1 Abort Control Sequence (4.192)

4.3.1.1 Introduction

It may be necessary to burn OMS/RCS propellants for systems management, OMS Ascent performance assist, or when a single or multiple SSME failure abort response has been selected by the crew. In support of OMS/RCS abort related propellant dumps, this is done to maintain the necessary c.g. control and/or landing weight conditions in order to successfully either land the vehicle (single SSME failure events, and some 2 and 3 SSME failure events), or drive the vehicle to a bail out - crew survivable attitude (aborts involving 2 and 3 SSME failures). The amount of OMS/RCS propellant loaded and the vehicle center of gravity are mission dependent. The quantity of OMS or RCS propellant which will be burned is controlled by burn timers used in the Abort Control Sequence. The OMS burn time is based on the time required to burn the desired quantity using two OMS engines, and the RCS timer is based on a 4 + X jet burn. Pre-mission-determined parameters are provided for the OMS/RCS burn control. For abort to orbit (ATO), only the OMS burn time is provided and that initial value is modified to provide improved mission capability as a function of the velocity at the time of failure. Both OMS and RCS values are provided for the return to landing site (RTL) or transatlantic landing (TAL) aborts. In addition to the values determined by the abort selection, there is a capability for the crew to manually initiate the burns and modify an initial value of the OMS and/or RCS timers through keyboard entry. If OMS propellant loading quantities require a higher burn rate than available through the OMS engines, an OMS/RCS interconnect can provide for burning OMS propellant through the RCS jets. This interconnected capability will be selected pre-mission for all RTL, TAL, and ATO aborts by I-Load and uplinks. For multiple SSME failures, the interconnect is automatically selected. The crew has the capability to manually select or inhibit this interconnect.

For an ATO abort downmode to a TAL abort in MM103, the initially selected ATO abort OMS propellant burn time will be replaced automatically with the TAL abort OMS propellant burn time. The dump method can be changed from OMS only to an interconnected dump through the OMS and RCS by means of the manual inputs via the Override Display.

For an OMS ascent performance assist burn downmode to an abort mode, the dump will be continuous if the assist burn has not been completed at the time of the abort request. If the OMS assist burn has been completed, any subsequent pre-MECO OMS propellant dump and OMS/RCS interconnect (if selected) will be started after the required minimum OMS off time since burn termination (30 seconds). For contingency abort cases initiated within this 30 second window, the minimum OMS off time will be overridden upon initiation of the manual OMS propellant dump. For all abort cases, the total OMS equivalent-on-time will amount to that necessary to provide for the abort dump.

4.3.1.2 Overview

Pre-MECO. For situations where the quantity of OMS propellants required to be burned cannot be accomplished in the allowable time using the OMS engines only, the RCS jets can be employed to assist in burning the OMS propellants through a crew selectable interconnect mode (toggle capability). When RCS jets are to be employed in this manner, the RCS propellant tank isolation valves are closed in both pods, and the OMS propellants are interconnected to the RCS jets. If the attempt to interconnect the OMS propellant tanks to either or both sets of RCS manifolds (1/2 and/or 3/4/5) is unsuccessful, those manifolds

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will be returned to feed from the RCS tanks and the resulting OMS propellant burn rate will be adjusted accordingly to provide an accurate value of propellant burned. After the necessary burn has been accomplished, all propellant feed paths are returned to the normal configuration.

Post-MECO. It may be necessary to burn OMS propellants post-MECO for systems management or to maintain the necessary c.g. control or to assist in protecting the Orbiter from recontact with the External Tank (ET) at ET Separation. For situations where the quantity of OMS propellants required to be burned cannot be accomplished in the allowable time using the OMS engines only, the RCS jets can be employed to assist in burning the OMS propellants through a crew selectable interconnect mode. When RCS jets are to be employed in this manner, the RCS propellant tank isolation valves are closed in both pods, and the OMS propellants are interconnected to the RCS jets. If the attempt to interconnect the OMS propellant tanks to either or both sets of RCS manifolds (1/2 and/or 3/4/5) is unsuccessful, those manifolds will be returned to feed from the RCS tanks. After the necessary burn has been accomplished, all propellant feed paths are returned to the normal configuration.

For an ATO abort selected post-MECO, no propellant dumping is required. For a declared RTLS abort which has finished all OMS propellant dumping pre-MECO, a dump of RCS propellants through the 4 RCS + X jets is initiated after 20 seconds has elapsed in MM602. For RTLS cases in which post-MECO OMS propellant dumping is required, the RCS 4 + X dump can be initiated in either MM602 or MM603. For these post-MECO propellant dump cases, the protection of the continuation of the RCS propellant dump is provided by the state of the RCS Dump counter. For all cases the crew has the capability to enable or inhibit the aft RCS dump via the Override display. The Override display also provides the crew with the capability to manually request and /or modify the premission selected dump time for RCS propellants.

A post-MECO OMS dump may be automatically commanded by Contingency 3 E/O Guidance. This may occur in first stage (Major Mode 102) before an I-Loaded value of MET (T_DUMP_LAST) has been attained, or after ET separation in Major Mode 601. If the dump is in progress at the time of transition from MM601 to MM602, the dump will continue, uninterrupted, through the major mode transition.

A short duration post-MECO OMS burn may be automatically commanded by Contingency 3 E/O Guidance. This burn will produce a +X acceleration on the propellant in the ET and any residual propellant in the MPS propellant lines. This +X acceleration will result in the settling of the MPS propellant slosh in the tanks and lines created by the MECO event. This OMS propellant settling burn will aid the Orbiter in separating from the ET.

RCS roll control. RCS roll control is selected either automatically or manually. Automatic selection is performed by the Ascent DAP (4.176) at SRB tailoff for two or three SSME failures in MM102, or for a second SSME failure prior to MECO Prep or Contingency MECO-Prep. Manual selection is performed for three SSME failures by crew request of CONT SINGLE ENG ROLL CNTL FLAG via the XXXXXX TRAJ 1, XXXXXX TRAJ 2, and RTLS TRAJ 2 display item entries. When selected, an OMS to RCS interconnect is initiated. For RCS roll control selected in support of a Mode 5 two engine out contingency abort, the OMS to RCS interconnect is initiated after the expiration of an I-loaded delay. RCS roll control will also be selected via auto recognition of a second SSME failure if sensed acceleration drops below a threshold value in second stage. This allows the use of OMS propellants by the RCS for vehicle control unless MECO-Prep or Contingency MECO-Prep has occurred. If the attempt to interconnect the OMS propellant tanks to either or both sets of manifolds (1/2 and/or 3/4/5) is unsuccessful, those manifolds will be returned to feed from the RCS tanks.

For pre-MECO the OMS propellants remain interconnected to the RCS jets until MECO commanded occurs and then are reconnected to normal by a Mode 2 return to normal process which provides a continuous propellant path to the RCS jets.

MM 304 OMS Propellant Burn. During MM 304, an OMS propellant-wasting burn will be initiated manually by crew request via the override display or automatically by guidance after the pitch-up maneuver has been completed to reduce the orbiter's landing weight and provide extra orbiter delta V after ET separation.

At the initiation of this sequence, the OMS engines will be commanded to the c.g. trim position and both sets of OMS helium/vapor isolation valves will be commanded open. The selection to interconnect the OMS propellants to the RCS jets will then be determined by the crew's manual item entry or automatically when the OMS equivalent on time is less than or equal to a predefined interconnect initiation fuel time (I-load). When an interconnected dump has been selected, the OMS/RCS interconnect is requested and a c.g. trim delay is started. If an interconnect dump is not selected, a RCS 4 + X settling burn is initiated, a settling burn timer is started, and a flag for dumping through the OMS engines only is set.

The OMS propellant burn via the OMS engines and 24 aft RCS jets (4 + X and 20 nulls), will occur as follows: The OMS ignition will be initiated after the expiration of the c.g. trim delay and the OMS/RCS interconnect sequence has completed its processing. The dump through the 24 aft RCS jets will be initiated after the expiration of an ignition press delay which starts at the ignition of the OMS engines.

The OMS propellant burn via the OMS engines only will occur after 10 seconds of the 4 + X settling burn. The 4 + X settling burn will be terminated after 20 seconds.

The OMS propellant-wasting burn via the 24 aft RCS jets will be terminated automatically when, (1) the OMS equivalent on time is greater than or equal to a predefined interconnect termination fuel time (I-load), (2) the normal acceleration exceeds a predefined limit (I-load) for more than one second period of continuous processing, or (3) manually by crew item entry. The OMS propellant-wasting burn via the OMS engines will be terminated automatically when, (1) the OMS equivalent on time is equal to or greater than a predefined fuel burn time (I-Load), (2) automatically if the normal acceleration exceeds a predefined limit (I-Load) for more than a 1-second period of continuous processing, or (3) manually by crew item entry.

The entry OMS fuel burn time I-load represents the time required to burn available OMS fuel at a pre-MECO two-OMS-engine flow rate. The OMS equivalent on time used during pre-MECO operations will be transferred to OPS 3 to support a MM304 OMS propellant burn. This timer is incremented during each cycle that an OMS burn is active to reflect the OMS fuel flow at a two-OMS-engine rate and also the delta fuel flow rate between 2 OMS engines and 10 or 24 RCS jets when the null jets are active. The 10 or 24 RCS jets delta fuel flow rate will be determined by the state of the aft manifold inhibit flags from the OMS/RCS interconnect sequence.

MM304 AFT RCS PROPELLANT BURN. When the ground relative velocity reaches a predefined threshold (I-load), a dump of RCS propellants through the RCS 4 + X jets is initiated if enabled by the crew via item entry. Capability is provided for the crew to manually request and/or modify the permission selected dump time for RCS propellants.

4.3.1.3 Detail Requirements Abort Control Sequence

Step 1. This step sets the scale factor for the OMS burn time display and provides the appropriate branching for the MM304 or OPS 1/6 abort functions.

The following signals are monitored:

| | | |
|-----|--------------------------------|-----------|
| (a) | MAJOR MODE 304 FLAG | V90X8161X |
| (b) | SECOND SSME FAIL CONFIRM | V90X1721X |
| (c) | CONT SINGLE ENG ROLL CNTL FLAG | V93X6682X |
| (d) | SERC FLAG | V90X8913X |

Set (1) equal to 1.0 and monitor (a).

If (a) is true, proceed to Step 24. Otherwise, if (a) is false, proceed to monitor (b), (c), and (d).

If (b) or (c) or (d) is true, set (2) true and proceed to Step 1A. Otherwise, if (b) and (c) and (d) are all false, proceed to Step 1B.

| | | |
|-----|-----------------------|-----------|
| (1) | OMS TIME SCALE FACTOR | V94J3755C |
| (2) | SERC FLAG | V90X8913X |

Step 1A. This step controls both the setting of the OMS Helium and Vapor Isolation Valve open commands to support Single Engine Roll Control (SERC) in response to two and three SSME failure events, and the commanding of the OMS to RCS interconnect for two SSME failure events. For two SSME failure events, the OMS Helium and Vapor Isolation Valves are commanded open to support SERC after confirmation of the command to perform an OMS to RCS interconnect. Then, when the second SSME fails prior to CONTINGENCY MECO PREP, an OMS to RCS interconnect is commanded and the 24 AFT RCS jets are commanded off to protect vehicle stability. For three SSME failure events, the OMS Helium and Vapor Isolation Valves are commanded open on a first pass basis to provide a pressurant source for the OMS tanks in support of SERC RCS jet firings.

The following signals are monitored:

| | | |
|-----|--------------------------------|------------|
| (a) | MECO CONFIRMED FLAG | V90X8561X |
| (b) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (c) | MECO PREPARATION DISCRETE | V90X1989X |
| (d) | CONTINGENCY MECO PREP DISCRETE | V90X8480X |
| (e) | CONT_2EO_MODE | V90J2077C |
| (f) | SERC_I/C_DEL_TIMER | (INTERNAL) |
| (g) | SERC_INCNT_DEL | V99U9787C |

If (a) is true, set (14) true, and on the first pass issue (6) through (13). On first pass and subsequent passes, proceed to Step 1B. Otherwise, if (a) is false, proceed to monitor (b).

If (b) is true, issue (6) through (13), and proceed to monitor (c) and (d). Otherwise, if (b) is false, proceed to monitor (c) and (d).

If (c) or (d) is true, then set (14) true and proceed to Step 1B. Otherwise, monitor (e).

If (e) is equal to 5, then on the first pass start (f) and proceed to monitor (e), (f) and (g).

If (e) is not equal to 5, or (f) is greater than or equal to (g), then on first pass terminate (1), (2), and (3), set (4) to enable, and issue (5).

Proceed to Step1B.

| | | |
|------|--------------------------------------|------------|
| (1) | ABORT RCS + X ON CMD | V90X8314X |
| (2) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (3) | OMS TO RCS RTRN TO NORMAL CONFIG CMD | V90X8313X |
| (4) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (5) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (6) | OMS L POD HE ISLN VLV A OP | V43K4180X |
| (7) | OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| (8) | OMS R POD HE ISLN VLV A OP | V43K5180X |
| (9) | OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| (10) | OMS L POD HE ISLN VLV B OP | V43K4181X |
| (11) | OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| (12) | OMS R POD HE ISLN VLV B OP | V43K5181X |
| (13) | OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |
| (14) | PRE MECO ICNCT COMPLETE FLAG | (INTERNAL) |

Step 1B. This step controls selection of the OMS burn time for a manually initiated OMS propellant dump and for an abort which has been down-moded from an ATO abort to a TAL abort.

The following signals are monitored:

| | | |
|-----|---------------------|------------|
| (a) | ORBITER DUMP ENABLE | V93X6980X |
| (b) | ATO ABORT SELECTED | (INTERNAL) |
| (c) | TAL ABORT DECLARED | V90X8658X |

If (a) is true, on first pass, set (1) true, set (2) equal to (3), set (5) false, and proceed to Step 2. On subsequent passes, proceed to Step 2. Otherwise, if (a) is false, proceed to monitor (b).

If (b) is true, proceed to monitor (c). Otherwise, if (b) is false, proceed to Step 2.

If (c) is true, on first pass, set (2) equal to (4), and proceed to Step 2. On subsequent passes, proceed to Step 2. Otherwise, if (c) is false, proceed to Step 2.

| | | |
|-----|-----------------------------|------------|
| (1) | BURN TIME SEL COMPLETE FLAG | (INTERNAL) |
| (2) | OMS DELTA T COMPUTED | V90W8325C |
| (3) | MANUAL_OMS_DT | V99U9717C |
| (4) | TAL_OMS_DT | V97U9786C |
| (5) | DUMP CUTOFF FLAG | (INTERNAL) |

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Step 2. This step determines if the abort burn table selection has been completed or pre-MECO interconnect operation is completed for second SSME failure situations.

The following signals are monitored:

- | | | |
|-----|------------------------------|------------|
| (a) | BURN TIME SEL COMPLETE FLAG | (INTERNAL) |
| (b) | PRE-MECO ICNCT COMPLETE FLAG | (INTERNAL) |

If (a) or (b) is true, proceed to Step 7.

If (a) and (b) are false, proceed to Step 3.

Step 3. This step controls the selection of the appropriate table values to be used in the control of the OMS and RCS abort burns.

The following signals are monitored:

- | | | |
|-----|---------------------|-----------|
| (a) | RTLS ABORT DECLARED | V90X8637X |
| (b) | TAL ABORT DECLARED | V90X8658X |
| (c) | TGT COMPLETE FLAG | V90X8504X |

If (a) is true, proceed to Step 4.

If (a) is false, and (b) is true, proceed to Step 5.

If (a) and (b) are both false, and (c) is true, proceed to Step 6.

If (a) and (b) and (c) are all false, proceed to Step 6a.

Step 4. This step selects the RTLS I-load or uplinked value for use in control of the OMS propellant abort burn during an RTLS abort.

The computed burn value and OMS/RCS interconnect initial selection are set equal to RTLS I-load or uplinked table values as follows:

- | | | |
|-----|----------------|-----------|
| (a) | RTLS_OMS_DT | V97U9780C |
| (b) | RTLS_ICNCT_SEL | V99U9991C |
| (c) | SERC FLAG | V90X8913X |

Set (1) below equal to (a), set (2) true, and proceed to the next if statement.

If (b) is true (ENABLE), or (c) is true, set (3) true (ENABLE) and return to Step 1. Otherwise, set (3) false (INHIBIT), and return to Step 1.

- | | | |
|-----|----------------------------------|------------|
| (1) | OMS DELTA T COMPUTED | V90W8325C |
| (2) | BURN TIME SEL COMPLETE FLAG | (INTERNAL) |
| (3) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |

Step 5. This step selects the TAL I-load or uplinked value for use in control of the OMS propellant abort burn during TAL abort.

The computed burn value and OMS/RCS interconnect initial selection are set equal to the TAL I-load or uplinked values as follows:

- | | | |
|-----|---------------|-----------|
| (a) | TAL_OMS_DT | V97U9786C |
| (b) | TAL_ICNCT_SEL | V99U9992C |
| (c) | SERC FLAG | V90X8913X |

Set (1) below equal to (a), set (2) true, and proceed to the next if statement.

If (b) is true (ENABLE), or (c) is true, set (3) true (ENABLE) and return to Step 1. Otherwise, set (3) false (INHIBIT), and return to Step 1.

- | | | |
|-----|----------------------------------|------------|
| (1) | OMS DELTA T COMPUTED | V90W3825C |
| (2) | BURN TIME SEL COMPLETE FLAG | (INTERNAL) |
| (3) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |

Step 6. This step selects the ATO I-load value for use in control of the OMS propellant abort burn during ATO abort.

- | | | |
|-----|----------------|-----------|
| (a) | SCALE FACTOR 2 | V90J8517C |
| (b) | ATO_OMS_DT | V97U9798C |
| (c) | ATO_ICNCT_SEL | V99U9993C |
| (d) | SERC FLAG | V90X8913X |
| (e) | ASSIST_OMS_DT | V97U1248C |

The computed burn value and OMS/RCS interconnect initial selection are set equal to the ATO I-load value as follows:

Set (1) below equal to the quantity of the product of (a) and (b) plus the quantity (e), set (3) and (4) equal to true, and proceed to the next if statement.

If (c) is true (ENABLE), or (d) is true, set (2) true (ENABLE) and return to Step 1. Otherwise, set (2) false (INHIBIT), and return to Step 1.

- | | | |
|-----|----------------------------------|------------|
| (1) | OMS DELTA T COMPUTED | V90W8325C |
| (2) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (3) | BURN TIME SEL COMPLETE FLAG | (INTERNAL) |
| (4) | ATO ABORT SELECTED | (INTERNAL) |

Step 6(a). This step initiates, and controls the OMS ascent performance assist burn in MM103. The step also protects the configuration of an OMS to RCS interconnect should Single Engine Roll Control be activated before the OMS assist burn is started.

The following signals are monitored:

- | | | |
|-----|-------------------|-----------|
| (a) | ASCENT OMS ASSIST | V90X0375X |
| (b) | ASSIST_OMS_DT | V97U1248C |

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(c) SERC

V90X8913X

If (a) is true, then on the first pass, set (1) below equal to (b). Then also on the first pass, if (c) is false, set (2) false (INH), and proceed to Step 7. Otherwise proceed to Step 7. On subsequent passes proceed to Step 7.

If (a) is false, then return to Step 1.

(1) OMS DELTA T COMPUTED

V90W8325C

(2) OMS/RCS INTERCONNECT INH/ENA CMD

V93X5348X

Step 7. All abort functions are suspended during the ET separation maneuver.

The following signals are monitored:

(a) MECO PREPARATION DISCRETE

V90X1989X

(b) MECO CONFIRMED FLAG

V90X8561X

If (a) and (b) are both false, proceed to Step 8.

If (a) or (b) is true, proceed to Step 12.

Step 8. This step primarily controls the termination of all pre-MECO OMS burns and dumps. The step allows the dumps or burns that are either not ready for termination or are ready to be initiated to proceed to the next step.

Monitor the following parameters:

(a) ORBITER DUMP INHIBIT

V93X6981X

(b) OMS DELTA T COMPUTED

V90W8325C

(c) OMS EQUIVALENT ON TIME

V90W8320C

(d) OMS-L ON CMD IND

V90X8271X

(e) OMS-R ON CMD IND

V90X8272X

(f) SERC FLAG

V90X8913X

(g) OMS TO RCS INTERCONNECT COMPLETE FLAG

V90X8282X

If (a) is false and (b) > (c), proceed to Step 9.

If (a) is true or (b) ≤ (c) proceed to monitor (d) and (e).

If (d) or (e) is true, terminate (1), (3), and (4), issue (2), set (8) false, and (10) true, start (9) and proceed to monitor (f). Otherwise, proceed to monitor (f).

If (f) is true, return to Step 1. Otherwise, proceed to monitor (g).

If (g) is true, terminate (5), issue (6), set (7) false (INHIBIT), and return to Step 1. Otherwise, return to Step 1.

(1) ABORT OMS IGN CMD

V90X8319X

(2) OMS CUTOFF CMD

V90X8318X

(3) ABORT RCS +X ON CMD

V90X8314X

| | | |
|------|--|------------|
| (4) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (5) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (6) | OMS TO RCS RETURN TO NORMAL CONFIG CMD | V90X8313X |
| (7) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (8) | ORBITER DUMP ENABLE | V93X6980X |
| (9) | OMS DELAY TIMER | (INTERNAL) |
| (10) | DUMP CUTOFF FLAG | (INTERNAL) |

Step 9. For pre-MECO conditions, this step controls the startup and maintenance of OMS engines only and/or OMS/RCS interconnected OMS propellant usage. For post-MECO conditions, this step supports the MPS propellant settling burn use of the OMS engines. In addition, this step protects for an abort minimum off time (30 seconds) for the OMS engines prior to restart.

The following signals are monitored:

| | | |
|-----|---------------------------------------|------------|
| (a) | OMS-L ON CMD IND | V90X8271X |
| (b) | OMS-R ON CMD IND | V90X8272X |
| (c) | SERC FLAG | V90X8913X |
| (d) | ORBITER DUMP ENABLE | V93X6980X |
| (e) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (f) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |
| (g) | DUMP CUTOFF FLAG | (INTERNAL) |
| (h) | OMS_CUTOFF_DELAY | (INTERNAL) |
| (i) | OMS DELAY TIMER | (INTERNAL) |

If (a) or (b) is true, increment (3) by 80 msec and proceed to monitor (c), (d), and (g). Otherwise, if (a) and (b) are both false, proceed to monitor (g) and (i).

If (g) is false or (i) is greater than or equal to (h), then issue (1), terminate (2), set (8) false, reset (i), and proceed to monitor (c), (d), and (g). Otherwise, proceed to monitor (c), (d), and (g).

If (c) is false and (g) is false, or (d) is true, proceed to monitor (e). Otherwise, return to Step 1.

If (e) is true (ENABLE), proceed to Step 10. Otherwise, proceed to monitor (f).

If (f) is true, terminate (4) through (6), issue (7), and return to Step 1. Otherwise, return to Step 1.

| | | |
|-----|--------------------------------------|------------|
| (1) | ABORT OMS IGN CMD | V90X8319X |
| (2) | OMS CUTOFF CMD | V90X8318X |
| (3) | OMS EQUIVALENT ON TIME | V90W8320C |
| (4) | ABORT RCS +X ON CMD | V90X8314X |
| (5) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (6) | OMS TO RCS INTECONNECT CMD | V90X8312X |
| (7) | OMS TO RCS RTRN TO NORMAL CONFIG CMD | V90X8313X |
| (8) | DUMP CUTOFF FLAG | (INTERNAL) |

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Step 10. This step assures that the OMS propellants are connected to the RCS jets.

The following signal is monitored:

| | | |
|-----|---------------------------------------|-----------|
| (a) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |
| (b) | ICNCT_DELAY | V99U9786C |
| (c) | ICNCT DELAY TIMER | INTERNAL |

If (a) is false, issue (1) below, terminate (2), and return to Step 1.

If (a) is true, on first pass start (c). On subsequent passes if (c) \geq (b) issue (3) and (4) below, and proceed to Step 11. Otherwise return to Step 1.

| | | |
|-----|--------------------------------------|-----------|
| (1) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (2) | OMS TO RCS RTRN TO NORMAL CONFIG CMD | V90X8313X |
| (3) | ABORT RCS +X ON CMD | V90X8314X |
| (4) | 20 RCS NULL JETS ON CMD | V90X8317X |

Step 11. This step controls the OMS propellant burn timer and scale factors when using RCS null jets.

The following signals are monitored:

| | | |
|-----|---------------------------------|-----------|
| (a) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (b) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (c) | OMS EQUIVALENT ON TIME | V90W8320C |

If (a) and (b) are both false, increment (c) by (2), set (1) equal to (3), and return to Step 1.

If (a) or (b) is true, increment (c) by (4), set (1) equal to (5), and return to Step 1.

| | | |
|-----|-----------------------|-----------|
| (1) | OMS TIME SCALE FACTOR | V94J3755C |
| (2) | RCS_24_JET_FU_BIAS | V99U9772C |
| (3) | RCS_24_JET_FU_SCALE | V99U9773C |
| (4) | RCS_10_JET_FU_BIAS | V99U9775C |
| (5) | RCS_10_JET_FU_SCALE | V99U9776C |

Step 12. This step provides the branches to support either a MM102 interconnected OMS dump with or without a Fast ET Separation, or a post-MECO contingency OMS engine MPS propellant settling burn, or the termination of the abort functions in preparation for ET Separation in MM103 or MM601.

Monitor the following parameters:

| | | |
|-----|---------------------------------|-----------|
| (a) | MAJOR MODE 102 FLAG | V90X8158X |
| (b) | CONT MPS SETTLING BURN ARM FLAG | V90X3234X |
| (c) | OMS DELTA T COMPUTED | V90W8325C |
| (d) | OMS EQUIVALENT ON TIME | V90W8320C |
| (e) | SETTLING BURN ENABLE FLAG | V90X3240X |

If (a) is true, on first pass, terminate (3), issue (1), set (2) true (ENABLE), and proceed to Step 13. On subsequent passes, proceed to Step 13. Otherwise, proceed to monitor (b).

If (b) is true, then proceed to monitor (c) and (d). Otherwise, on first pass, set (4) true, set (5), (6), and (7) false, and proceed to Step 14. On subsequent passes, proceed to Step 14.

If (c) is greater than (d), then on first pass set (3) and (8) true, terminate (1), (6), and (7), set (2) false (INHIBIT), and proceed to monitor (e). On subsequent passes, proceed to monitor (e). Otherwise, proceed to monitor (e).

If (e) is true, then proceed to Step 9. Otherwise, return to Step 1.

| | | |
|-----|--|-----------|
| (1) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (2) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (3) | OMS TO RCS RETURN TO NORMAL CONFIG CMD | V90X8313X |
| (4) | OMS CUTOFF CMD | V90X8318X |
| (5) | ABORT OMS IGN CMD | V90X8319X |
| (6) | ABORT RCS +X ON CMD | V90X8314X |
| (7) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (8) | MODE 2 INDICATOR | V90X8308X |

Step 13. This step determines whether to initiate or terminate contingency rapid dump in MM102. At termination for fast separation, a Mode 2 type interconnect return to normal is commanded.

The following signals are monitored:

| | | |
|-----|------------------------|-----------|
| (a) | FAST SEPARATION FLAG | V90X8267X |
| (b) | ORBITER DUMP INHIBIT | V93X6981X |
| (c) | OMS DELTA T COMPUTED | V90W8325X |
| (d) | OMS EQUIVALENT ON TIME | V90W8320C |
| (e) | ORBITER DUMP ENABLE | V93X6980X |

If (a) is true, on first pass, set (1) true and proceed to Step 20. On subsequent passes, proceed to Step 20. Otherwise, proceed to monitor (b), (c), and (d).

If (b) is true or (c) \leq (d), proceed to Step 20; otherwise, proceed to monitor (e).

If (e) is true proceed to Step 17. Otherwise, return to Step 1.

| | | |
|-----|------------------|-----------|
| (1) | MODE 2 INDICATOR | V90X8308X |
|-----|------------------|-----------|

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Step 14. This step selects a Mode 2 OMS/RCS Return-to-Normal to be initiated at MECO Command and terminates the Orbiter Dump Enable and Orbiter Dump Inhibit commands. The OMS He/Vapor Isolation Op commands are terminated at the completion of the interconnect return-to-normal sequence.

The following signals are monitored:

- | | | |
|-----|---------------------------------------|-----------|
| (a) | MECO COMMAND FLAG | V90X8569X |
| (b) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |

If (a) is false, return to Step 1.

If (a) is true, one time only, terminate (3), issue (4), set (13) true, set (1), (2), and (14) false (INHIBIT), and proceed to Step 15. On subsequent passes, proceed to monitor (b).

If (b) is false, one time only, terminate (5) through (12), set (13) false, and proceed to Step 15. On subsequent passes, proceed to Step 15. Otherwise, proceed to Step 15.

- | | | |
|------|--|-----------|
| (1) | ORBITER DUMP ENABLE | V93X6980X |
| (2) | ORBITER DUMP INHIBIT | V93X6981X |
| (3) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (4) | OMS TO RCS RETURN TO NORMAL CONFIG CMD | V90X8313X |
| (5) | OMS L POD HE ISLN VLV A OP | V43K4180X |
| (6) | OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| (7) | OMS R POD HE ISLN VLV A OP | V43K5180X |
| (8) | OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| (9) | OMS L POD HE ISLN VLV B OP | V43K4181X |
| (10) | OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| (11) | OMS R POD HE ISLN VLV B OP | V43K5181X |
| (12) | OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |
| (13) | MODE 2 INDICATOR | V90X8308X |
| (14) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |

Step 15. This step determines if a post-MECO dump has been manually inhibited, or terminated by completion.

The following signals are monitored:

- | | | |
|-----|------------------------|-----------|
| (a) | ORBITER DUMP ENABLE | V93X6980X |
| (b) | ORBITER DUMP INHIBIT | V93X6981X |
| (c) | OMS DELTA T COMPUTED | V90W8325C |
| (d) | OMS EQUIVALENT ON TIME | V90W8320C |

If (a) is true and (c) > (d), proceed to Step 16.

If (a) is true and (c) ≤ (d), proceed to Step 20.

If (a) is false and (b) is true, proceed to Step 20.

If (a) and (b) are false, proceed to Step 23.

Step 16. This step assures the flight control system constraints and OMS system NZ constraints are satisfied in MM 602 or during a 3 E/O Contingency Abort prior to interconnecting OMS propellants to the RCS jets.

The following signals are monitored:

| | | |
|-----|----------------------------------|------------|
| (a) | MM 602 DUMP INIT FLAG | (INTERNAL) |
| (b) | MAJOR MODE 602 FLAG | V90X8174X |
| (c) | NZ | V90A5381C |
| (d) | OMS_NZ_LIM | V99U9697C |
| (e) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (f) | FCS_ACCEPT_ICNCT | V90X8296X |
| (g) | CONT_3EO_START | V90X0909X |

If (a) is false, proceed to monitor (b) and (g). Otherwise, if (a) is true, proceed to Step 16A.

If (b) or (g) is true, proceed to monitor (c). Otherwise, if (b) and (g) are false, return to Step 1.

If $| (c) | \leq (d)$, issue (1) below, set (2) true, start timer (3), and proceed to monitor (e). Otherwise, if $| (c) | > (d)$, set (4) false, set (5) true, and return to Step 1.

If (e) is true (ENABLE), proceed to monitor (f). Otherwise, if (e) is false (INHIBIT), set (6) true, and return to Step 1.

If (f) is true, issue (8), terminate (9) and (10), and return to Step 1. If (f) is false, set (6) true and (7) false (INHIBIT), and return to Step 1.

| | | |
|------|------------------------------------|------------|
| (1) | CG TRIM CMD | V90X8309X |
| (2) | MM 602 DUMP INIT FLAG | (INTERNAL) |
| (3) | CG TRIM DELAY TIMER | (INTERNAL) |
| (4) | ORBITER DUMP ENABLE | V93X6980X |
| (5) | ORBITER DUMP INHIBIT | V93X6981X |
| (6) | OME ONLY FLAG | V90X8051X |
| (7) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (8) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (9) | OMS TO RCS RTRN TO NORM CONFIG CMD | V90X8313X |
| (10) | ABORT RCS + X ON CMD | V90X8314X |

Step 16A. This step insures the OMS/RCS interconnect sequence has completed before continuing the execution of an OMS propellant dump if an interconnect is requested. This step also issues the 4 + X jet command to provide propellant settling, and insures the OMS system NZ constraints are satisfied prior to OMS ignition.

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The following signals are monitored:

| | | |
|-----|---------------------------------------|------------|
| (a) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (b) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |
| (c) | CG_TRIM_DELAY | V97U9836C |
| (d) | CG TRIM DELAY TIMER | (INTERNAL) |
| (e) | NZ | V90A5381C |
| (f) | OMS_NZ_LIM | V99U9697C |

If (a) is true (ENABLE), proceed to monitor (b). Otherwise, if (a) is false (INHIBIT), issue (1) and proceed to monitor (c).

If (b) is true, issue (1) and proceed to monitor (c). Otherwise, if (b) is false, return to Step 1.

If (c) is \leq (d), on first pass, proceed to monitor (e) and (f). On subsequent passes, proceed to Step 17. Otherwise, if (c) $>$ (d), return to Step 1.

If $| (e) |$ is \leq (f), proceed to Step 17. Otherwise, if $| (e) |$ is $>$ (f), set (2) true and proceed to Step 18.

| | | |
|-----|--------------------------|------------|
| (1) | ABORT RCS + X ON CMD | V90X8314X |
| (2) | OMS NZ DUMP INHIBIT FLAG | (INTERNAL) |

Step 17. This step initiates the contingency dumping of OMS propellant through the OMS engines in OPS 1 and OPS 6 and increments the OMS dump timer.

The following signals are monitored:

| | | |
|-----|---------------------------|------------|
| (a) | IGN PRESS DELAY INIT FLAG | (INTERNAL) |
| (b) | OMS-L ON CMD IND | V90X8271X |
| (c) | OMS-R ON CMD IND | V90X8272X |
| (d) | IGN_PRESS_DELAY | V97U9838C |
| (e) | IGN PRESS DELAY TIMER | (INTERNAL) |
| (f) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (g) | MAJOR MODE 102 FLAG | V90X8158X |

If (a) is true, proceed to monitor (b) and (c). Otherwise, start timer (e), set (4) true, and proceed to monitor (b) and (c).

If (b) and (c) are both false, terminate (2), issue (3), and return to Step 1.

If either (b) or (c) is true, increment (1) by 80 msec and proceed to monitor (d).

If (d) \leq (e) or (f) is true, proceed to monitor (g). Otherwise, return to Step 1.

If (g) is true, proceed to Step 19. Otherwise, proceed to Step 18.

| | | |
|-----|---------------------------|------------|
| (1) | OMS EQUIVALENT ON TIME | V90W8320C |
| (2) | OMS CUTOFF CMD | V90X8318X |
| (3) | ABORT OMS IGN CMD | V90X8319X |
| (4) | IGN PRESS DELAY INIT FLAG | (INTERNAL) |

Step 18. This step controls the termination of the contingency dumping of OMS propellants based on OMS and/or RCS system constraints in MM602.

The following signals are monitored:

| | | |
|-----|----------------------------------|------------|
| (a) | NZ | V90A5381C |
| (b) | OMS_NZ_LIMIT | V99U9697C |
| (c) | OME ONLY FLAG | V90X8051X |
| (d) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (e) | CONTINGENCY_NZ_LIM | V97U9837C |
| (f) | OMS EQUIVALENT ON TIME | V90W8320C |
| (g) | CONT_OMS_RCS_ICNCT_TERM_FU_TIME | V99U9718C |
| (h) | OMS NZ DUMP INHIBIT FLAG | (INTERNAL) |

If | (a) | > (b) for three consecutive passes, or (h) is true, terminate (1), (3), (4), (5), and (13). Issue (2) and (6), set (7), (11), and (12) false, set (8) and (9) true, set (10) false (INHIBIT), reset (14) and (15), and proceed to Step 22. Otherwise go to the next if statement.

If (c) is true or (d) is false (INHIBIT) or [| (a) | > (e) for three consecutive passes] or (f) ≥ (g), terminate (3) through (5), issue (6), set (9) true and (10) false (INHIBIT), and proceed to Step 22. Otherwise, proceed to Step 19.

| | | |
|------|--|------------|
| (1) | ABORT OMS IGN CMD | V90X8319X |
| (2) | OMS CUTOFF CMD | V90X8318X |
| (3) | ABORT RCS +X ON CMD | V90X8314X |
| (4) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (5) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (6) | OMS TO RCS RETURN TO NORMAL CONFIG CMD | V90X8313X |
| (7) | ORBITER DUMP ENABLE | V93X6980X |
| (8) | ORBITER DUMP INHIBIT | V93X6981X |
| (9) | OME ONLY FLAG | V90X8051X |
| (10) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (11) | MM602 DUMP INIT FLAG | (INTERNAL) |
| (12) | IGN PRESS DELAY INIT FLAG | (INTERNAL) |
| (13) | C.G. TRIM CMD | V90X8309X |
| (14) | IGN PRESS DELAY TIMER | (INTERNAL) |
| (15) | C.G. TRIM DELAY TIMER | (INTERNAL) |

Step 19. This step issues the abort dump commands and determines the proper bias and scale factor to be used based on the Manifold Jet Inhibit flags from the OMS/RCS Interconnect Sequence.

Monitor the following signals:

| | | |
|-----|---------------------------------------|-----------|
| (a) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (b) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (c) | OMS EQUIVALENT ON TIME | V90W8320C |
| (d) | OMS TIME SCALE FACTOR | V94J3755C |
| (e) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |

If (e) is true, issue (5) and (6), and proceed to monitor (a) and (b). Otherwise, return to Step 1.

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If (a) and (b) are both false, increment (c) by (1), set (d) equal to (2), and return to Step 1.

If (a) or (b) is true, increment (c) by (3), set (d) equal to (4), and return to Step 1.

| | | |
|-----|-------------------------|-----------|
| (1) | RCS_24_JET_FU_BIAS | V99U9772C |
| (2) | RCS_24_JET_FU_SCALE | V99U9773C |
| (3) | RCS_10_JET_FU_BIAS | V99U9775C |
| (4) | RCS_10_JET_FU_SCALE | V99U9776C |
| (5) | ABORT RCS + X ON CMD | V90X8314X |
| (6) | 20 RCS NULL JETS ON CMD | V90X8317X |

Step 20. This step is the first step of a common routine ending at Step 22 which performs those functions associated with completion or termination of the manually selected dump for post-MECO (MM102 and 602).

The following signals are monitored:

| | | |
|-----|------------------|-----------|
| (a) | OMS-L ON CMD IND | V90X8271X |
| (b) | OMS-R ON CMD IND | V90X8272X |

If (a) or (b) is true, terminate (1) through (4) and (6), issue (7) and (8), set (9) true, set (5), (11), and (12) false, set (10) false (INHIBIT), reset (13) and (14), and proceed to Step 21.

If (a) and (b) are both false, proceed to Step 21.

| | | |
|------|--|------------|
| (1) | C.G. TRIM CMD | V90X8309X |
| (2) | ABORT OMS IGN CMD | V90X8319X |
| (3) | ABORT RCS + X ON CMD | V90X8314X |
| (4) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (5) | ORBITER DUMP ENABLE | V93X6980X |
| (6) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (7) | OMS CUTOFF CMD | V90X8318X |
| (8) | OMS TO RCS RETURN TO NORMAL CONFIG CMD | V90X8313X |
| (9) | ORBITER DUMP INHIBIT | V93X6981X |
| (10) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (11) | MM602 DUMP INIT FLAG | (INTERNAL) |
| (12) | IGN PRESS DELAY INIT FLAG | (INTERNAL) |
| (13) | IGN PRESS DELAY TIMER | (INTERNAL) |
| (14) | C.G. TRIM DELAY TIMER | (INTERNAL) |

Step 21. This step controls the initialization, startup, and continuation of the post-MECO Aft RCS propellant dump through the 4 + X jets.

The following signals are monitored:

| | | |
|-----|----------------------|-----------|
| (a) | AFT RCS DUMP COUNTER | V90W8229C |
| (b) | MAJOR MODE 602 FLAG | V90X8174X |
| (c) | MAJOR MODE 603 FLAG | V90X8122X |
| (d) | NZ | V90A5381C |

(e) CONTINGENCY_NZ_LIM V97U9837C

If (a) is greater than zero, then proceed to Step 23. Otherwise, proceed to monitor (b), (c), (d), and (e).

If either (b) or (c) are true, and the absolute value of (d) is greater than (e), then proceed to Step 22.
Otherwise, return to Step 1.

Step 22. This step selects the manual post-MECO RCS propellant burn timer.

The following signals are monitored:

(a) OMS TO RCS INTERCONNECT COMPLETE FLAG V90X8282X

If (a) is false, then one time only, set (1) equal to (2), and proceed to Step 23. On subsequent passes, proceed to Step 23.

If (a) is true, return to Step 1.

(1) AFT RCS DUMP DURATION V93W6958C
(2) T_RCS_REF V97U9828C

Step 23. This step controls the RTLS post-MECO RCS propellant burn. The crew has the capability to terminate RCS propellant burn via Override display.

The following signals are monitored:

(a) MM 602 FLAG V90X8174X
(b) MM 603 FLAG V90X8122X
(c) AFT RCS DUMP COUNTER V90W8229C
(d) AFT RCS DUMP DURATION V93W6958C
(e) AFT RCS DUMP ENABLE V93X6949X

If (a) is true and 20 seconds have elapsed since (a) was true, or (b) is true, proceed to the next if statement; otherwise, return to Step 1.

If (d) ≤ (c), terminate output (1), reset output (2) and return to Step 1.

If (d) > (c) and (e) is true, issue output (1), increment (c) by 80 msec and return to Step 1.

If (d) > (c) and (e) is false, terminate output (1) and return to Step 1.

(1) ABORT RCS + X ON CMD V90X8314X
(2) AFT RCS DUMP ENABLE V93X6949X

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Step 24. This step initializes the ENTRY OMS FUEL BURN TIME, and determines if an OMS/RCS Interconnect is required. This step will also initiate an automatic OMS dump in a TAL abort, or a manual OMS dump by the crew via the Override display (if all constraints are satisfied), and pressurizes the OMS tanks.

The following signals are monitored:

| | | |
|-----|----------------------------------|------------|
| (a) | START_DUMP_VELOCITY | V99U9573C |
| (b) | GND REL VEL MAGNITUDE IN M50 SYS | V95L0151C |
| (c) | ORBITER DUMP ENABLE | V93X6980X |
| (d) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (e) | OMS_RCS_INTERCON_INIT_FU_TIME | V99U9716C |
| (f) | OMS EQUIVALENT ON TIME | V90W8320C |
| (g) | OMS DELTA T COMPUTED | V90W8325C |
| (h) | ENTRY_OMS_FUEL_BURN_TIME | V99U9571C |
| (i) | FCS_ACCEPT_ICNCT | V90X8296X |
| (j) | ORBITER DUMP INHIBIT | V93X6981X |
| (k) | DUMP ENA INIT FLAG | (INTERNAL) |

If (a) \geq (b) proceed to Step 29. Otherwise, if (a) < (b), proceed to the next if statement.

If first pass, set (g) equal to (h) and if (e) > (f), set (15) equal to true (ENABLE), and proceed to monitor (i) and (j). Otherwise, if first pass and (e) \leq (f), proceed to monitor (i) and (j). On subsequent passes, proceed to monitor (i) and (j).

If (i) is true and (j) is false, on first pass, set (c) true and proceed to monitor (c). On subsequent passes, proceed to monitor (c). Otherwise, proceed to monitor (c).

If (c) is false, proceed to Step 28. Otherwise, if (c) is true, proceed to monitor (k).

If (k) is false, issue outputs (1) through (9), set (17) true, and proceed to monitor (d) and (i). Otherwise, if (k) is true, proceed to Step 25.

If (d) is true (ENABLE) and (i) is true, issue (13), terminate (14), start timer (16), and proceed to Step 28. Otherwise, issue (10), set (11) and (18) true, set (15) false (INHIBIT), start timer (12), and proceed to Step 28.

| | | |
|------|-------------------------------|------------|
| (1) | C.G. TRIM CMD | V90X8309X |
| (2) | OMS L POD HE ISLN VLV A OP | V43K4180X |
| (3) | OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| (4) | OMS R POD HE ISLN VLV A OP | V43K5180X |
| (5) | OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| (6) | OMS L POD HE ISLN VLV B OP | V43K4181X |
| (7) | OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| (8) | OMS R POD HE ISLN VLV B OP | V43K5181X |
| (9) | OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |
| (10) | ABORT RCS + X ON CMD | V90X8314X |
| (11) | OME ONLY FLAG | V90X8051X |
| (12) | RCS 4 + X ON TIME | (INTERNAL) |
| (13) | OMS TO RCS INTERCONNECT CMD | V90X8312X |

- | | | |
|------|--|------------|
| (14) | OMS TO RCS RETURN TO NORMAL CONFIG CMD | V90X8313X |
| (15) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (16) | C.G. TRIM DELAY TIMER | (INTERNAL) |
| (17) | DUMP ENA INIT FLAG | (INTERNAL) |
| (18) | TWO OME DUMP FLAG | (INTERNAL) |

Step 25. This step monitors the TWO OME DUMP FLAG to determine if an OMS only dump is to be processed and will monitor the RCS 4 + X ON TIME and issue the dump commands at the proper intervals.

The following signals are monitored:

- | | | |
|-----|--------------------|------------|
| (a) | TWO OME DUMP FLAG | (INTERNAL) |
| (b) | RCS 4 + X ON TIMER | (INTERNAL) |

If (a) is false, proceed to Step 26.

If (a) is true and (b) \geq 10 seconds, one time only, issue (1), terminate (2), and proceed to the next if statement. Otherwise, proceed to the next if statement.

If (a) is true and (b) \geq 20 seconds, one time only, terminate (3), and proceed to Step 28. Otherwise, proceed to Step 28.

- | | | |
|-----|----------------------|-----------|
| (1) | ABORT OMS IGN CMD | V90X8319X |
| (2) | OMS CUTOFF CMD | V90X8318X |
| (3) | ABORT RCS + X ON CMD | V90X8314X |

Step 26. This monitors the OMS/RCS I/C ENA/INH flag to determine if the interconnect is to be terminated either by crew selection or upon burn completion or for exceedance of systems constraints in OPS 3.

The following signals are monitored:

- | | | |
|-----|---------------------------------------|-----------|
| (a) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (b) | NZ | V90A5381C |
| (c) | CONTINGENCY_NZ_LIM | V97U9837C |
| (d) | OMS EQUIVALENT ON TIME | V90W8320C |
| (e) | OMS_RCS_INTERCON_TERM_FU_TIME | V99U9952C |
| (f) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |

If [(a) is false (INHIBIT) or | (b) | > (c) continuously for more than 1 second or (d) is \geq (e)], terminate (1), (2), and (4), issue (3), set (5) false (INHIBIT), set (6) true, and proceed to Step 27. Otherwise, proceed to monitor (f).

If (f) is true, proceed to Step 27. Otherwise, proceed to Step 28.

- | | | |
|-----|--|-----------|
| (1) | ABORT RCS + X ON CMD | V90X8314X |
| (2) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (3) | OMS TO RCS RETURN TO NORMAL CONFIG CMD | V90X8313X |
| (4) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (5) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |

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(6) OME ONLY FLAG V90X8051X

Step 27. This step initiates the OMS plus 24 RCS jet dump after the designed time delays.

The following signals are monitored:

| | |
|--------------------------------------|------------|
| (a) CG_TRIM_DELAY | V97U9836C |
| (b) CG TRIM DELAY TIMER | (INTERNAL) |
| (c) OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (d) IGN_PRESS_DELAY | V97U9838C |
| (e) IGN PRESS DELAY TIMER | (INTERNAL) |
| (f) AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (g) AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (h) OMS EQUIVALENT ON TIME | V90W8320C |
| (i) OMS TIME SCALE FACTOR | V94J3755C |
| (j) OMS-L ON CMD IND | V90X8271X |
| (k) OMS-R ON CMD IND | V90X8272X |

If (a) ≤ (b), proceed to monitor (j) and (k). Otherwise, proceed to Step 28.

If both (j) and (k) are false, issue (1), terminate (2), start timer (e), and proceed to monitor (c), (d), and (e). Otherwise, proceed to monitor (c), (d), and (e).

If (c) is true (ENABLE) and (d) ≤ (e), issue (3) and (4), and proceed to monitor (f) and (g). Otherwise, proceed to Step 28.

If (f) or (g) is true, increment (h) by (7), set (i) equal to (8), and proceed to Step 28. Otherwise, increment (h) by (5), set (i) equal to (6), and proceed to Step 28.

| | |
|-----------------------------|-----------|
| (1) ABORT OMS IGN CMD | V90X8319X |
| (2) OMS CUTOFF CMD | V90X8318X |
| (3) ABORT RCS + X ON CMD | V90X8314X |
| (4) 20 RCS NULL JETS ON CMD | V90X8317X |
| (5) RCS_24_JET_FU_BIAS | V99U9772C |
| (6) RCS_24_JET_FU_SCALE | V99U9773C |
| (7) RCS_10_JET_FU_BIAS | V99U9775C |
| (8) RCS_10_JET_FU_SCALE | V99U9776C |

Step 28. This step increments the OMS dump timer and terminates the OMS propellant dump by crew input, dump completion or OMS system constraints in OPS 3.

The following signals are monitored:

| | |
|----------------------------|-----------|
| (a) ORBITER DUMP INHIBIT | V93X6981X |
| (b) OMS EQUIVALENT ON TIME | V90W8320C |
| (c) OMS DELTA T COMPUTED | V90W8325C |
| (d) NZ | V90A5381C |
| (e) OMS_NZ_LIM | V99U9697C |
| (f) OMS-L ON CMD IND | V90X8271X |

(g) OMS-R ON CMD IND V90X8272X

If [(a) is true] or [(b) is \geq (c)] or [| (d) | > (e) continuously for more than 1.0 sec], terminate outputs (1) through (13), issue (14) and (15) set (21) true, set (16) and (18) false and (17) false (INHIBIT), set (22) true, reset (19), (20), and (23), and return to Step 1. Otherwise, go to the next if statement.

If (f) or (g) is true, increment (b) by 80 msec, and return to Step 1. Otherwise, return to Step 1.

| | | |
|------|--|------------|
| (1) | C.G. TRIM CMD | V90X8309X |
| (2) | ABORT OMS IGN CMD | V90X8319X |
| (3) | ABORT RCS + X ON CMD | V90X8314X |
| (4) | 20 RCS NULL JETS ON CMD | V90X8317X |
| (5) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (6) | OMS L POD HE ISLN VLV A OP | V43K4180X |
| (7) | OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| (8) | OMS R POD HE ISLN VLV A OP | V43K5180X |
| (9) | OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| (10) | OMS L POD HE ISLN VLV B OP | V43K4181X |
| (11) | OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| (12) | OMS R POD HE ISLN VLV B OP | V43K5181X |
| (13) | OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |
| (14) | OMS CUTOFF CMD | V90X8318X |
| (15) | OMS TO RCS RETURN TO NORMAL CONFIG CMD | V90X8313X |
| (16) | ORBITER DUMP ENABLE | V93X6980X |
| (17) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (18) | DUMP ENA INIT FLAG | (INTERNAL) |
| (19) | IGN PRESS DELAY TIMER | (INTERNAL) |
| (20) | RCS 4 + X ON TIMER | (INTERNAL) |
| (21) | ORBITER DUMP INHIBIT | V93X6981X |
| (22) | OME ONLY FLAG | V90X8051X |
| (23) | C.G. TRIM DELAY TIMER | (INTERNAL) |

Step 29. This step controls the MM304 RCS propellant dump via the RCS 4 + X jets.

The following signals are monitored:

| | | |
|-----|-----------------------|-----------|
| (a) | AFT RCS DUMP ENABLE | V93X6849X |
| (b) | AFT RCS DUMP DURATION | V93W6958C |
| (c) | AFT RCS DUMP COUNTER | V90W8229C |
| (d) | AFT RCS TTG SF | V94J3757C |

If (a) is true, proceed to the next if statement. Otherwise, terminate (1), and return to Step 1.

If (b) > (c), issue (1) below, increment (c) by the product of (d) and 80 msec, and return to Step 1.

If (b) \leq (c), terminate (1), set (a) = false, and return to Step 1.

| | | |
|-----|----------------------|-----------|
| (1) | ABORT RCS + X ON CMD | V90X8314C |
|-----|----------------------|-----------|

ABORT CONTROL SEQUENCE INITIALIZATION

| <u>NOMENCLATURE</u> | <u>INITIAL VALUE</u> | <u>UNITS</u> |
|------------------------------|----------------------|--------------|
| BURN TIME SEL COMPLETE FLAG | FALSE | |
| ATO ABORT SELECTED | FALSE | |
| MM602 DUMP INIT FLAG | FALSE | |
| CG TRIM DELAY TIMER | 0.0 | SEC |
| IGN PRESS DELAY TIMER | 0.0 | SEC |
| DUMP ENA INIT FLAG | FALSE | |
| RCS 4 + X ON TIMER | 0.0 | SEC |
| OME ONLY FLAG | FALSE | |
| PRE-MECO ICNCT COMPLETE FLAG | FALSE | |
| IGN PRESS DELAY INIT | FALSE | |
| 2 OME DUMP FLAG | FALSE | |
| OMS NZ DUMP INHIBIT FLAG | FALSE | |
| SERC FLAG | FALSE | |
| OMS CUTOFF CMD | FALSE | |
| OMS_CUTOFF_DELAY | 30.0 | SEC |
| OMS DELAY TIMER | 0.0 | SEC |
| DUMP CUTOFF FLAG | FALSE | |
| SERC_I/C_DEL_TIMER | 0.0 | SEC |
| AFT RCS DUMP COUNTER | 0.0 | SEC |

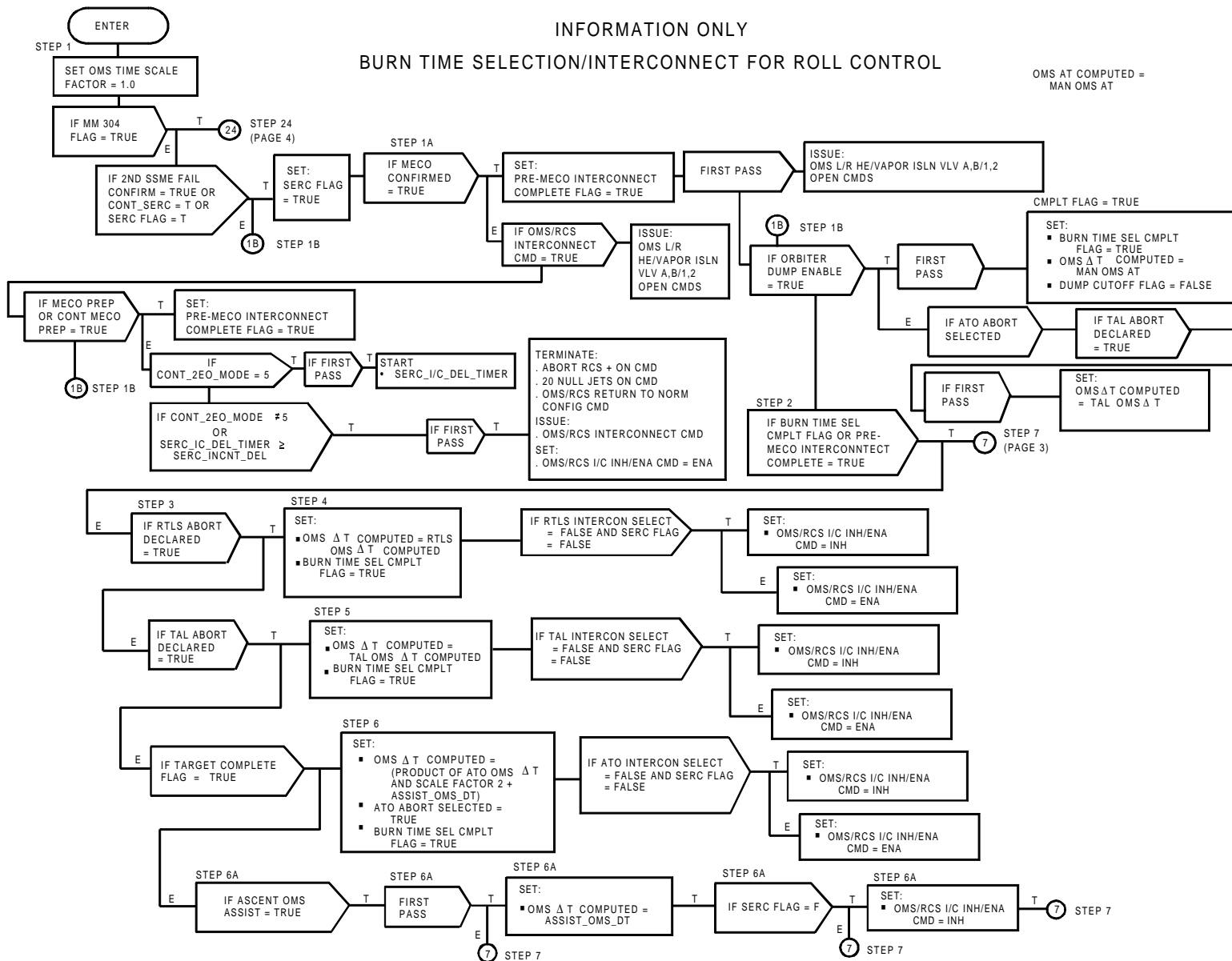


FIGURE 4.192.(1) Abort Control Sequence (Sheet 1 of 7)

INFORMATION ONLY
PRE MECO - OMS OR OMS/RCS DUMP
POST MECO - MPS SETTLING BURN

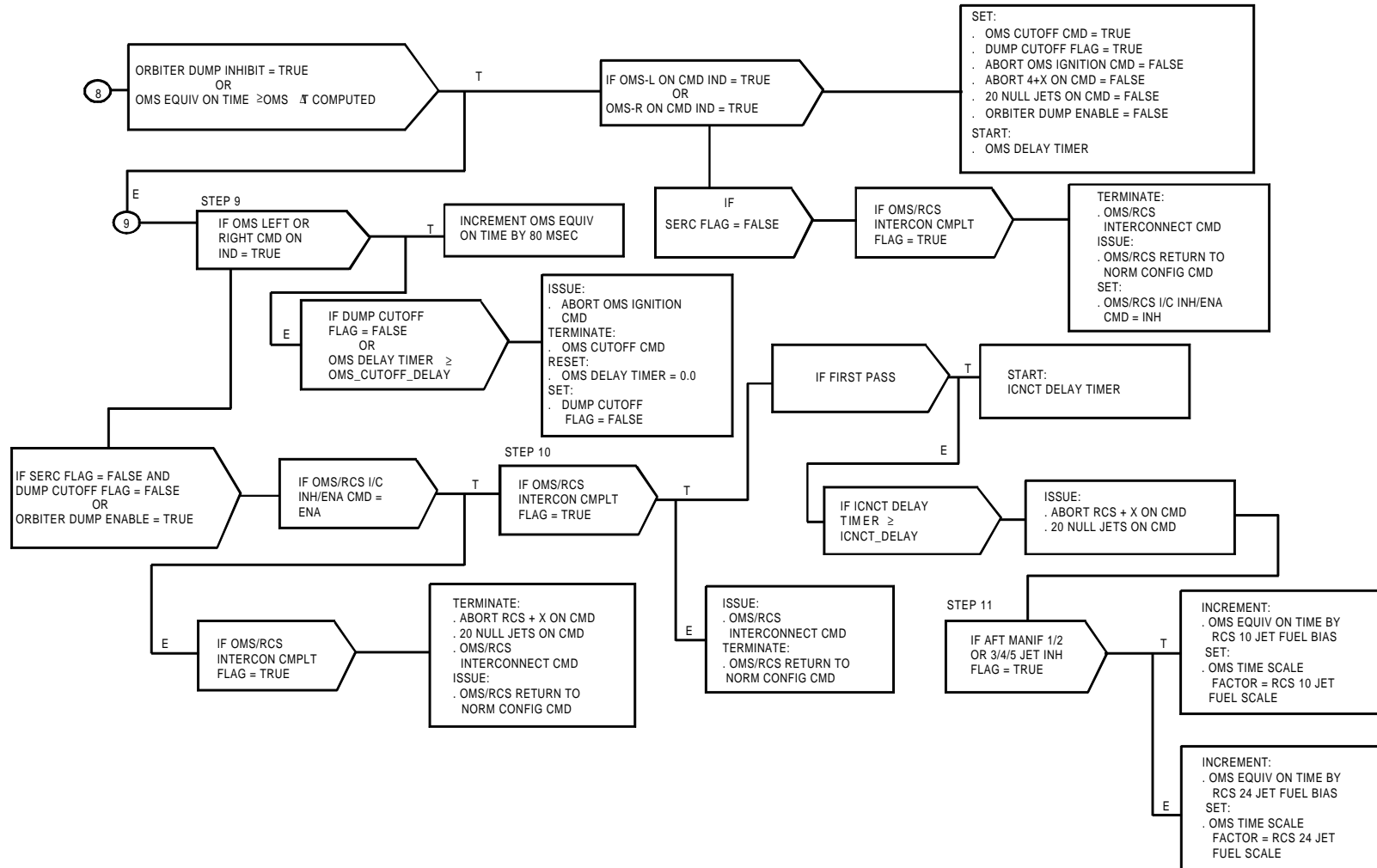


FIGURE 4.192.(2) Abort Control Sequence (Sheet 2 of 7)

POST MECO . OMS OR OMS/RCS BURN, MPS SETTLING BURN, AND AFT RCS PROP BURN

INFORMATION ONLY

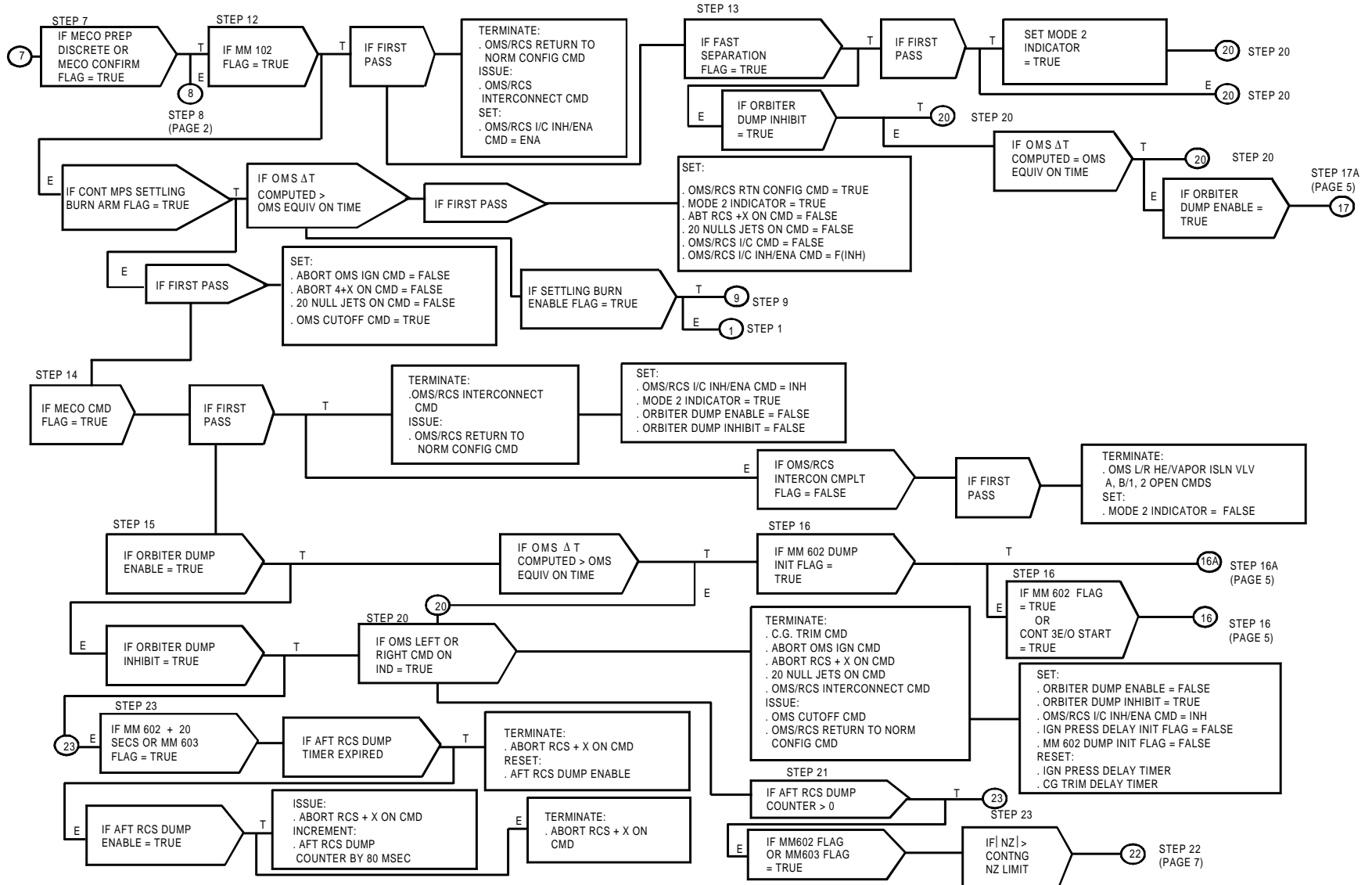


FIGURE 4.192.(3) Abort Control Sequence (Sheet 3 of 7)

INFORMATION ONLY

MAJOR MODE 304 - OMS OR OMS/RCS BURN AND AFT RCS PROP BURN

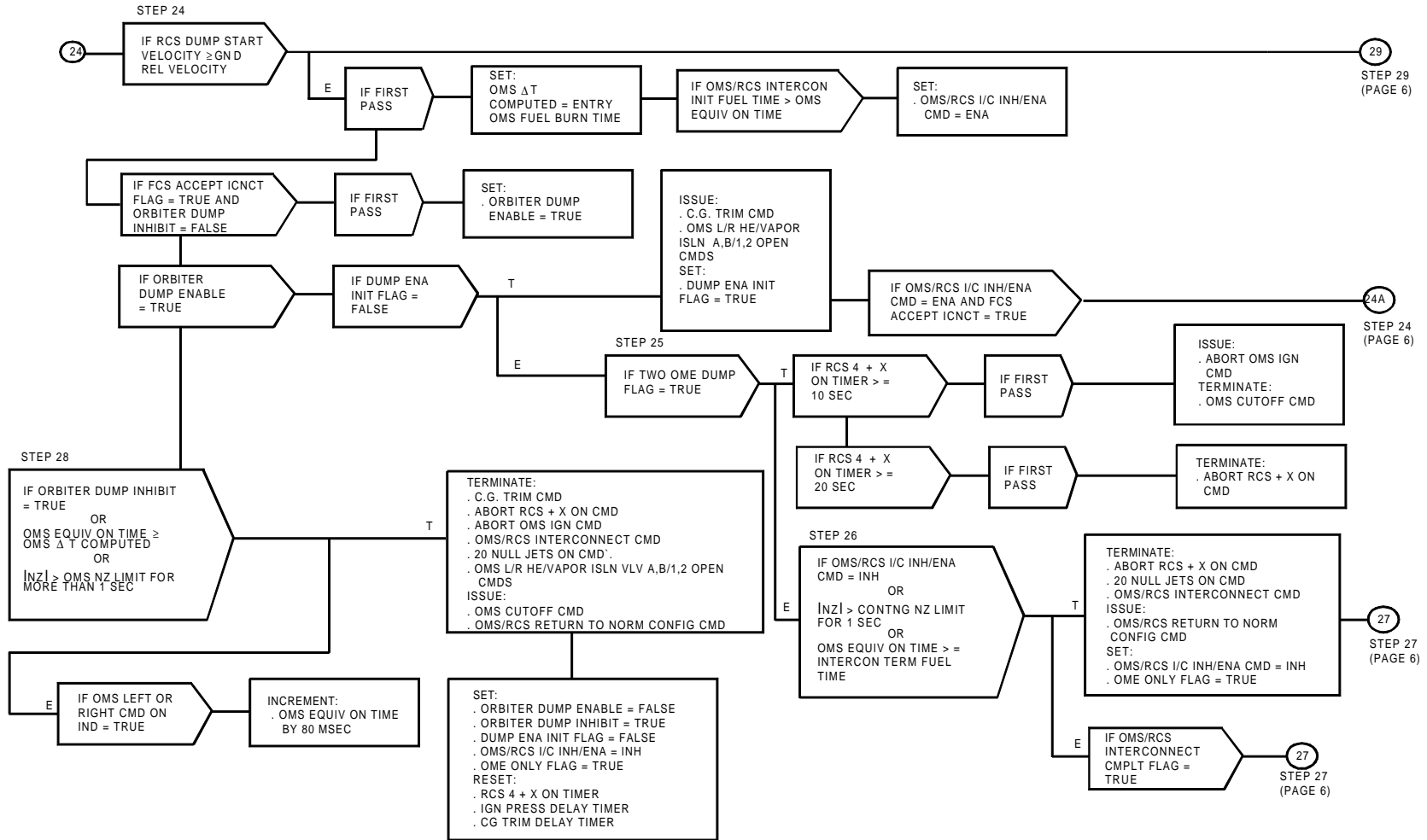


FIGURE 4.192.(4) Abort Control Sequence (Sheet 4 of 7)

INFORMATION ONLY
CONTINUATION OF POST MECO BURN CONTROL

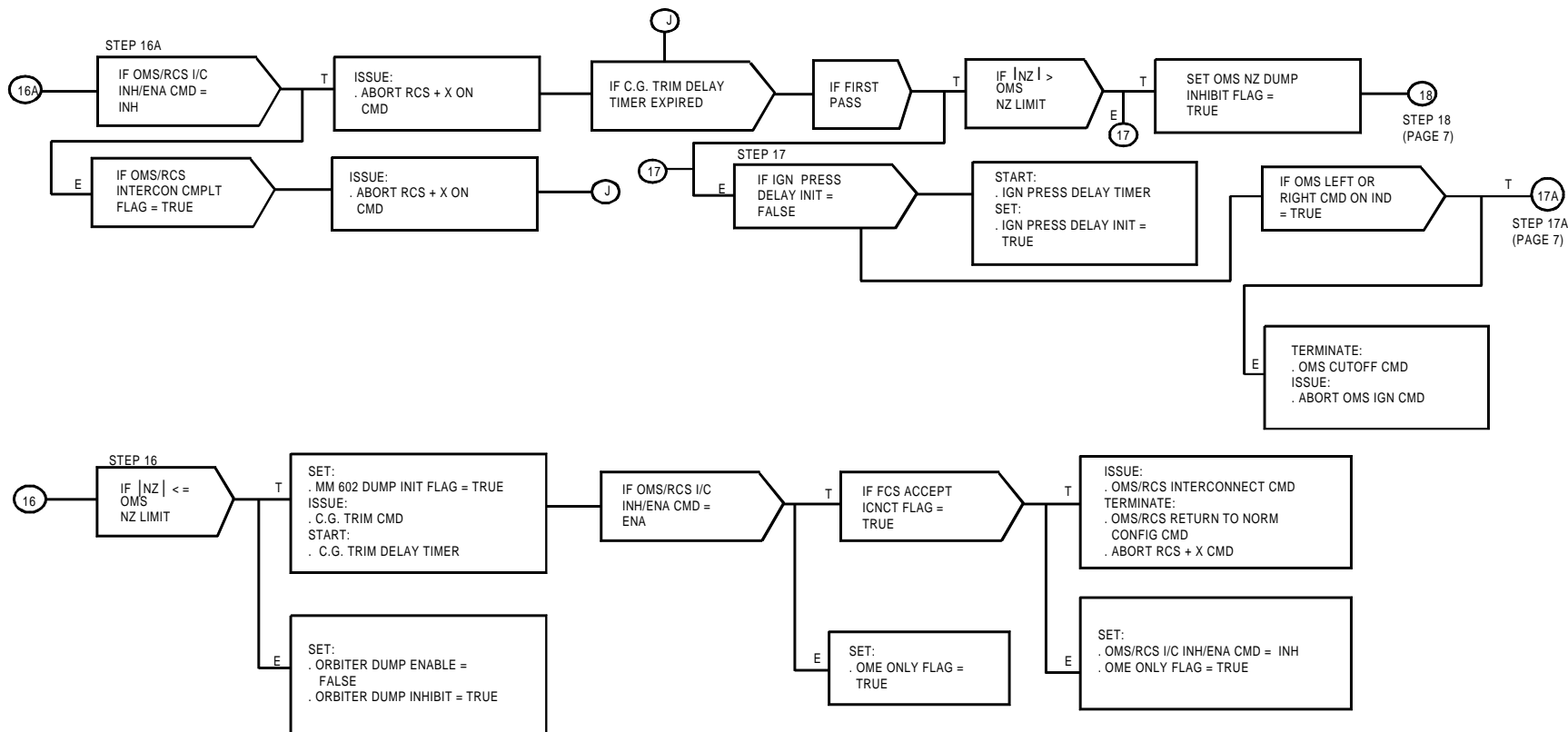


FIGURE 4.192.(5) Abort Control Sequence (Sheet 5 of 7)

INFORMATION ONLY
CONTINUATION OF MM304 BURN CONTROL

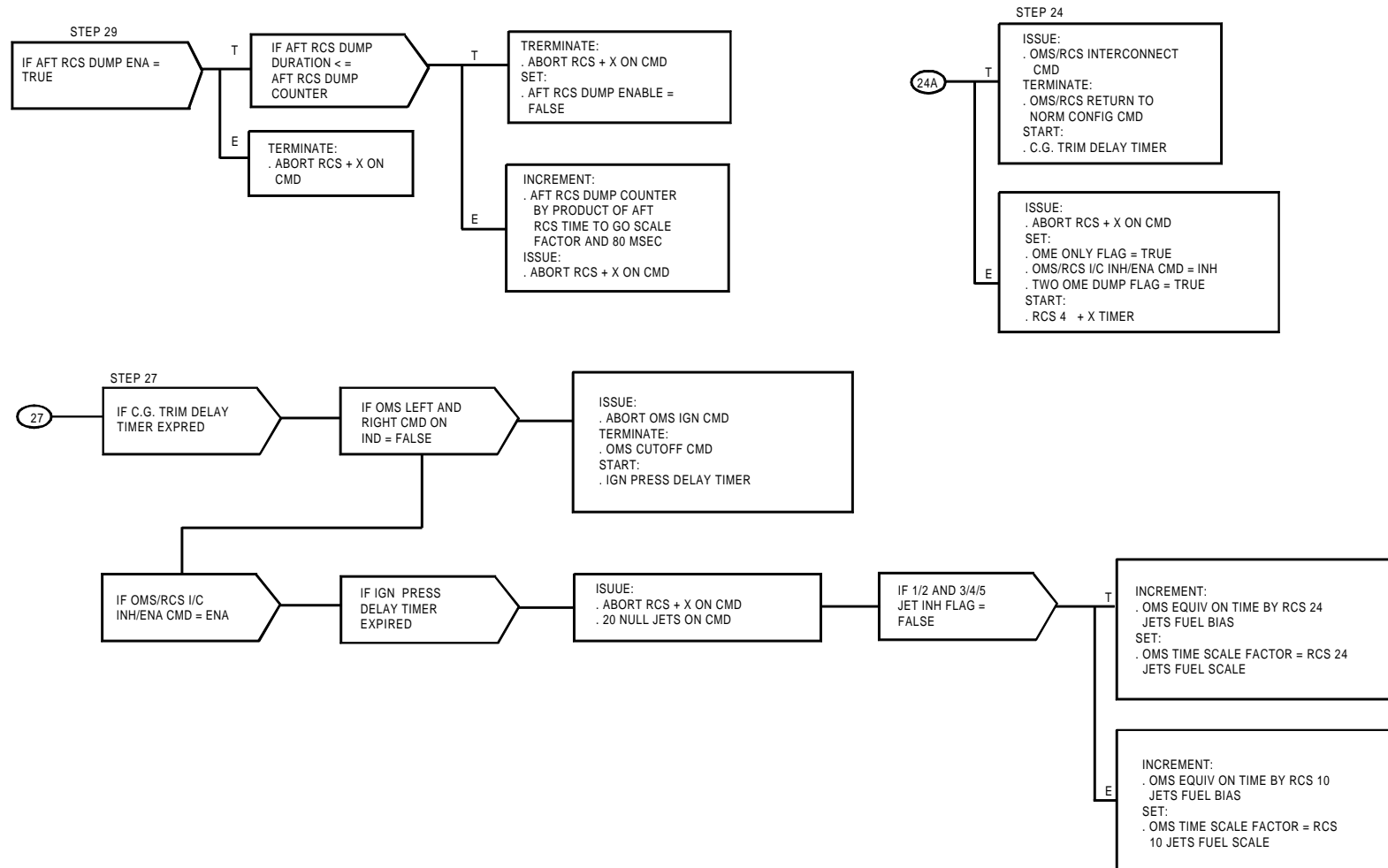


FIGURE 4.192.(6) Abort Control Sequence (Sheet 6 of 7)

INFORMATION ONLY
CONTINUATION OF POST MECO BURN CONTROL

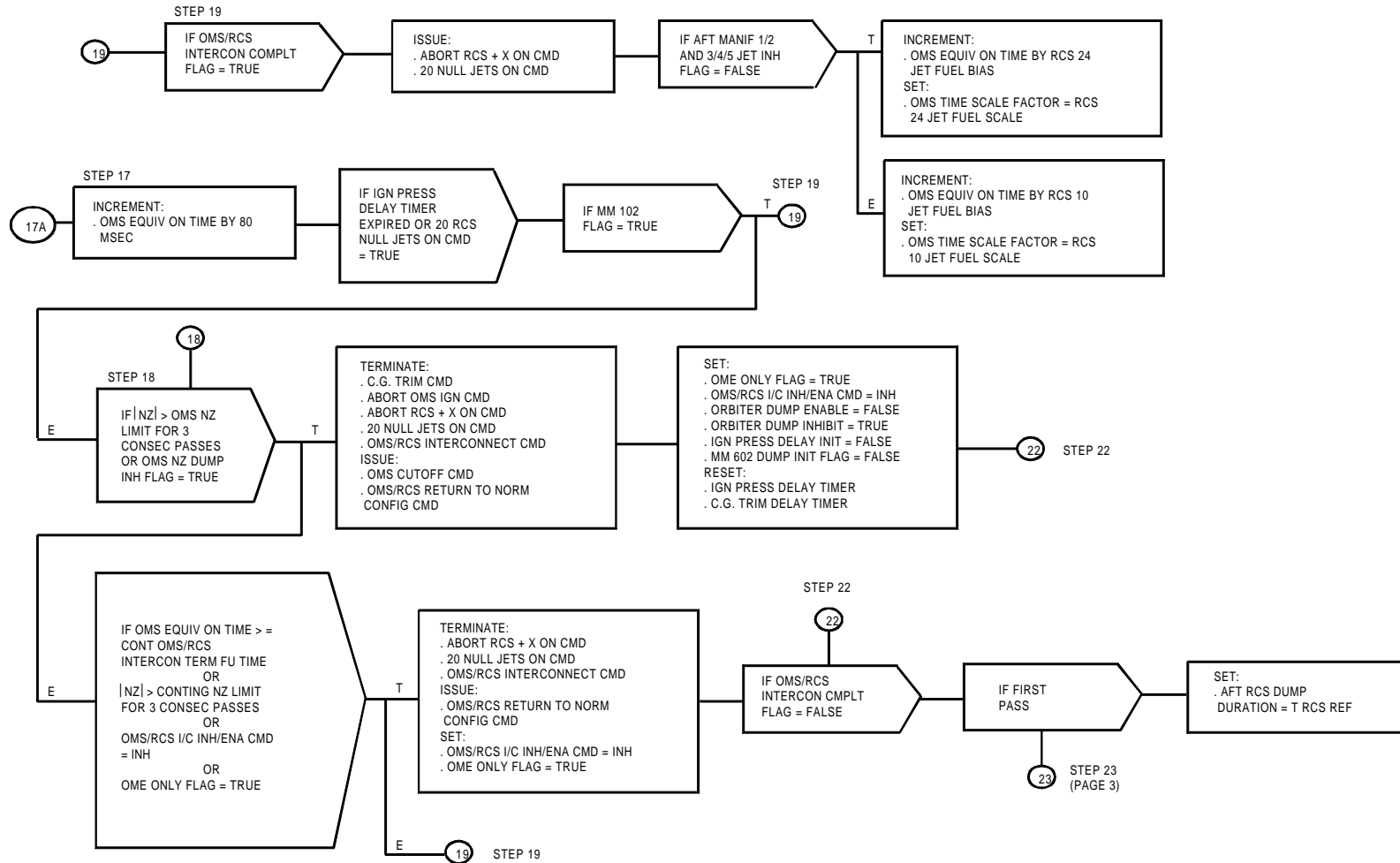


FIGURE 4.192.(7) Abort Control Sequence (Sheet 7 of 7)

TABLE 4.3.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR ABORT CONTROL SEQUENCER (G4.192)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|----------------------------------|------------|------------------------------------|--------------------|-------|-----------|---------|---------|-------|
| AFT_RCS_DUMP_ENABLE | V93X6949XA | AFT RCS DUMP ENABLE | OVERRIDE DISP | | BD | | 90114B | |
| AFT_RCS_TTG_SF | V94J3757CA | AFT RCS TIME SCALE FACTOR | E/L RCS CMD SOP | | | | 90114B | |
| ARM_CONT_MPS_SETTLING_BURN | V90X3234X | CONT MPS SETTling BURN ARM FLAG | PW CONT GUID | | BD | | 92504G | |
| ARM_CONT_MPS_SETTLING_BURN AS29A | V90X3234XA | CONT MPS SETTling BURN ARM FLAG | CONT 3E/O GUID | | BD | | 92672B | |
| ASSIST_OMS_DT | V90X0375X | ASCENT OMS ASSIST | MSC | EVENT | BD | | 93017G | * |
| ATO_OMS_DT | V97U1248C | SECOND STAGE OMS ASSIST DUMP TIMER | UL | S | | | 93025B | |
| CLOCK/CLOCKTIME | V97U9798C | ATO ABORT OMS DUMP TIMER | UL | S | | | 92364D | |
| CONTINGENCY_NZ_LIM | V91W5000C | CLOCK-COMPUTER(GMT) | FCOS | S | | | 93160B | * |
| CONT_2EO_MODE | V97U9837C | NORMAL ACCEL LIMIT FOR ICNCT | CONT 3E/O GUID | G | | | 91036B | |
| CONT_3EO_START | V90J2077C | CONTINGENCY 2-ENG OUT MODE INDEX | PW CONT GUID | | HXS | | 93017G | * |
| CONT_MECO_PREP_FLAG | V90X0909X | CONTINGENCY 3 E/O START FLAG | CONT 3E/O GUID | | BD | | 93017G | * |
| CONT_MECO_PREP_FLAG | V90X8480X | CONTINGENCY MECO PREP DISCRETE | PW CONT GUID | | | | 90243C | |
| CONT_MECO_PREP_FLAG | V90X8480XA | CONTINGENCY MECO PREP DISCRETE | PW RTLS GUID | | | | 90114B | |
| CONT_OMS_RCS_ICNCT_TERM_FU_TIME | V99U9718C | CONT OMS/RCS ICNCT TERM FU TIME | UL | S | | | 92392C | |
| CONT_SERC | V93X6682X | CONT SINGLE ENG ROLL CNTL FLAG | XXXXXX TRAJ 1 DISP | | BD | | 93017G | * |
| CONT_SERC | V93X6682XA | CONT SINGLE ENG ROLL CNTL FLAG | ASC DAP | | BD | | 93017G | * |
| CONT_SERC | V93X6682XB | CONT SINGLE ENG ROLL CNTL FLAG | XXXXXX TRAJ 2 DISP | | BD | | 93017G | * |
| CONT_SERC | V93X6682XC | CONT SINGLE ENG ROLL CNTL FLAG | RTLS TRAJ 2 DISP | | BD | | 93017G | * |
| ENTRY_OMS_FUEL_BURN_TIME | V99U9571C | TAL MM 304 OMS DUMP TIMER | UL | S | SPL | S | 92175D | |
| FAST_SEP_FLAG | V90X8267X | FAST SEPARATION FLAG | ET SEP SEQ | | | | 79643A | |
| FCS_ACCEPT_ICNCT | V90X8296XA | INTERCONNECTED DUMP CONSTRAINT | AEROJET DAP | | | | 90705H | |
| FCS_ACCEPT_ICNCT | V90X8296XB | INTERCONNECTED DUMP CONSTRAINT | GRTLS DAP | | | | 90705H | |
| FCS_ACCEPT_ICNCT | V90X8296XC | INTERCONNECTED DUMP CONSTRAINT | CONT 3E/O GUID | | | | 90964 | |
| GUID_MECO_PREP_FLAG | V90X1989XA | MECO PREPARATION DISCRETE | ASC 2STG GUID | | | | | |
| GUID_MECO_PREP_FLAG | V90X1989XB | MECO PREPARATION DISCRETE | PW RTLS GUID | | | | | |
| K2 | V90J8517C | SCALE FACTOR 2 | AOA/ATO TGT | | | | | |
| MANUAL_OMS_DT | V99U9717C | MANUAL OMS DUMP TIMER | UL | S | SPL | S | 92175D | |
| MANUAL_OMS_DT | V99U9717CA | MANUAL OMS DUMP TIMER | OVERRIDE SPEC | S | | | 92175D | |
| MECO_CMD | V90X8569XA | MECO COMMAND FLAG | SSME OPS | | BD | | 93017G | * |
| MECO_CONFIRMED | V90X8561X | MECO CONFIRMED FLAG | SSME OPS | | BD | | 93017G | * |
| MM_CODE_102/MM_102 | V90X8158X | MAJOR MODE 102 FLAG | MSC | | | | 93012D | |
| MM_CODE_304/MM_304 | V90X8161X | MAJOR MODE 304 FLAG | MSC | | | | 92355B | |
| MM_CODE_602/MM_602 | V90X8174X | MAJOR MODE 602 FLAG | MSC | | | | 92355B | |
| MM_CODE_603/MM_603 | V90X8122X | MAJOR MODE 603 FLAG | MSC | | | | 92355B | |
| NZ | V90A5381C | SELECTED AA NORMAL ACCEL | SF | G | SPL | | 93017G | * |
| OMS_L_ON_CMD_IND | V90X8271X | OMS-L ON CMD IND | OMS FIRE SEQ | | | | 90120B | |
| OMS_NZ_LIM | V99U9697C | NORMAL ACCEL LIMIT FOR OMS DUMP | CONT 3E/O GUID | G | | | 90705H | |
| OMS_RCS_INTERCON_INIT_FU_TIME | V99U9716C | OMS/RCS ICNCT INIT FU TIME | UL | S | | | 92392C | |
| OMS_RCS_INTERCON_TERM_FU_TIME | V99U9952C | OMS/RCS ICNCT TERM FU TIME | UL | S | | | 92392C | |
| OMS_R_ON_CMD_IND | V90X8272X | OMS-R ON CMD IND | OMS FIRE SEQ | | | | 90120B | |
| ORBITER_DUMP_ENA | V93X6980XA | ORBITER DUMP ENABLE | OVERRIDE SPEC | | | | 89449 | |
| ORBITER_DUMP_ENA | V93X6980XC | ORBITER DUMP ENABLE | CONT 3E/O GUID | | BD | | 90964 | |
| ORBITER_DUMP_ENA | V93X6980XD | ORBITER DUMP ENABLE | XXXXXX TRAJ 1 DISP | | | | 93012D | |
| ORBITER_DUMP_ENA | V93X6980XE | ORBITER DUMP ENABLE | XXXXXX TRAJ 2 DISP | | | | 93012D | |
| ORBITER_DUMP_ENA | V93X6980XF | ORBITER DUMP ENABLE | RTLS TRAJ 2 DISP | | | | 93012D | |
| ORBITER_DUMP_INH | V93X6981XA | ORBITER DUMP INHIBIT | OVERRIDE SPEC | | | | 89449 | |

TABLE 4.3.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR ABORT CONTROL SEQUENCER (G4.192)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------------|------------|-----------------------------------|--------------------|-------|-----------|---------|---------|-------|
| ORBITER_DUMP_INH | V93X6981XB | ORBITER DUMP INHIBIT | XXXXXX TRAJ 1 DISP | | | | 93012D | |
| ORBITER_DUMP_INH | V93X6981XC | ORBITER DUMP INHIBIT | XXXXXX TRAJ 2 DISP | | | | 93012D | |
| ORBITER_DUMP_INH | V93X6981XD | ORBITER DUMP INHIBIT | RTLS TRAJ 2 DISP | | | | 93012D | |
| REL_VEL_MAG/V | V95L0151CC | GND REL VEL MAGNITUDE IN M50 SYS | ENT UPP | FT/S | SPL | | 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 | * |
| RTLS_ICNCT_SEL | V99U9991C | RTLS INTERCONNECT DISCRETE | UL | | BD | | 92175D | |
| RTLS_OMS_DT | V97U9780C | RTLS PRE-MECO OMS DUMP TIMER | UL | S | SPL | S | 92175D | |
| SEC_ME_FL_CNFM | V90X1721X | 2ND SSME FAIL CONFIRM | ASC DAP | | | | 89990E | |
| SETTLING_BURN_ENA | V90X3240X | SETTLING BURN ENABLE FLAG | CONT 3E/O GUID | | BD | | 92504G | |
| S_ABORT_CONTROL | V90X8504X | TGT COMPLETE FLAG | AOA/ATO TGT | | | | | |
| S_ATO | V90X8635X | ATO ABORT DECLARED | MSC | | | | 93012D | |
| TAL_ABORT_DECLARED | V90X8658X | TAL ABORT DECLARED | MSC | | | | 93090E | |
| TAL_ICNCT_SEL | V99U9992C | TAL INTERCONNECT DISCRETE | UL | | BD | | 92175D | |
| TAL_OMS_DT | V97U9786C | TAL PRE-MECO OMS DUMP TIMER | UL | S | SPL | S | 92175D | |
| | V90W8325CB | OMS DELTA T COMPUTED | OVERRIDE SPEC | S | SPL | | 90122E | |
| | 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 | * |
| | V93W6958C | AFT RCS DUMP DURATION | OVERRIDE DISP | S | | | 92392C | |
| | V93W8325CB | OMS DELTA T COMPUTED | OVERRIDE SPEC | | | | 90114B | |
| | V93X5348XA | OMS/RCS INTERCONNECT INH/ENA CMD | OVERRIDE DISP | | BD | | 93017G | * |
| | V93X5348XC | OMS/RCS INTERCONNECT INH/ENA CMD | ABT OMS/RCS CONN | | BD | | 90964 | |
| | V93X5348XD | OMS/RCS INTERCONNECT INH/ENA CMD | CONT 3E/O GUID | | BD | | 90964 | |

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

TABLE 4.3.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ABORT CONTROL SEQUENCER (G4.192)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------------|------------|-------------------------------|--|-------|-----------|---------|---------|-------|
| AFT_RCS_DUMP_CNTR | V90W8229C | AFT RCS DUMP COUNTER | OVERRIDE SPEC | S | | | 90114B | |
| AFT_RCS_DUMP_ENABLE | V93X6949XB | AFT RCS DUMP ENABLE | OVERRIDE DISP | | BD | | 89149B | |
| MODE_2_INDICATOR | V90X8308X | MODE 2 INDICATOR | ABT OMS/RCS CONN | | BD | | 90705H | |
| OME_ONLY_FLAG | V90X8051X | OME ONLY FLAG | OVERRIDE DISP | | | | 90114B | |
| S_OMS_CUTOFF | V90X8318XA | OMS CUTOFF CMD | ASC 2STG GUID MSC OMS FIRE SEQ PW CONT GUID PW RTLS GUID TLM | | | | 93064D | |
| S_OMS_IGN | V90X8319X | ABORT OMS IGNITION CMD | ASC 2STG GUID MSC PW CONT GUID PW RTLS GUID | | | | 89990E | |
| S_RCS_IGN | V90X8314X | ABORT RCS +X ON CMD | ASC 2STG GUID ASC RCS CMD SOP DL FMT 21/A E/L RCS CMD SOP PW CONT GUID PW RTLS GUID | | BD | | 93017G | * |
| S_RCS_NULL20 | V90X8317X | 20 RCS NULL JETS ON CMD | ASC 2STG GUID ASC RCS CMD SOP DL FMT 21/A E/L RCS CMD SOP PW CONT GUID PW RTLS GUID | | BD | | 93017G | * |
| T1 | V90W8320C | OMS EQUIVALENT ON TIME | ASC 2STG GUID ASC MNVR DIP CONT 3E/O GUID DL FMT 21/A OVERRIDE SPEC | S | SPL | | 93017G | * |
| | V43K4180XC | OMS-L POD HE ISLN VLV A OP | HDWR | | | | | |
| | V43K4181XC | OMS-L POD HE ISLN VLV B OP | HDWR | | | | 90114B | |
| | V43K4182XC | OMS-L POD VAPOR ISLN VLV 1 OP | PCA A1 | | | | | |
| | V43K4183XC | OMS-L POD VAPOR ISLN VLV 2 OP | PCA A3 | | | | 90114B | |
| | V43K5180XC | OMS-R POD HE ISLN VLV A OP | HDWR | | | | | |
| | V43K5181XC | OMS-R POD HE ISLN VLV B OP | HDWR | | | | 90114B | |
| | V43K5182XC | OMS-R POD VAPOR ISLN VLV 1 OP | PCA A1 | | | | | |
| | V43K5183XC | OMS-R POD VAPOR ISLN VLV 2 OP | PCA A3 | | | | 90114B | |
| | V90M2857PC | CGEB_IPA_LG2_FLAG_WD1_HFE | DL FMT 21/A | | | | 93017G | * |
| | V90M3129PA | CGSB_SEQ_DL_FLAG_WD | DL FMT 21/A | | | | 93017G | * |
| | V90W8325CA | OMS DELTA T COMPUTED | ASC 2STG GUID DL FMT 21/1 OVERRIDE SPEC | S | SPL | | 93017G | * |
| | V90X8309X | C.G. TRIM | OMS TVC CMD SOP | | | | | |

TABLE 4.3.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ABORT CONTROL SEQUENCER (G4.192)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|---|-------|-----------|------------------|---------|-------------|
| | V90X8312X | OMS TO RCS INTERCONNECT CMD | ABT OMS/RCS CONN DL FMT 21/A MSC RCS REG SEQ | | BD | | 93017G | * |
| | V90X8313X | OMS TO RCS RTRN TO NORM CONFIG CMD | RCS/RCS XFEED ABT OMS/RCS CONN DL FMT 21/A MSC | | BD | | 93017G | * |
| | V90X8913X | SERC FLAG | VERRIDE DISP | | | | 89990E | |
| | V93M0508PB | CGSB_FLAG_WORD2 | DL FMT 21/A | | | | 93017G | * |
| | V93X5348XB | OMS/RCS INTERCONNECT INH/ENA CMD | DL FMT 21/A VERRIDE DISP | | BD | | 93017G | * |
| | V94J3755CA | OMS TIME SCALE FACTOR | ASC 2STG GUID VERRIDE SPEC | | | | 90122E | |

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 4.3.1.4-3. ABORT CONTROL SEQUENCER (G4.192) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|---------------------------------|-----------|-----------|----|----|---|---|----------------------------------|----------|-----|---------|-------------|
| ASSIST_OMS_DT | V97U1248C | SEC | F | S | M | C | G4.192 G4.2 | 00 | QOD | 93025B | |
| ATO_ICNCT_SEL | V99U9993C | ND | D | | M | C | G4.192 | 00 | AAD | 90655 | |
| ATO_OMS_DT | V97U9798C | SEC | F | S | M | C | G4.192 | 00 | AAD | 90655 | |
| CONTINGENCY_NZ_LIM | V97U9837C | G | F | S | M | C | G4.192 G4.6 | 00 | QTO | 90705H | |
| CONT_OMS_RCS_ICNCT_TERM_FU_TIME | V99U9718C | SEC | F | S | M | P | G4.192 | 00 | QTO | 90655 | |
| ENTRY_OMS_FUEL_BURN_TIME | V99U9571C | SEC | F | S | M | C | G4.192 G6.47 | 00 | QTO | 90655 | |
| ICNCT_DELAY | V99U9786C | SEC | F | S | M | C | G4.192 | 00 | QID | DC0617 | |
| MANUAL_OMS_DT | V99U9717C | SEC | F | S | M | C | G4.192 G4.6 G5.21 G6.47 | 00 | QRP | 90705H | |
| OMS_NZ_LIM | V99U9697C | G | F | S | M | C | G4.192 G4.6 | 01 03 | QTO | 90705H | |
| OMS_RCS_INTERCON_INIT_FU_TIME | V99U9716C | SEC | F | S | M | C | G4.192 | 00 | QTO | 92364D | |
| OMS_RCS_INTERCON_TERM_FU_TIME | V99U9952C | SEC | F | S | M | C | G4.192 | 00 | QTO | 92364D | |
| RCS_10_JET_FU_BIAS | V99U9775C | SEC | F | S | M | C | G4.192 | 00 | QRD | 90655 | |
| RCS_10_JET_FU_SCALE | V99U9776C | ND | F | S | M | C | G4.192 | 00 | QRD | 90655 | |
| RCS_24_JET_FU_BIAS | V99U9772C | SEC | F | S | M | C | G4.192 | 00 | QRD | 90655 | |
| RCS_24_JET_FU_SCALE | V99U9773C | ND | F | S | M | C | G4.192 | 00 | QRD | 90655 | |
| RTLS_ICNCT_SEL | V99U9991C | ND | D | | M | C | G4.192 | 00 | QRP | 90655 | |
| RTLS_OMS_DT | V97U9780C | SEC | F | S | M | C | G4.192 | 00 | QRP | 90655 | |
| SERC_INCNT_DEL | V99U9787C | SEC | F | S | D | P | G4.192 | 00 | QID | 92198A | |
| START_DUMP_VELOCITY | V99U9573C | FT/SEC | F | S | M | C | G4.192 | 00 | QTR | DC2063 | |
| TAL_ICNCT_SEL | V99U9992C | ND | D | | M | C | G4.192 | 00 | QTP | 90655 | |
| TAL_OMS_DT | V97U9786C | SEC | F | S | M | C | G4.192 | 00 | QTP | 90655 | |
| T_RCS_REF | V97U9828C | SEC | F | S | M | C | G4.192 | 00 | QAC | 90655 | |

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

TABLE 4.3.1.4-4. ABORT CONTROL SEQUENCER (G4.192) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--------------------------|-----------|----|-------------|-----------|----|--------|---|---------|---------|-------------|
| CG_TRIM_DELAY | V97U9836C | 00 | +4.5 | E+00 SEC | F | S | C | G4.192 | 29551B | |
| IGN_PRESS_DELAY | V97U9838C | 00 | +2.0 | E+00 SEC | F | S | C | G4.192 | 29551B | |

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

TABLE 4.3.1.4-5. ABORT CONTROL SEQUENCER (G4.192) 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.

4.3.2 Abort OMS/RCS Interconnect (4.184)

4.3.2.1 Introduction

The OMS/RCS interconnect function provides the control necessary to feed OMS propellants to RCS jets when required by an abort. In addition, after completion of the burn, controls are provided for reconfiguration to the normal RCS and OMS propellant feed from their respective tanks.

4.3.2.2 Overview

When the abort control sequence has issued a request for an interconnect, the OMS/RCS interconnect sequence performs the following functions. On the first pass, the AFT MANIFOLD JET INHIBIT 1/2 and 3/4/5 FLAGS are set false, and all affected OMS/ RCS propellant valve commands are removed to establish a known condition. The RCS 1/2 and 3/4/5 ALL JET INHIBIT FLAGS are set to true to inhibit all AFT RCS jet firings during the interconnect process. Then the RCS propellant tank isolation valves are commanded closed.

Prior to opening the RCS crossfeed valves, the status of the RCS tank isolation valves is monitored. If any of the tank isolation valves do not indicate closed, or the associated COMMFAULT status indicates true, the corresponding AFT MANIFOLD JET INHIBIT FLAG is set true to inhibit the use of jets on those manifolds for dumping OMS propellants. The RCS crossfeed valves are commanded closed and a set of RCS tank isolation valves are commanded open for those manifolds whose jets are inhibited. If any of the RCS aft crossfeed valves have been commanded opened, the OMS pod crossfeed "B" valves are commanded open.

If all of the jets have been inhibited in the above process, the RCS tank isolation valves are opened, the OMS TO RCS INTERCONNECT CMD set false, the OMS TO RCS RTRN TO NORM CONFIG CMD set true, the OMS TO RCS INTERCONNECT COMPLETE FLAG is set false to allow proper sequencing of the Abort Control Sequence, and the OMS/RCS INTERCONNECT INH/ENA CMD set false (INHIBIT), and the sequence is terminated.

The sequence monitors the RCS crossfeed valves which have been commanded open. If all of the valves which were commanded open indicate open, and none of the associated COMMFAULT status indicates true, the OMS pod crossfeed valves "B" are checked and the OMS pod crossfeed "A" valves commanded open if any "B" valve fails to open. If any of the OMS pod crossfeed "A" valves do not indicate open, the OMS TO RCS INTERCONNECT CMD is set false, the OMS TO RCS RTRN TO NORM CONFIG CMD is set true, and the OMS TO RCS INTERCONNECT COMPLETE FLAG is set true to allow for the proper sequencing of the ABT CNTL sequence and the OMS/RCS INH/ENA CMD is set false (INHIBIT) and the interconnect sequence returns to begin the return to normal process. If all OMS pod crossfeed "B" or "A" valves indicate open, then the OMS TO RCS INTERCONNECT COMPLETE FLAG is set true. If any of the jets have been inhibited, the RCS crossfeed valves for that manifold are closed and after a delay of 1.5 seconds the RCS tank isolation valves are opened. Then, after another 1.5 second delay, the OMS TO RCS INTERCONNECT COMPLETE FLAG is set true, and the sequence is terminated.

When the OMS/RCS interconnect is complete and if none of the jets have been inhibited, the sequence monitors the status of the RCS tank isolation valves. If any RCS tank isolation valve closed indication is lost for three consecutive passes, an internal flag is set to indicate which manifold requires reconfiguration and the RCS crossfeed valves for the affected manifolds are commanded closed. After a delay of 1.5

seconds the RCS tank isolation valves for those manifolds are commanded open. While the valves are being reconfigured, a flag is set to inhibit all jet firings from that manifold until the propellant feed from the RCS tanks can be established. The sequence will then be terminated. If a COMMFAULT status for the RCS tank isolation valves indicates true for three consecutive cycles, the manifold jet inhibit flag for those manifolds is set true for those manifolds, and the monitor function is terminated.

When the abort control sequence requests a return to normal configuration the following functions are performed. All affected OMS/RCS propellant valve commands are set false to establish a known condition. If a Mode 2 return to normal has not been requested, then the ALL JET INHIBIT FLAGS are set true to inhibit all aft jet firings during the return to normal process if the respective AFT MANIFOLD JET INHIBIT FLAGS are false. Then, sequentially, the OMS pod crossfeed valves are commanded closed, and the RCS tank isolation valves are commanded open. Prior to closing the RCS crossfeed valves, the 1/2 manifold RCS tank isolation valves are monitored. If any of the 1/2 tank isolation valves does not indicate open, or the associated COMMFAULT status indicates true, the RCS crossfeed valves between that manifold and the companion 3/4/5 manifold will not be closed, providing RCS propellants to the affected 1/2 manifold. Finally, as determined by the above check, those RCS crossfeed valves to be closed are commanded closed and the OMS/RCS INTERCONNECT COMPLETE FLAG, AFT MANIFOLD JET INHIBIT FLAGS, and the ALL JET INHIBIT FLAGS are set false, and the sequence is terminated.

During a Mode 2 return to normal sequence, continuous propellant flow is provided to the RCS for flight control and the ALL JET INHIBIT FLAGS remain false. The sequential order of the valve commands begins with the opening of all RCS tank isolation valves. Prior to closing the RCS crossfeed valves, the 1/2 manifold RCS tank isolation valves are monitored. If any of the 1/2 tank isolation valves do not indicate open, or the associated COMMFAULT status indicates true, the RCS crossfeed valves between that manifold and the companion 3/4/5 manifold will be commanded open providing RCS propellants to the affected 1/2 manifold. Finally, as determined by the above check, those RCS crossfeed valves are commanded closed, OMS crossfeed valves are commanded closed and the OMS/RCS INTERCONNECT COMPLETE FLAG and AFT MANIFOLD INHIBIT FLAGS are set false and the sequence is terminated.

During pre-launch countdown and prior to T-3 hours when the OMS crossfeed valves are closed, a microswitch failure can cause an erroneous position discrete for either the oxidizer valve or the fuel valve. If any crossfeed valve does not indicate open, the software considers the valve set as non-operational. The microswitch failure can cause the loss of redundancy in the automatic interconnect valve capability. Even though the valve is functional, the software sequence will not consider using the valve. A failed microswitch cannot be repaired on the pad. To avoid rollback to the Orbiter Processing Facility (OPF), a Launch Hold is called to verify the functionality of the valve. Once the valve function has been verified, it is cycled in an attempt to regain indication. If the valve position discrete still indicates a failed condition but the valve is verified to be open, the corresponding OMS B Mask Flag is invoked for the failed discrete using the Launch Data Bus to the PASS software and transferred to BFS via the "one shot". The valve pair with the failed microswitch is left open (with cockpit switch in GPC) for launch.

One and only one OMS B Mask Flag can be "set" to allow the software to use the correct valve position for the valve with the faulty microswitch. At first pass, the software will allow an abort interconnected dump utilizing the functional OMS crossfeed valve with the failed open discrete. Mask Flags are not required for either set of the OMS A crossfeed valves because they are only opened in flight when an abort dump is required and the OMS B crossfeed valves have failed. The flag will be removed when the return to normal flag is set. The software continues to use the remaining non-masked discrettes to make decisions about the OMS system health. The software will consider the OMS B valve with the masked discrete to be failed if it is commanded to open for subsequent interconnected dumps.

When either an OMS/RCS interconnect or return to normal configuration has been requested by the Abort Control Sequence, the Abort OMS/RCS Interconnect Sequence will perform the requested function to completion prior to recognizing another request. RCS jet firing commands will be inhibited during an interconnect and a non-Mode 2 return to normal while the sequence is providing the requested function. This is controlled by the sequence setting RCS 1/2(3/4/5) ALL JET INHIBIT FLAGS true to be used by the Ascent and Entry/Landing RCS Command SOP.

During 3 engines out contingency aborts, contingency 3 E/O guidance (principal function 4.6) will cyclically issue a Mode 2 return to normal request after MECO confirmed to insure RCS jet availability during critical contingency maneuvers.

4.3.2.3 DETAIL REQUIREMENTS

Step 1. This step determines if the OMS-to-RCS interconnect or return-to-normal process is required.

When either an OMS/RCS interconnect or return to normal configuration has been requested by the Abort Control Sequence, the Abort OMS/RCS Interconnect Sequence will perform the requested function to completion prior to recognizing another request. In this step, use is made of two internal flags to control the process, these are the OMS/RCS I/C IN PROGRESS FLAG and the OMS/RCS RTRN TO NORM IN PROGRESS FLAG. Both of these flags are initialized to the false state.

The following signals are monitored:

| | | |
|-----|---------------------------------------|-----------|
| (a) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (b) | OMS TO RCS RTRN TO NORM CONFIG CMD | V90X8313X |
| (c) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |
| (d) | INTERCONNECT MONITOR FLAG | INTERNAL |
| (e) | OMS/RCS I/C IN PROGRESS FLAG | INTERNAL |
| (f) | OMS/RCS RTRN TO NORM IN PROGRESS FLAG | INTERNAL |
| (g) | MODE 2 INDICATOR | V90X8308X |

If (e) is true, proceed to the next steps as required to complete the interconnect sequence, otherwise, go to the next if statement.

If (f) is true, proceed to the next steps as required to complete the return to normal configuration sequence, otherwise, go to the next if statement.

If (a) is true, and (c) is false, terminate (1) thru (76) below, upon completion of termination of all commands, change set and reset discretetes for commands (63) thru (76) to false, set (77), (78), (79), and (82) false, set (80), (81), and (83) true, set (85) through (101) equal to zero, and go to Step 2. Otherwise go to the next if statement.

If (b) is true, and (c) is true, terminate (1) thru (76) below, set (79), (82), and (102) through (105) false, set (84) true, and proceed to monitor (g). Otherwise, proceed to monitor (c) and (d).

If (g) is true, proceed to Step 12. Otherwise, set (80) and (81) true and proceed to Step 9.

If (c) and (d) are both true, proceed to Step 7. Otherwise, terminate the sequence.

| | | |
|-----|------------------------------------|-----------|
| (1) | OMS-L POD XFD VLVS A CMD 1 CL | V43K4283X |
| (2) | OMS-L POD OXDZR XFD VLV A CMD 2 CL | V43K4285X |

| | | |
|------|--------------------------------------|-----------|
| (3) | OMS-L POD FUEL XFD VLV A CMD 2 CL | V43K4385X |
| (4) | OMS-L POD XFD VLVS B CMD 1 CL | V43K4287X |
| (5) | OMS-L POD OXDZR XFD VLV B CMD 2 CL | V43K4289X |
| (6) | OMS-L POD FUEL XFD VLV B CMD 2 CL | V43K4389X |
| (7) | OMS-R POD XFD VLVS A CMD 1 CL | V43K5283X |
| (8) | OMS-R POD OXDZR XFD VLV A CMD 2 CL | V43K5285X |
| (9) | OMS-R POD FUEL XFD VLV A CMD 2 CL | V43K5385X |
| (10) | OMS-R POD XFD VLVS B CMD 1 CL | V43K5287X |
| (11) | OMS-R POD OXDZR XFD VLV B CMD 2 CL | V43K5289X |
| (12) | OMS-R POD FUEL XFD VLV B CMD 2 CL | V43K5389X |
| (13) | RCS-L AFT XFD VLV-1/2 GPC CL A | V42K2416X |
| (14) | RCS-L AFT OX XFD VLV-1/2 GPC CL B | V42K2418X |
| (15) | RCS-L AFT FU XFD VLV-1/2 GPC CL B | V42K2422X |
| (16) | RCS-L AFT XFD VLV-3/4/5 GPC CL A | V42K2428X |
| (17) | RCS-L AFT OX XFD V-3/4/5 GPC CL B | V42K2430X |
| (18) | RCS-L AFT FU XFD V-3/4/5 GPC CL B | V42K2434X |
| (19) | RCS-R AFT XFD VLV-1/2 GPC CLOSE A | V42K3416X |
| (20) | RCS-R AFT OX XFD V-1/2 GPC CLOSE B | V42K3418X |
| (21) | RCS-R AFT FU XFD V-1/2 GPC CLOSE B | V42K3422X |
| (22) | RCS-R AFT XFD VLV-3/4/5 GPC CL A | V42K3428X |
| (23) | RCS-R AFT OX XFD V-3/4/5 GPC CL B | V42K3430X |
| (24) | RCS-R AFT FU XFD V-3/4/5 GPC CL B | V42K3434X |
| (25) | RCS-L AFT TK ISLN V-1/2 GPC CL A | V42K2353X |
| (26) | RCS-L AFT OX TK ISLN V1/2 GPC CL B | V42K2354X |
| (27) | RCS-L AFT FU TK ISLN V1/2 GPC CL B | V42K2355X |
| (28) | RCS-L AFT OX TK ISLN V3/4/5 A GPC CL | V42K2357X |
| (29) | RCS-L AFT FU TK ISLN V3/4/5 A GPC CL | V42K2358X |
| (30) | RCS-L AFT OX TK ISLN V3/4/5 B GPC CL | V42K2360X |
| (31) | RCS-L AFT FU TK ISLN V3/4/5 B GPC CL | V42K2361X |
| (32) | RCS-R AFT TK ISLN V-1/2 GPC CL A | V42K3353X |
| (33) | RCS-R AFT OX TK ISLN V-1/2 GPC CL B | V42K3354X |
| (34) | RCS-R AFT FU TK ISLN V-1/2 GPC CL B | V42K3355X |
| (35) | RCS-R AFT OX TK ISLN V3/4/5 A GPC CL | V42K3357X |
| (36) | RCS-R AFT FU TK ISLN V3/4/5 A GPC CL | V42K3358X |
| (37) | RCS-R AFT OX TK ISLN V3/4/5 B GPC CL | V42K3360X |
| (38) | RCS-R AFT FU TK ISLN V3/4/5 B GPC CL | V42K3361X |
| (39) | OMS-L POD XFD VLVS A CMD 1 OP | V43K4282X |
| (40) | OMS-L POD OXDZR XFD VLV A CMD 2 OP | V43K4284X |
| (41) | OMS-L POD FUEL XFD VLV A CMD 2 OP | V43K4384X |
| (42) | OMS-L POD XFD VLVS B CMD 1 OP | V43K4286X |
| (43) | OMS-L POD OXDZR XFD VLV B CMD 2 OP | V43K4288X |
| (44) | OMS-L POD FUEL XFD VLV B CMD 2 OP | V43K4388X |

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| (45) | OMS-R POD XFD VLVS A CMD 1 OP | V43K5282X |
| (46) | OMS-R POD OXDZR XFD VLV A CMD 2 OP | V43K5284X |
| (47) | OMS-R POD FUEL XFD VLV A CMD 2 OP | V43K5384X |
| (48) | OMS-R POD XFD VLVS B CMD 1 OP | V43K5286X |
| (49) | OMS-R POD OXDZR XFD VLV B CMD 2 OP | V43K5288X |
| (50) | OMS-R POD FUEL XFD VLV B CMD 2 OP | V43K5388X |
| (51) | RCS-L AFT XFD VLV-1/2 GPC OP A | V42K2402X |
| (52) | RCS-L AFT OX XFD VLV-1/2 GPC OP B | V42K2403X |
| (53) | RCS-L AFT FU XFD VLV-1 /2 GPC OP B | V42K2404X |
| (54) | RCS-L AFT XFD VLV-3/4/5 GPC OP A | V42K2408X |
| (55) | RCS-L AFT OX XFD V-3/4/5 GPC OP B | V42K2409X |
| (56) | RCS-L AFT FU XFD V-3/4/5 GPC OP B | V42K2410X |
| (57) | RCS-R AFT XFD VLV-1/2 GPC OPEN A | V42K3402X |
| (58) | RCS-R AFT OX XFD V-1/2 GPC OPEN B | V42K3403X |
| (59) | RCS-R AFT FU XFD V-1/2 GPC OPEN B | V42K3404X |
| (60) | RCS-R AFT XFD VLV-3/4/5 GPC OPEN A | V42K3408X |
| (61) | RCS-R AFT OX XFD V-3/4/5 GPC OP B | V42K3409X |
| (62) | RCS-R AFT FU XFD V-3/4/5 GPC OP B | V42K3410X |
| (63) | RCS-L AFT TK ISLN V-1/2 GPC OP A | V42K2342X |
| (64) | RCS-L AFT OX TK ISLN V-1/2 GPC OP B | V42K2343X |
| (65) | RCS-L AFT FU TK ISLN V-1/2 GPC OP B | V42K2344X |
| (66) | RCS-L AFT OX TK ISLN V-3/4/5 A GPC OP | V42K2346X |
| (67) | RCS-L AFT FU TK ISLN V-3/4/5 A GPC OP | V42K2347X |
| (68) | RCS-L AFT OX TK ISLN V-3/4/5 B GPC OP | V42K2349X |
| (69) | RCS-L AFT FU TK ISLN V-3/4/5 B GPC OP | V42K2350X |
| (70) | RCS-R AFT TK ISLN V-1/2 GPC OP A | V42K3342X |
| (71) | RCS-R AFT OX TK ISLN V-1/2 GPC OP B | V42K3343X |
| (72) | RCS-R AFT FU TK ISLN V-1/2 GPC OP B | V42K3344X |
| (73) | RCS-R AFT OX TK ISLN V-3/4/5 A GPC OP | V42K3346X |
| (74) | RCS-R AFT FU TK ISLN V-3/4/5 A GPC OP | V42K3347X |
| (75) | RCS-R AFT OX TK ISLN V-3/4/5 B GPC OP | V42K3349X |
| (76) | RCS-R AFT FU TK ISLN V-3/4/5 B GPC OP | V42K3350X |
| (77) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (78) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (79) | INTERCONNECT MONITOR FLAG | INTERNAL |
| (80) | RCS 1/2 ALL JET INHIBIT FLAG | V90X8290X |
| (81) | RCS 3/4/5 ALL JET INHIBIT FLAG | V90X8291X |
| (82) | 1/2 XFD/ISO FAIL FLAG | INTERNAL |
| (83) | OMS/RCS I/C IN PROGRESS FLAG | INTERNAL |
| (84) | OMS/RCS RTRN TO NORM IN PROGRESS FLAG | INTERNAL |
| (85) | I/C FAIL COUNTER | INTERNAL |
| (86) | FA 1 COMMFAULT CYC COUNTER | INTERNAL |
| (87) | RCS L OX TK POSN CYC COUNTER | INTERNAL |
| (88) | RCS L FU TK POSN CYC COUNTER | INTERNAL |

| | | |
|-------|--------------------------------|-----------|
| (89) | FA3 COMMFAULT CYC COUNTER | INTERNAL |
| (90) | RCS R OX TK POSN CYC COUNTER | INTERNAL |
| (91) | RCS R FU TK POSN CYC COUNTER | INTERNAL |
| (92) | FA 2 COMMFAULT CYC COUNTER | INTERNAL |
| (93) | RCS L A OX TK POSN CYC COUNTER | INTERNAL |
| (94) | RCS L B OX TK POSN CYC COUNTER | INTERNAL |
| (95) | RCS L A FU TK POSN CYC COUNTER | INTERNAL |
| (96) | RCS L B FU TK POSN CYC COUNTER | INTERNAL |
| (97) | FA 4 COMMFAULT CYC COUNTER | INTERNAL |
| (98) | RCS R A OX TK POSN CYC COUNTER | INTERNAL |
| (99) | RCS R B OX TK POSN CYC COUNTER | INTERNAL |
| (100) | RCS R A FU TK POSN CYC COUNTER | INTERNAL |
| (101) | RCS R B FU TK POSN CYC COUNTER | INTERNAL |
| (102) | OMS-L POD OX XFD B MASK | V99X0016X |
| (103) | OMS-L POD FU XFD B MASK | V99X0017X |
| (104) | OMS-R POD OX XFD B MASK | V99X0018X |
| (105) | OMS-R POD FU XFD B MASK | V99X0019X |

Step 2. This step commands RCS propellant tank isolation valves closed on initiation of the interconnect sequence.

Issue the following commands and return to Step 1 until at least 1.5 seconds have elapsed. Then proceed to Step 3.

| | |
|--------------------------------------|-----------|
| RCS-L AFT TK ISLN V-1/2 GPC CL A | V42K2353X |
| RCS-L AFT OX TK ISLN V1/2 GPC CL B | V42K2354X |
| RCS-L AFT FU TK ISLN V1/2 GPC CL B | V42K2355X |
| RCS-L AFT OX TK ISLN V3/4/5 A GPC CL | V42K2357X |
| RCS-L AFT FU TK ISLN V3/4/5 A GPC CL | V42K2358X |
| RCS-L AFT OX TK ISLN V3/4/5 B GPC CL | V42K2360X |
| RCS-L AFT FU TK ISLN V3/4/5 B GPC CL | V42K2361X |
| | |
| RCS-R AFT TK ISLN V-1/2 GPC CL A | V42K3353X |
| RCS-R AFT OX TK ISLN V-1/2 GPC CL B | V42K3354X |
| RCS-R AFT FU TK ISLN V-1/2 GPC CL B | V42K3355X |
| RCS-R AFT OX TK ISLN V3/4/5 A GPC CL | V42K3357X |
| RCS-R AFT FU TK ISLN V3/4/5 A GPC CL | V42K3358X |
| RCS-R AFT OX TK ISLN V3/4/5 B GPC CL | V42K3360X |
| RCS-R AFT FU TK ISLN V3/4/5 B GPC CL | V42K3361X |

Step 3. This step monitors the position of the RCS tank isolation valves, opening the RCS crossfeed valves for those manifolds with all tank isolation valves configured correctly. If any tank isolation valve (1/2 or 3/4/5) indicates not closed, an I/C fail counter will be incremented for processing in Step 5 and Step 6. If any RCS crossfeed valve is commanded open, the OMS pod crossfeed valves "B" are also commanded open.

The following signals are monitored:

| | | |
|-----|-----------------------------------|-----------|
| (a) | RCS L AFT OX TANK ISLN VLV 1/2 CL | V42X2221X |
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| (b) | RCS L AFT FU TANK ISLN VLV 1/2 CL | V42X2321X |
| (c) | RCS R AFT OX TANK ISLN VLV 1/2 CL | V42X3221X |
| (d) | RCS R AFT FU TANK ISLN VLV 1/2 CL | V42X3321X |
| (e) | RCS L AFT OX TANK ISLN VLV 1/2 OP | V42X2220X |
| (f) | RCS L AFT FU TANK ISLN VLV 1/2 OP | V42X2320X |
| (g) | RCS R AFT OX TANK ISLN VLV 1/2 OP | V42X3220X |
| (h) | RCS R AFT FU TANK ISLN VLV 1/2 OP | V42X3320X |
| (i) | RCS L AFT OX TANK ISLN VLV 3/4/5 A CL | V42X2223X |
| (j) | RCS L AFT OX TANK ISLN VLV 3/4/5 B CL | V42X2225X |
| (k) | RCS L AFT FU TANK ISLN VLV 3/4/5 A CL | V42X2323X |
| (l) | RCS L AFT FU TANK ISLN VLV 3/4/5 B CL | V42X2325X |
| (m) | RCS R AFT OX TANK ISLN VLV 3/4/5 A CL | V42X3223X |
| (n) | RCS R AFT OX TANK ISLN VLV 3/4/5 B CL | V42X3225X |
| (o) | RCS R AFT FU TANK ISLN VLV 3/4/5 A CL | V42X3323X |
| (p) | RCS R AFT FU TANK ISLN VLV 3/4/5 B CL | V42X3325X |
| (q) | FA 1 INPUT PROM SEG 3, 10 STATUS | V91X2845X |
| (r) | FA 3 INPUT PROM SEG 3, 10 STATUS | V91X2847X |
| (s) | FA 2 INPUT PROM SEG 3, 10 STATUS | V91X2846X |
| (t) | FA 4 INPUT PROM SEG 3, 10 STATUS | V91X2848X |
| (u) | I/C FAIL COUNTER | INTERNAL |

If (a) thru (d) are not all true, or (e) thru (h) are not all false, or (q) or (r) is true, set (1) true, increment (3) by 1, and go to the next if statement. Otherwise, issue (4) thru (9) and go to the next if statement.

If (i) thru (p) are not all true, or if (s) or (t) is true, set (2) true, increment (3) by 1, and go to the next if statement. Otherwise, issue (10) thru (15) and go to the next if statement.

If (u) > 1 proceed to Step 6. Otherwise, Issue (16) thru (21) and return to Step 1 until at least 1.5 seconds have elapsed. Then proceed to Step 4.

| | | |
|------|-----------------------------------|-----------|
| (1) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (2) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (3) | I/C FAIL COUNTER | INTERNAL |
| (4) | RCS-L AFT XFD VLV-1/2 GPC OP A | V42K2402X |
| (5) | RCS-L AFT OX XFD VLV-1/2 GPC OP B | V42K2403X |
| (6) | RCS-L AFT FU XFD VLV-1/2 GPC OP B | V42K2404X |
| (7) | RCS-R AFT XFD VLV-1/2 GPC OP A | V42K3402X |
| (8) | RCS-R AFT OX XFD VLV-1/2 GPC OP B | V42K3403X |
| (9) | RCS-R AFT FU XFD VLV-1/2 GPC OP B | V42K3404X |
| (10) | RCS-L AFT XFD VLV-3/4/5 GPC OP A | V42K2408X |

| | | |
|------|------------------------------------|-----------|
| (11) | RCS-L AFT OX XFD V-3/4/5 GPC OP B | V42K2409X |
| (12) | RCS-L AFT FU XFD V-3/4/5 GPC OP B | V42K2410X |
| (13) | RCS-R AFT XFD VLV-3/4/5 GPC OPEN A | V42K3408X |
| (14) | RCS-R AFT OX XFD V-3/4/5 GPC OP B | V42K3409X |
| (15) | RCS-R AFT FU XFD V-3/4/5 GPC OP B | V42K3410X |
| (16) | OMS-L POD XFD VLVS B CMD 1 OP | V43K4286X |
| (17) | OMS-L POD OXDZR XFD VLV B CMD 2 OP | V43K4288X |
| (18) | OMS-L POD FUEL XFD VLV B CMD 2 OP | V43K4388X |
| (19) | OMS-R POD XFD VLVS B CMD 1 OP | V43K5286X |
| (20) | OMS-R POD OXDZR XFD VLV B CMD 2 OP | V43K5288X |
| (21) | OMS-R POD FUEL XFD VLV B CMD 2 OP | V43K5388X |

Step 4. This step checks the response of the RCS crossfeed valves which have been commanded open during the interconnect sequence. If any RCS crossfeed valve (1/2 or 3/4/5) failed to open, the sequence is directed to the step which will reconfigure the system to furnish propellants to those manifolds (1/2 or 3/4/5) from the RCS tanks.

The following signals are monitored:

| | | |
|-----|----------------------------------|-----------|
| (a) | RCS L AFT OX XFD VLV 1/2 OP | V42X2236X |
| (b) | RCS L AFT FU XFD VLV 1/2 OP | V42X2336X |
| (c) | RCS R AFT OX XFD VLV 1/2 OP | V42X3236X |
| (d) | RCS R AFT FU XFD VLV 1/2 OP | V42X3336X |
| (e) | RCS L OX/FU XFD VLV 1/2 OP | V42X2251X |
| (f) | RCS R OX/FU XFD VLV 1/2 OP | V42X2252X |
| (g) | RCS L AFT OX XFD VLV 3/4/5 OP | V42X2238X |
| (h) | RCS L AFT FU XFD VLV 3/4/5 OP | V42X2338X |
| (i) | RCS R AFT OX XFD VLV 3/4/5 OP | V42X3238X |
| (j) | RCS R AFT FU XFD VLV 3/4/5 OP | V42X3338X |
| (k) | RCS L OX/FU XFD VLV 3/4/5 OP | V42X2253X |
| (l) | RCS R OX/FU XFD VLV 3/4/5 OP | V42X2254X |
| (m) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (n) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (o) | FA 3 INPUT PROM SEG 3, 10 STATUS | V91X2847X |
| (p) | FA 4 INPUT PROM SEG 3, 10 STATUS | V91X2848X |
| (q) | I/C FAIL COUNTER | INTERNAL |

If [(m) is false] and [(a) or (b) or (f) is false, or (o) is true] and [(c) or (d) or (e) is false, or (p) is true], increment (2) by 1, set (1) true, and go to the next if statement. Otherwise, go to the next if statement.

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If [(n) is false] and [(g) or (h) or (l) is false, or (p) is true] and [(i) or (j) or (k) is false, or (o) is true], increment (2) by 1, and go to the next if statement. Otherwise, go to the next if statement.

If (q) = 0, proceed to Step 11, otherwise go to Step 5.

- | | | |
|-----|-----------------------|----------|
| (1) | 1/2 XFD/ISO FAIL FLAG | INTERNAL |
| (2) | I/C FAIL COUNTER | INTERNAL |

Step 5. This step controls the reconfiguration process for returning propellant feed from the RCS tanks for those manifolds (1/2 and/or 3/4/5) whose interconnect to the OMS tanks was unsuccessful, or those manifolds for which the monitor function had lost the indication of RCS tank isolation valve closed.

The following signals are monitored:

- | | | |
|-----|---------------------------------|-----------|
| (a) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (b) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (c) | I/C FAIL COUNTER | INTERNAL |
| (d) | 1/2 XFD/ISO FAIL FLAG | INTERNAL |

If (c) > 1, terminate (1) thru (18) below, issue (19) thru (36), then return to Step 1 until 1.5 seconds have elapsed. Then proceed to Step 6. Otherwise go to the next if statement.

If (a) or (b) is true, proceed to Step 6. Otherwise, go to the next if statement.

If (d) = true, terminate (1) thru (6) below, issue (19) thru (24), set (37) equal true, and return to Step 1 until at least 1.5 seconds has elapsed. Then proceed to Step 6. Otherwise, proceed to the next if statement.

If (d) is false, terminate (7) thru (12) below, issue (25) thru (30), set (38) equal true, and return to Step 1 until at least 1.5 seconds has elapsed. Then proceed to Step 6.

- | | | |
|------|------------------------------------|-----------|
| (1) | RCS-L AFT XFD VLV-1/2 GPC OP A | V42K2402X |
| (2) | RCS-L AFT OX XFD VLV-1/2 GPC OP B | V42K2403X |
| (3) | RCS-L AFT FU XFD VLV-1/2 GPC OP B | V42K2404X |
| (4) | RCS-R AFT XFD VLV-1/2 GPC OPEN A | V42K3402X |
| (5) | RCS-R AFT OX XFD V-1/2 GPC OPEN B | V42K3403X |
| (6) | RCS-R AFT FU XFD V-1/2 GPC OPEN B | V42K3404X |
| (7) | RCS-L AFT XFD VLV-3/4/5 GPC OP A | V42K2408X |
| (8) | RCS-L AFT OX XFD V-3/4/5 GPC OP B | V42K2409X |
| (9) | RCS-L AFT FU XFD V-3/4/5 GPC OP B | V42K2410X |
| (10) | RCS-R AFT XFD VLV-3/4/5 GPC OPEN A | V42K3408X |
| (11) | RCS-R AFT OX XFD V-3/4/5 GPC OP B | V42K3409X |
| (12) | RCS-R AFT FU XFD V-3/4/5 GPC OP B | V42K3410X |
| (13) | OMS-L POD XFD VLVS B CMD 1 OP | V43K4286X |
| (14) | OMS-L POD OXDZR XFD VLV B CMD 2 OP | V43K4288X |
| (15) | OMS-L POD FUEL XFD VLV B CMD 2 OP | V43K4388X |

| | | |
|------|------------------------------------|-----------|
| (16) | OMS-R POD XFD VLVS B CMD 1 OP | V43K5286X |
| (17) | OMS-R POD OXDZR XFD VLV B CMD 2 OP | V43K5288X |
| (18) | OMS-R POD FUEL XFD VLV B CMD 2 OP | V43K5388X |
| (19) | RCS-L AFT XFD VLV-1/2 GPC CL A | V42K2416X |
| (20) | RCS-L AFT OX XFD VLV-1/2 GPC CL B | V42K2418X |
| (21) | RCS-L AFT FU XFD VLV-1/2 GPC CL B | V42K2422X |
| (22) | RCS-R AFT XFD VLV-1/2 GPC CLOSE A | V42K3416X |
| (23) | RCS-R AFT OX XFD V-1/2 GPC CLOSE B | V42K3418X |
| (24) | RCS-R AFT FU XFD V-1/2 GPC CLOSE B | V42K3422X |
| (25) | RCS-L AFT XFD VLV-3/4/5 GPC CL A | V42K2428X |
| (26) | RCS-L AFT OX XFD V-3/4/5 GPC CL B | V42K2430X |
| (27) | RCS-L AFT FU XFD V-3/4/5 GPC CL B | V42K2434X |
| (28) | RCS-R AFT XFD VLV-3/4/5 GPC CL A | V42K3428X |
| (29) | RCS-R AFT OX XFD V-3/4/5 GPC CL B | V42K3430X |
| (30) | RCS-R AFT FU XFD V-3/4/5 GPC CL B | V42K3434X |
| (31) | OMS-L POD XFD VLVS B CMD 1 CL | V43K4287X |
| (32) | OMS-L POD OXDZR XFD VLV B CMD 2 CL | V43K4289X |
| (33) | OMS-L POD FUEL XFD VLV B CMD 2 CL | V43K4389X |
| (34) | OMS-R POD XFD VLVS B CMD 1 CL | V43K5287X |
| (35) | OMS-R POD OXDZR XFD VLV B CMD 2 CL | V43K5289X |
| (36) | OMS-R POD FUEL XFD VLV B CMD 2 CL | V43K5389X |
| (37) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (38) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |

Step 6. This step commands the RCS tank isolation valves open in the OMS TO RCS return to normal configuration and as part of an unsuccessful attempt to accomplish the OMS/RCS interconnect sequence. If both 1/2 and 3/4/5 manifold tank isolation valves have been commanded open, the OMS/RCS interconnect is inhibited and OMS propellant burn via RCS jets will not occur.

The following signals are monitored:

| | | |
|-----|--|------------|
| (a) | OMS TO RCS RTRN TO NORM IN PROGRESS FLAG | (INTERNAL) |
| (b) | I/C FAIL COUNTER | (INTERNAL) |
| (c) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |

If (a) is true, issue (15) thru (28) below, and return to Step 1 until at least 1.5 seconds have elapsed. Then proceed to Step 10. Otherwise, go to the next if statement.

If (b) > 1, terminate (1) thru (14), issue (15) thru (28) below, and return to Step 1 until at least 1.5 seconds have elapsed. Then proceed to Step 11. Otherwise go to the next if statement.

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If (c) is true, terminate (1) thru (6), issue (15) thru (20) below and return to Step 1 until at least 1.5 seconds have elapsed. Then proceed to Step 11. Otherwise, terminate (7) thru (14), issue (21) thru (28) below and return to Step 1 until at least 1.5 seconds have elapsed. Then proceed to Step 11.

| | | |
|------|--------------------------------------|-----------|
| (1) | RCS-L AFT TK ISLN V-1/2 GPC CL A | V42K2353X |
| (2) | RCS-L AFT OX TK ISLN V1/2 GPC CL B | V42K2354X |
| (3) | RCS-L AFT FU TK ISLN V1/2 GPC CL B | V42K2355X |
| (4) | RCS-R AFT TK ISLN V-1/2 GPC CL A | V42K3353X |
| (5) | RCS-R AFT OX TK ISLN V-1/2 GPC CL B | V42K3354X |
| (6) | RCS-R AFT FU TK ISLN V-1/2 GPC CL B | V42K3355X |
| (7) | RCS-L AFT OX TK ISLN V3/4/5 A GPC CL | V42K2357X |
| (8) | RCS-L AFT FU TK ISLN V3/4/5 A GPC CL | V42K2358X |
| (9) | RCS-R AFT OX TK ISLN V3/4/5 A GPC CL | V42K3357X |
| (10) | RCS-R AFT FU TK ISLN V3/4/5 A GPC CL | V42K3358X |
| (11) | RCS-L AFT OX TK ISLN V3/4/5 B GPC CL | V42K2360X |
| (12) | RCS-L AFT FU TK ISLN V3/4/5 B GPC CL | V42K2361X |
| (13) | RCS-R AFT OX TK ISLN V3/4/5 B GPC CL | V42K3360X |
| (14) | RCS-R AFT FU TK ISLN V3/4/5 B GPC CL | V42K3361X |
| (15) | RCS-L AFT TK ISLN V-1/2 GPC OP A | V42K2342X |
| (16) | RCS-L AFT OX TK ISLN V1/2 GPC OP B | V42K2343X |
| (17) | RCS-L AFT FU TK ISLN V1/2 GPC OP B | V42K2344X |
| (18) | RCS-R AFT TK ISLN V-1/2 GPC OP A | V42K3342X |
| (19) | RCS-R AFT OX TK ISLN V-1/2 GPC OP B | V42K3343X |
| (20) | RCS-R AFT FU TK ISLN V-1/2 GPC OP B | V42K3344X |
| (21) | RCS-L AFT OX TK ISLN V3/4/5 A GPC OP | V42K2346X |
| (22) | RCS-L AFT FU TK ISLN V3/4/5 A GPC OP | V42K2347X |
| (23) | RCS-R AFT OX TK ISLN V3/4/5 A GPC OP | V42K3346X |
| (24) | RCS-R AFT FU TK ISLN V3/4/5 A GPC OP | V42K3347X |
| (25) | RCS-L AFT OX TK ISLN V3/4/5 B GPC OP | V42K2349X |
| (26) | RCS-L AFT FU TK ISLN V3/4/5 B GPC OP | V42K2350X |
| (27) | RCS-R AFT OX TK ISLN V3/4/5 B GPC OP | V42K3349X |
| (28) | RCS-R AFT FU TX ISLN V3/4/5 B GPC OP | V42K3350X |

Step 7. This step monitors the status of the left RCS tank isolation valves 1/2 when the OMS to RCS interconnect has been successfully completed. If any RCS left tank isolation valve 1/2 closed status becomes false for three consecutive cycles, the RCS 1/2 ALL JET INHIBIT FLAG is set true to inhibit all 1/2 jet firings and the 1/2 XFD/ISO FAIL FLAG is set true for use in the RCS crossfeed reconfiguration process. If the COMMFAULT status for the left 1/2 tank isolation valves indicates true for three

consecutive cycles, the AFT MANIFOLD 1/2 JET INHIBIT FLAG is set true to inhibit dumping through that manifold. The monitor function is then terminated.

The following signals are monitored:

| | | |
|-----|-----------------------------------|------------|
| (a) | FA 1 INPUT PROM SEG 3, 10 STATUS | V91X2845X |
| (b) | FA 1 COMMFAULT CYC COUNTER | (INTERNAL) |
| (c) | RCS L AFT OX TANK ISLN VLV 1/2 CL | V42X2221X |
| (d) | RCS L AFT FU TANK ISLN VLV 1/2 CL | V42X2321X |
| (e) | RCS L OX TK POSN CYC COUNTER | (INTERNAL) |
| (f) | RCS L FU TK POSN CYC COUNTER | (INTERNAL) |

If (a) is true, increment (b) by 1, set (e) and (f) to zero, and proceed to monitor (b). Otherwise, if (a) is false, set (b) to zero, and proceed to monitor (c).

If (b) is equal to three, set (1) true, (2) false, and return to Step 1. Otherwise, proceed to Step 7A.

If (c) is false, increment (e) by 1, and proceed to monitor (e). Otherwise, set (e) to zero, and proceed to monitor (d).

If (e) is equal to three, set (2) false, (3) through (5) true, increment (6) by 1, and proceed to Step 5. Otherwise, proceed to monitor (d).

If (d) is false, increment (f) by 1, and proceed to monitor (f). Otherwise, set (f) to zero, and proceed to Step 7A.

If (f) is equal to three, set (2) false, (3) through (5) true, increment (6) by 1, and proceed to Step 5. Otherwise, proceed to Step 7A.

| | | |
|-----|-------------------------------|------------|
| (1) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (2) | INTERCONNECT MONITOR FLAG | (INTERNAL) |
| (3) | 1/2 XFD/ISO FAIL FLAG | (INTERNAL) |
| (4) | RCS 1/2 ALL JET INHIBIT FLAG | V90X8290X |
| (5) | OMS/RCS I/C IN PROGRESS FLAG | (INTERNAL) |
| (6) | I/C FAIL COUNTER | (INTERNAL) |

Step 7A. This step monitors the status of the right RCS tank isolation valves 1/2 when the OMS to RCS interconnect has been successfully completed. If any RCS right tank isolation valve 1/2 closed status becomes false for three consecutive cycles, the RCS 1/2 ALL JET INHIBIT FLAG is set true to inhibit all 1/2 jet firings and the 1/2 XFD/ISO FAIL FLAG is set true for use in the RCS crossfeed reconfiguration process. If the COMMFAULT status for the right 1/2 tank isolation valves indicates true for three consecutive cycles, the AFT MANIFOLD 1/2 JET INHIBIT FLAG is set true to inhibit dumping through that manifold. The monitor function is then terminated.

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The following signals are monitored:

| | | |
|-----|-----------------------------------|------------|
| (a) | FA 3 INPUT PROM SEG 3, 10 STATUS | V91X2847X |
| (b) | FA 3 COMMFAULT CYC COUNTER | (INTERNAL) |
| (c) | RCS R AFT OX TANK ISLN VLV 1/2 CL | V42X3221X |
| (d) | RCS R AFT FU TANK ISLN VLV 1/2 CL | V42X3321X |
| (e) | RCS R OX TK POSN CYC COUNTER | (INTERNAL) |
| (f) | RCS R FU TK POSN CYC COUNTER | (INTERNAL) |

If (a) is true, increment (b) by 1, set (e) and (f) to zero, and proceed to monitor (b). Otherwise, if (a) is false, set (b) to zero, and proceed to monitor (c).

If (b) is equal to three, set (1) true, (2) false, and return to Step 1. Otherwise, proceed to Step 8.

If (c) is false, increment (e) by 1, and proceed to monitor (e). Otherwise, set (e) to zero, and proceed to monitor (d).

If (e) is equal to three, set (2) false, (3) through (5) true, increment (6) by 1, and proceed to Step 5. Otherwise, proceed to monitor (d).

If (d) is false, increment (f) by 1, and proceed to monitor (f). Otherwise, set (f) to zero, and proceed to Step 8.

If (f) is equal to three, set (2) false, (3) through (5) true, increment (6) by 1, and proceed to Step 5. Otherwise, proceed to Step 8.

| | | |
|-----|-------------------------------|------------|
| (1) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (2) | INTERCONNECT MONITOR FLAG | (INTERNAL) |
| (3) | 1/2 XFD/ISO FAIL FLAG | (INTERNAL) |
| (4) | RCS 1/2 ALL JET INHIBIT FLAG | V90X8290X |
| (5) | OMS/RCS I/C IN PROGRESS FLAG | (INTERNAL) |
| (6) | I/C FAIL COUNTER | (INTERNAL) |

Step 8. This step monitors the status of the 3/4/5A RCS tank isolation valves when the OMS to RCS interconnect has been successfully completed. If any 3/4/5A RCS tank isolation valve closed status becomes false for three consecutive cycles, the RCS 3/4/5 ALL JET INHIBIT FLAG is set true to inhibit all 3/4/5 jet firings. If the COMMFAULT status for the 3/4/5A tank isolation valves indicates true for three consecutive cycles the AFT MANIFOLD 3/4/5 JET INHIBIT FLAG is set true to inhibit dumping through that manifold. The monitor function is then terminated.

The following signals are monitored:

| | | |
|-----|---------------------------------------|------------|
| (a) | FA 2 INPUT PROM SEG 3, 10 STATUS | V91X2846X |
| (b) | FA 2 COMMFAULT CYC COUNTER | (INTERNAL) |
| (c) | RCS L AFT OX TANK ISLN VLV 3/4/5 A CL | V42X2223X |
| (d) | RCS R AFT OX TANK ISLN VLV 3/4/5 A CL | V42X3223X |
| (e) | RCS L AFT FU TANK ISLN VLV 3/4/5 A CL | V42X2323X |
| (f) | RCS R AFT FU TANK ISLN VLV 3/4/5 A CL | V42X3323X |
| (g) | RCS L A OX TK POSN CYC COUNTER | (INTERNAL) |
| (h) | RCS R A OX TK POSN CYC COUNTER | (INTERNAL) |
| (i) | RCS L A FU TK POSN CYC COUNTER | (INTERNAL) |
| (j) | RCS R A FU TK POSN CYC COUNTER | (INTERNAL) |

If (a) is true, increment (b) by 1, set (g), (h), (i), and (j) to zero, and proceed to monitor (b). Otherwise, if (a) is false, set (b) to zero, and proceed to monitor (c).

If (b) is equal to three, set (1) true, (2) false, and return to Step 1. Otherwise, proceed to Step 8A.

If (c) is false, increment (g) by 1, and proceed to monitor (g). Otherwise, set (g) to zero, and proceed to monitor (d).

If (g) is equal to three, set (2) false, (3) and (4) true, increment (5) by 1, and proceed to Step 5. Otherwise, proceed to monitor (d).

If (d) is false, increment (h) by 1, and proceed to monitor (h). Otherwise, set (h) to zero, and proceed to monitor (e).

If (h) is equal to three, set (2) false, (3) and (4) true, increment (5) by 1, and proceed to Step 5. Otherwise, proceed to monitor (e).

If (e) is false, increment (i) by 1, and proceed to monitor (i). Otherwise, set (i) to zero, and proceed to monitor (f).

If (i) is equal to three, set (2) false, (3) and (4) true, increment (5) by 1, and proceed to Step 5. Otherwise proceed to monitor (f).

If (f) is false, increment (j) by 1, and proceed to monitor (j). Otherwise, set (j) to zero, and proceed to Step 8A.

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If (j) is equal to three, set (2) false, (3) and (4) true, increment (5) by 1, and proceed to Step 5. Otherwise, proceed to Step 8A.

| | | |
|-----|---------------------------------|------------|
| (1) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (2) | INTERCONNECT MONITOR FLAG | (INTERNAL) |
| (3) | RCS 3/4/5 ALL JET INHIBIT FLAG | V90X8291X |
| (4) | OMS/RCS I/C IN PROGRESS FLAG | (INTERNAL) |
| (5) | 1/C FAIL COUNTER | (INTERNAL) |

Step 8A. This step monitors the status of the 3/4/5B RCS tank isolation valves when the OMS to RCS interconnect has been successfully completed. If any 3/4/5B RCS tank isolation valve closed status becomes false for three consecutive cycles, the RCS 3/4/5 ALL JET INHIBIT FLAG is set true to inhibit all 3/4/5 jet firings. If the COMMFAULT status for the 3/4/5B tank isolation valves indicates true for three consecutive cycles, the AFT MANIFOLD 3/4/5 JET INHIBIT FLAG is set true to inhibit dumping through that manifold. The monitor function is then terminated.

The following signals are monitored:

| | | |
|-----|---------------------------------------|------------|
| (a) | FA 4 INPUT PROM SEQ 3, 10 STATUS | V91X2848X |
| (b) | FA 4 COMMFAULT CYC COUNTER | (INTERNAL) |
| (c) | RCS L AFT OX TANK ISLN VLV 3/4/5 B CL | V42X2225X |
| (d) | RCS R AFT OX TANK ISLN VLV 3/4/5 B CL | V42X3225X |
| (e) | RCS L AFT FU TANK ISLN VLV 3/4/5 B CL | V42X2325X |
| (f) | RCS R AFT FU TANK ISLN VLV 3/4/5 B CL | V42X3325X |
| (g) | RCS L B OX TK POSN CYC COUNTER | (INTERNAL) |
| (h) | RCS R B OX TK POSN CYC COUNTER | (INTERNAL) |
| (i) | RCS L B FU TK POSN CYC COUNTER | (INTERNAL) |
| (j) | RCS R B FU TK POSN CYC COUNTER | (INTERNAL) |

If (a) is true, increment (b) by 1, set (g), (h), (i), and (j) to zero, and proceed to monitor (b). Otherwise, if (a) is false, set (b) to zero, and proceed to monitor (c).

If (b) is equal to three, set (1) true, (2) false, and return to Step 1. Otherwise, return to Step 1.

If (c) is false, increment (g) by 1, and proceed to monitor (g). Otherwise, set (g) to zero, and proceed to monitor (d).

If (g) is equal to three, set (2) false, (3) and (4) true, increment (5) by 1, and proceed to Step 5. Otherwise, proceed to monitor (d).

If (d) is false, increment (h) by 1, and proceed to monitor (h). Otherwise, set (h) to zero, and proceed to monitor (e).

If (h) is equal to three, set (2) false, (3) and (4) true, increment (5) by 1, and proceed to Step 5. Otherwise, proceed to monitor (e).

If (e) is false, increment (i) by 1, and proceed to monitor (i). Otherwise, set (i) to zero, and proceed to monitor (f).

If (i) is equal to three, set (2) false, (3) and (4) true, increment (5) by 1, and proceed to Step 5.
Otherwise, proceed to monitor (f).

If (f) is false, increment (j) by 1, and proceed to monitor (j). Otherwise, set (j) to zero, and return to Step 1.

If (j) is equal to three, set (2) false, (3) and (4) true, increment (5) by 1, and proceed to Step 5.
Otherwise, return to Step 1.

| | | |
|-----|---------------------------------|------------|
| (1) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (2) | INTERCONNECT MONITOR FLAG | (INTERNAL) |
| (3) | RCS 3/4/5 ALL JET INHIBIT FLAG | V90X8291X |
| (4) | OMS/RCS I/C IN PROGRESS FLAG | (INTERNAL) |
| (5) | I/C FAIL COUNTER | (INTERNAL) |

Step 9. This step commands the OMS pod crossfeed valves closed on initiation of the return to normal configuration sequence.

Issue the following commands and return to Step 1 until at least 1.5 seconds have elapsed. Set (13) through (16) false. Then proceed to Step 6.

| | | |
|------|------------------------------------|-----------|
| (1) | OMS-L POD XFD VLVS A CMD 1 CL | V43K4283X |
| (2) | OMS-L POD OXDZR XFD VLV A CMD 2 CL | V43K4285X |
| (3) | OMS-L POD FUEL XFD VLV A CMD 2 CL | V43K4385X |
| (4) | OMS-L POD XFD VLVS B CMD 1 CL | V43K4287X |
| (5) | OMS-L POD OXDZR XFD VLV B CMD 2 CL | V43K4289X |
| (6) | OMS-L POD FUEL XFD VLV B CMD 2 CL | V43K4389X |
| (7) | OMS-R POD XFD VLVS A CMD 1 CL | V43K5283X |
| (8) | OMS-R POD OXDZR XFD VLV A CMD 2 CL | V43K5285X |
| (9) | OMS-R POD FUEL XFD VLV A CMD 2 CL | V43K5385X |
| (10) | OMS-R POD XFD VLVS B CMD 1 CL | V43K5287X |
| (11) | OMS-R POD OXDZR XFD VLV B CMD 2 CL | V43K5289X |
| (12) | OMS-R POD FUEL XFD VLV B CMD 2 CL | V43K5389X |
| (13) | OMS-L POD OX XFD B MASK | V99X0016X |
| (14) | OMS-L POD FU XFD B MASK | V99X0017X |
| (15) | OMS-R POD OX XFD B MASK | V99X0018X |
| (16) | OMS-R POD FU XFD B MASK | V99X0019X |

Step 10. This step monitors the response of the RCS left and right tank isolation valves on the 1/2 manifolds in the OMS/RCS return to normal configuration sequence. If any left or right 1/2 tank isolation valve fails to open, the RCS crossfeed valves between that manifold pair (OX and FU) and the corresponding 3/4/5 manifold will be left open to provide RCS propellant through the crossfeed valves.

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The following signals are monitored:

| | | |
|-----|-----------------------------------|-----------|
| (a) | RCS L AFT OX TANK ISLN VLV 1/2 OP | V42X2220X |
| (b) | RCS L AFT FU TANK ISLN VLV 1/2 OP | V42X2320X |
| (c) | RCS R AFT OX TANK ISLN VLV 1/2 OP | V42X3220X |
| (d) | RCS R AFT FU TANK ISLN VLV 1/2 OP | V42X3320X |
| (e) | RCS L AFT OX TANK ISLN VLV 1/2 CL | V42X2221X |
| (f) | RCS L AFT FU TANK ISLN VLV 1/2 CL | V42X2321X |
| (g) | RCS R AFT OX TANK ISLN VLV 1/2 CL | V42X3221X |
| (h) | RCS R AFT FU TANK ISLN VLV 1/2 CL | V42X3321X |
| (i) | FA 1 INPUT PROM SEG 3, 10 STATUS | V91X2845X |
| (j) | FA 3 INPUT PROM SEG 3, 10 STATUS | V91X2847X |

If (a) and (b) are true, and (e), (f) and (i) are false, issue (1) thru (6) below, and go to the next if statement. Otherwise, issue (13) through (18) and go to the next if statement,

If (c) and (d) are true, and (g), (h) and (j) are false, issue (7) thru (12) below, and go to the next statement, otherwise, issue (19) through (24) and go to the next statement.

Set (25) ad (26) false and return to Step 1 until at least 1.5 seconds have elapsed and then proceed to Step 16.

| | | |
|------|------------------------------------|-----------|
| (1) | RCS-L AFT XFD VLV-1/2 GPC CL A | V42K2416X |
| (2) | RCS-L AFT OX XFD VLV-1/2 GPC CL B | V42K2418X |
| (3) | RCS-L AFT FU XFD VLV-1/2 GPC CL B | V42K2422X |
| (4) | RCS-L AFT XFD VLV-3/4/5 GPC CL A | V42K2428X |
| (5) | RCS-L AFT OX XFD V-3/4/5 GPC CL B | V42K2430X |
| (6) | RCS-L AFT FU XFD V-3/4/5 GPC CL B | V42K2434X |
| (7) | RCS-R AFT XFD VLV-1/2 GPC CLOSE A | V42K3416X |
| (8) | RCS-R AFT OX XFD V-1/2 GPC CLOSE B | V42K3418X |
| (9) | RCS-R AFT FU XFD V-1/2 GPC CLOSE B | V42K3422X |
| (10) | RCS-R AFT XFD VLV-3/4/5 GPC CL A | V42K3428X |
| (11) | RCS-R AFT OX XFD V-3/4/5 GPC CL B | V42K3430X |
| (12) | RCS-R AFT FU XFD V-3/4/5 GPC CL B | V42K3434X |
| (13) | RCS-L AFT XFD VLV-1/2 GPC OP A | V42K2402X |
| (14) | RCS-L AFT OX XFD VLV-1/2 GPC OP B | V42K2403X |
| (15) | RCS-L AFT FU XFD VLV-1/2 GPC OP B | V42K2404X |
| (16) | RCS-L AFT XFD VLV-3/4/5 GPC OP A | V42K2408X |
| (17) | RCS-L AFT OX XFD V-3/4/5 GPC OP B | V42K2409X |
| (18) | RCS-L AFT FU XFD V-3/4/5 GPC OP B | V42K2410X |

| | | |
|------|------------------------------------|-----------|
| (19) | RCS-R AFT XFD VLV-1/2 GPC OPEN A | V42K3402X |
| (20) | RCS-R AFT OX XFD V-1/2 GPC OPEN B | V42K3403X |
| (21) | RCS-R AFT FU XFD V-1/2 GPC OPEN B | V42K3404X |
| (22) | RCS-R AFT XFD VLV-3/4/5 GPC OPEN A | V42K3408X |
| (23) | RCS-R AFT OX XFD V-3/4/5 GPC OP B | V42K3409X |
| (24) | RCS-R AFT FU XFD V-3/4/5 GPC OP B | V42K3410X |
| (25) | RCS 1/2 ALL JET INHIBIT FLAG | V90X8290X |
| (26) | RCS 3/4/5 ALL JET INHIBIT FLAG | V90X8291X |

Step 11. This step completes the interconnect sequence. In addition, the interconnect monitor is requested for those interconnects which were completed with no commfaults or RCS isolation valves open or crossfeed valves closed.

Four internal crossfeed B valve position open indicators (LOCAL OMS-L POD OX OXD VLV B POSN OP, LOCAL OMS-L POD FU XFD VLV B POSN OP, LOCAL OMS-R POD OX XFD VLV B POSN OP, and LOCAL OMS-R POD FU XFD VLV B POSN OP) are used to control the process. These internal variables are initialized to the hardware input discretes (OMS-L POD OX XFD VLV B POSN OP, OMS-L POD FU XFD VLV B POSN OP, OMS-R POD OX XFD VLV B POSN OP, and OMS-R POD FU XFD VLV B POSN OP).

The following signals are monitored:

| | | |
|-----|---------------------------------------|-----------|
| (a) | OMS-L POD OX XFD VLV B POSN OP | V43X4258X |
| (b) | OMS-L POD FU XFD VLV B POSN OP | V43X4358X |
| (c) | OMS-R POD OX XFD VLV B POSN OP | V43X5258X |
| (d) | OMS-R POD FU XFD VLV B POSN OP | V43X5358X |
| (e) | OMS-L POD OX XFD VLV A POSN OP | V43X4256X |
| (f) | OMS-L POD FU XFD VLV A POSN OP | V43X4356X |
| (g) | OMS-R POD OX XFD VLV A POSN OP | V43X5256X |
| (h) | OMS-R POD FU XFD VLV A POSN OP | V43X5356X |
| (i) | FA 1 INPUT PROM SEG 3, 10 STATUS | V91X2845X |
| (j) | FA 2 INPUT PROM SEG 3, 10 STATUS | V91X2846X |
| (k) | OMS/RCS I/C IN PROGRESS FLAG | INTERNAL |
| (l) | I/C FAIL COUNTER | INTERNAL |
| (m) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |
| (n) | OMS-L POD OX XFD B MASK | V99X0016X |
| (o) | OMS-L POD FU XFD B MASK | V99X0017X |
| (p) | OMS-R POD OX XFD B MASK | V99X0018X |
| (q) | OMS-R POD FU XFD B MASK | V99X0019X |
| (r) | LOCAL OMS-L POD OX XFD VLV B POSN OP | INTERNAL |
| (s) | LOCAL OMS-L POD FU XFD VLV B POSN OP | INTERNAL |
| (t) | LOCAL OMS-R POD OX XFD VLV B POSN OP | INTERNAL |
| (u) | LOCAL OMS-R POD FU XFD VLV B POSN OP | INTERNAL |

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If (n) = true set (19) = true and proceed to monitor (l). Otherwise, if (o) = true set (20) = true and proceed to monitor (l). Otherwise if (p) = true set (21) = true and proceed to monitor (l). Otherwise, if (q) = true set (22) true and proceed to monitor (l). Otherwise go to the next if statement.

If (l) > 1, set (8) = false (INHIBIT), set (9) and (11) = false, set (12) true, set (15) through (18) = false and proceed to Step 16. Otherwise, go to the next if statement.

If [(k) is true and (m) is false], and [(r) or (s) or (t) or (u) is false, or (j) is true], issue (1) through (6), and return to Step 1 until at least 1.5 seconds have elapsed, then proceed to the next if statement. Otherwise proceed to monitor (l).

If [(e) or (f) or (g) or (h) is false] or (i) is true, set (8) = false (INHIBIT), set (9) and (11) = false, set (7) and (12) = true, set (15) through (18) = false and return to Step 1. Otherwise, go to the next if statement.

If (l) = 0 and (k) is true, set (7) and (10) = true, set (9), (13), and (14) = false and go to Step 7. Otherwise, go to the next statement.

Set (7) = true, set (9), (13), and (14) = false and return to Step 1.

| | | |
|------|---------------------------------------|-----------|
| (1) | OMS-L POD XFD VLVS A CMD 1 OP | V43K4282X |
| (2) | OMS-L POD OXDZR XFD VLV A CMD 2 OP | V43K4284X |
| (3) | OMS-L POD FUEL XFD VLV A CMD 2 OP | V43K4384X |
| (4) | OMS-R POD XFD VLVS A CMD 1 OP | V43K5282X |
| (5) | OMS-R POD OXDZR XFD VLV A CMD 2 OP | V43K5284X |
| (6) | OMS-R POD FUEL XFD VLV A CMD 2 OP | V43K5384X |
| (7) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |
| (8) | OMS/RCS INTERCONNECT INH/ENA CMD | V93X5348X |
| (9) | OMS/RCS I/C IN PROGRESS FLAG | INTERNAL |
| (10) | INTERCONNECT MONITOR FLAG | INTERNAL |
| (11) | OMS TO RCS INTERCONNECT CMD | V90X8312X |
| (12) | OMS TO RCS RTRN TO NORM CONFIG CMD | V90X8313X |
| (13) | RCS 1/2 ALL JET INHIBIT FLAG | V90X8290X |
| (14) | RCS 3/4/5 ALL JET INHIBIT FLAG | V90X8291X |
| (15) | OMS-L POD OX XFD B MASK | V99X0016X |
| (16) | OMS-L POD FU XFD B MASK | V99X0017X |
| (17) | OMS-R POD OX XFD B MASK | V99X0018X |
| (18) | OMS-R POD FU XFD B MASK | V99X0019X |
| (19) | LOCAL OMS-L POD OX XFD VLV B POSN OP | INTERNAL |
| (20) | LOCAL OMS-L POD FU XFD VLV B POSN OP | INTERNAL |
| (21) | LOCAL OMS-R POD OX XFD VLV B POSN OP | INTERNAL |
| (22) | LOCAL OMS-R POD FU XFD VLV B POSN OP | INTERNAL |

Step 12. This step is the first procedure in the execution of the Mode 2 return-to-normal for a contingency situation. The RCS tank isolation valves are commanded to the open position and then 1.5 seconds delay is satisfied before proceeding to the next step.

Issue commands (1) through (14) below and return to Step 1 until 1.5 seconds have expired, then proceed to Step 13.

- | | | |
|------|--------------------------------------|-----------|
| (1) | RCS-L AFT TK ISLN V-1/2 GPC OP A | V42K2342X |
| (2) | RCS-L AFT OX TK ISLN V1/2 GPC OP B | V42K2343X |
| (3) | RCS-L AFT FU TK ISLN V1/2 GPC OP B | V42K2344X |
| (4) | RCS-R AFT TK ISLN V-1/2 GPC OP A | V42K3342X |
| (5) | RCS-R AFT OX TK ISLN V-1/2 GPC OP B | V42K3343X |
| (6) | RCS-R AFT FU TK ISLN V-1/2 GPC OP B | V42K3344X |
| (7) | RCS-L AFT OX TK ISLN V3/4/5 A GPC OP | V42K2346X |
| (8) | RCS-L AFT FU TK ISLN V3/4/5 A GPC OP | V42K2347X |
| (9) | RCS-R AFT OX TK ISLN V3/4/5 A GPC OP | V42K3346X |
| (10) | RCS-R AFT FU TK ISLN V3/4/5 A GPC OP | V42K3347X |
| (11) | RCS-L AFT OX TK ISLN V3/4/5 B GPC OP | V42K2349X |
| (12) | RCS-L AFT FU TK ISLN V3/4/5 B GPC OP | V42K2350X |
| (13) | RCS-R AFT OX TK ISLN V3/4/5 B GPC OP | V42K3349X |
| (14) | RCS-R AFT FU TK ISLN V3/4/5 B GPC OP | V42K3350X |

Step 13. This step monitors the response of the left RCS tank isolation valves on the 1/2 manifolds during the Mode 2 OMS/RCS return-to-normal configuration sequence. If any left 1/2 tank isolation valve fails to open or it's associated commfault is true, the left 1/2 RCS crossfeed valves between that manifold pair (OX and FU) and the left 3/4/5 manifold will be commanded open to provide RCS propellant through the crossfeed valves. If the left 1/2 RCS tank isolation valves are open, the left 1/2 and 3/4/5 RCS crossfeed valves will be commanded closed.

Monitor the following signals:

- | | | |
|-----|-----------------------------------|-----------|
| (a) | RCS L AFT OX TANK ISLN VLV 1/2 OP | V42X2220X |
| (b) | RCS L AFT FU TANK ISLN VLV 1/2 OP | V42X2320X |
| (c) | RCS L AFT OX TANK ISLN VLV 1/2 CL | V42X2221X |
| (d) | RCS L AFT FU TANK ISLN VLV 1/2 CL | V42X2321X |
| (e) | FA 1 INPUT PROM SEG 3, 10 STATUS | V91X2845X |

If [(a) and (b) are both true] and [(c), (d), and (e) are all false], issue (7) through (12) and proceed to Step 14.

If [(a) or (b) is false] or [(c) or (d) or (e) is true], issue (1) through (6) and proceed to Step 14.

- | | | |
|-----|-----------------------------------|-----------|
| (1) | RCS-L AFT XFD VLV-1/2 GPC OP A | V42K2402X |
| (2) | RCS-L AFT OX XFD VLV-1/2 GPC OP B | V42K2403X |

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- | | | |
|------|-----------------------------------|-----------|
| (3) | RCS-L AFT FU XFD VLV-1/2 GPC OP B | V42K2404X |
| (4) | RCS-L AFT XFD VLV-3/4/5 GPC OP A | V42K2408X |
| (5) | RCS-L AFT OX XFD V-3/4/5 GPC OP B | V42K2409X |
| (6) | RCS-L AFT FU XFD V-3/4/5 GPC OP B | V42K2410X |
| (7) | RCS-L AFT XFD VLV-1/2 GPC CL A | V42K2416X |
| (8) | RCS-L AFT OX XFD VLV-1/2 GPC CL B | V42K2418X |
| (9) | RCS-L AFT FU XFD VLV-1/2 GPC CL B | V42K2422X |
| (10) | RCS-L AFT XFD VLV-3/4/5 GPC CL A | V42K2428X |
| (11) | RCS-L AFT OX XFD V-3/4/5 GPC CL B | V42K2430X |
| (12) | RCS-L AFT FU XFD V-3/4/5 GPC CL B | V42K2434X |

Step 14. This step monitors the response of the right RCS tank isolation valves on the 1/2 manifolds during the Mode 2 OMS/RCS return-to-normal configuration sequence. If any right 1/2 tank isolation valve fails to open or it's associated commfault is true, the right 1/2 RCS crossfeed valves between that manifold pair (OX and FU) and the right 3/4/5 manifold will be commanded open to provide RCS propellant through the crossfeed valves. If the right 1/2 RCS tank isolation valves are open, the right 1/2 and 3/4/5 RCS crossfeed valves will be commanded closed.

Monitor the following signals:

- | | | |
|-----|-----------------------------------|-----------|
| (a) | RCS R AFT OX TANK ISLN VLV 1/2 OP | V42X3220X |
| (b) | RCS R AFT FU TANK ISLN VLV 1/2 OP | V42X3320X |
| (c) | RCS R AFT OX TANK ISLN VLV 1/2 CL | V42X3221X |
| (d) | RCS R AFT FU TANK ISLN VLV 1/2 CL | V42X3321X |
| (e) | FA 3 INPUT PROM SEG 3, 10 STATUS | V91X2847X |

If [(a) and (b) are both true] and [(c), (d), and (e) are all false], issue (7) through (12) and return to Step 1 until 1.5 seconds has expired, then proceed to Step 15.

If [(a) or (b) is false] or [(c) or (d) or (e) is true], issue (1) through (6) and return to Step 1 until 1.5 seconds has expired, then proceed to Step 15.

- | | | |
|------|-------------------------------------|-----------|
| (1) | RCS-R AFT XFD VLV-1/2 GPC OPEN A | V42K3402X |
| (2) | RCS-R AFT OX XFD VLV-1/2 GPC OPEN B | V42K3403X |
| (3) | RCS-R AFT FU XFD VLV-1/2 GPC OPEN B | V42K3404X |
| (4) | RCS-R AFT XFD VLV-3/4/5 GPC OPEN A | V42K3408X |
| (5) | RCS-R AFT OX XFD V-3/4/5 GPC OP B | V42K3409X |
| (6) | RCS-R AFT FU XFD V-3/4/5 GPC OP B | V42K3410X |
| (7) | RCS-R AFT XFD VLV-1/2 GPC CLOSE A | V42K3416X |
| (8) | RCS-R AFT OX XFD V-1/2 GPC CLOSE B | V42K3418X |
| (9) | RCS-R AFT FU XFD V-1/2 GPC CLOSE B | V42K3422X |
| (10) | RCS-R AFT XFD VLV-3/4/5 GPC CL A | V42K3428X |

- | | | |
|------|-----------------------------------|-----------|
| (11) | RCS-R AFT OX XFD V-3/4/5 GPC CL B | V42K3430X |
| (12) | RCS-R AFT FU XFD V-3/4/5 GPC CL B | V42K3434X |

Step 15. This step commands the OMS propellant crossfeed valves closed.

Issue commands (1) through (12), and return to Step 1 until 1.5 seconds have elapsed, then proceed to Step 16.

- | | | |
|------|------------------------------------|-----------|
| (1) | OMS-L POD XFD VLVS A CMD 1 CL | V43K4283X |
| (2) | OMS-L POD OXDZR XFD VLV A CMD 2 CL | V43K4285X |
| (3) | OMS-L POD FUEL XFD VLV A CMD 2 CL | V43K4385X |
| (4) | OMS-L POD XFD VLVS B CMD 1 CL | V43K4287X |
| (5) | OMS-L POD OXDZR XFD VLV B CMD 2 CL | V43K4289X |
| (6) | OMS-L POD FUEL XFD VLV B CMD 2 CL | V43K4389X |
| (7) | OMS-R POD XFD VLVS A CMD 1 CL | V43K5283X |
| (8) | OMS-R POD OXDZR XFD VLV A CMD 2 CL | V43K5285X |
| (9) | OMS-R ROD FUEL XFD VLV A CMD 2 CL | V43K5385X |
| (10) | OMS-R POD XFD VLVS B CMD 1 CL | V43K5287X |
| (11) | OMS-R POD OXDZR XFD VLV B CMD 2 CL | V43K5289X |
| (12) | OMS-R POD FUEL XFD VLV B CMD 2 CL | V43K5389X |

Step 16. This step completes the intact abort and Mode 2 return to normal sequence.

Set (1) through (6) false and return to Step 1.

- | | | |
|-----|---------------------------------------|------------|
| (1) | RCS 1/2 ALL JET INHIBIT FLAG | V90X8290X |
| (2) | RCS 3/4/5 ALL JET INHIBIT FLAG | V90X8291X |
| (3) | AFT MANIFOLD 1/2 JET INH FLAG | V90X8285X |
| (4) | AFT MANIFOLD 3/4/5 JET INH FLAG | V90X8286X |
| (5) | OMS TO RCS INTERCONNECT COMPLETE FLAG | V90X8282X |
| (6) | OMS/RCS RTRN TO NORM IN PROGRESS FLAG | (INTERNAL) |

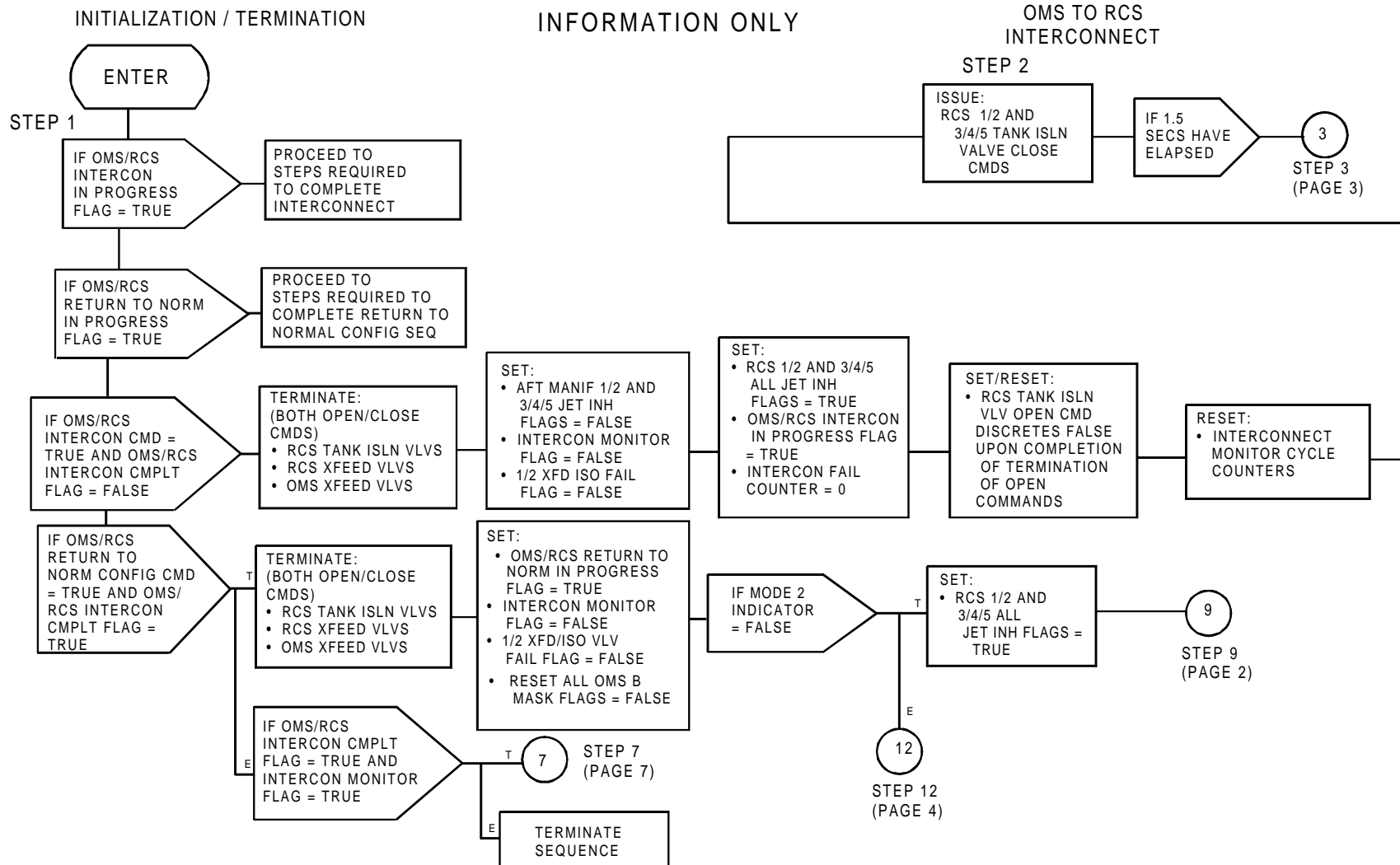


FIGURE 4.184.(1) Abort OMS/RCS Interconnect Sequence (Sheet 1 of 7)

NOMINAL RETURN TO NORMAL

INFORMATION ONLY

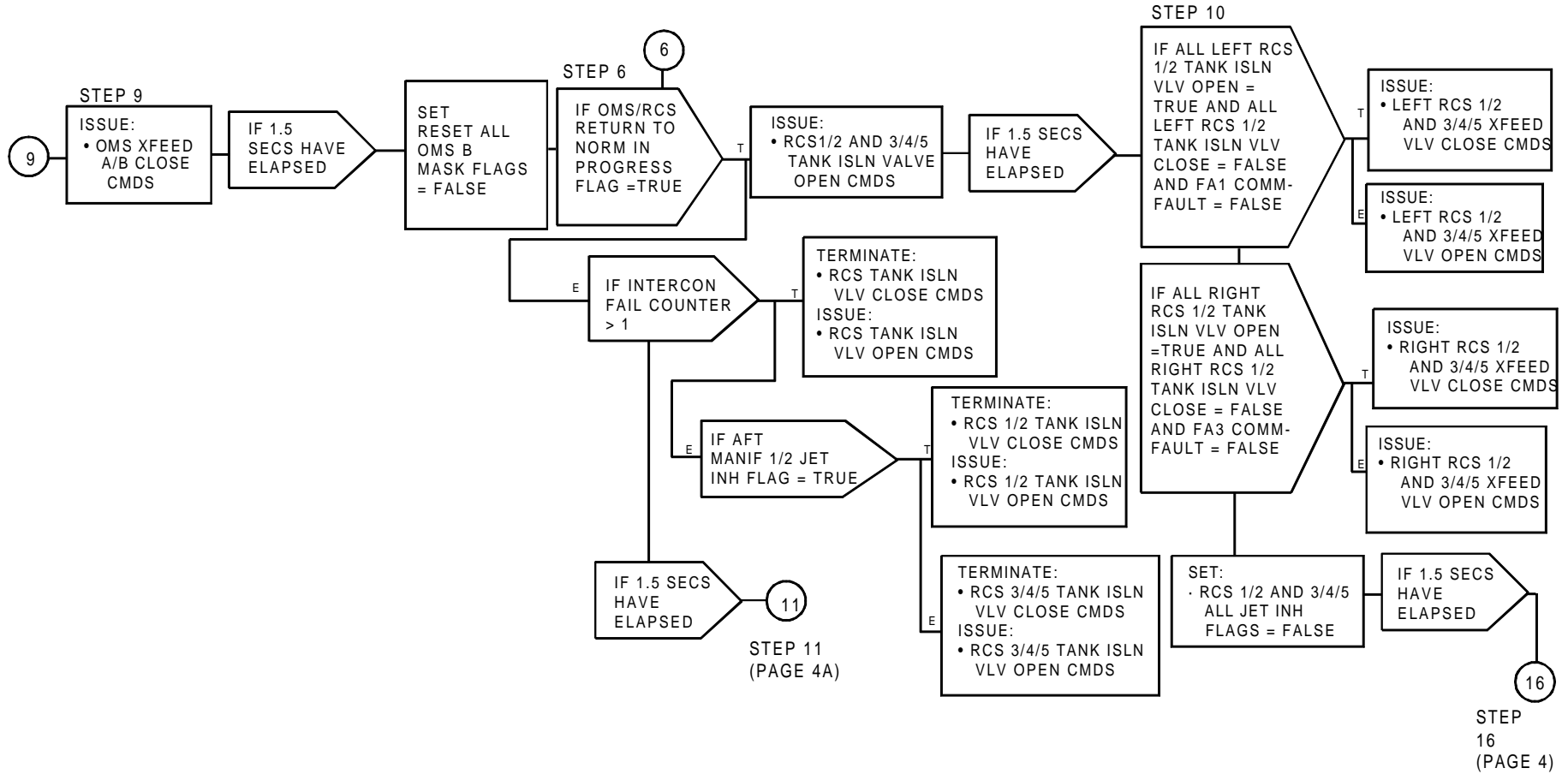


FIGURE 4.184.(2) Abort OMS/RCS Interconnect Sequence (Sheet 2 of 7)

INFORMATION ONLY
CONTINUATION OF OMS TO RCS INTERCONNECT

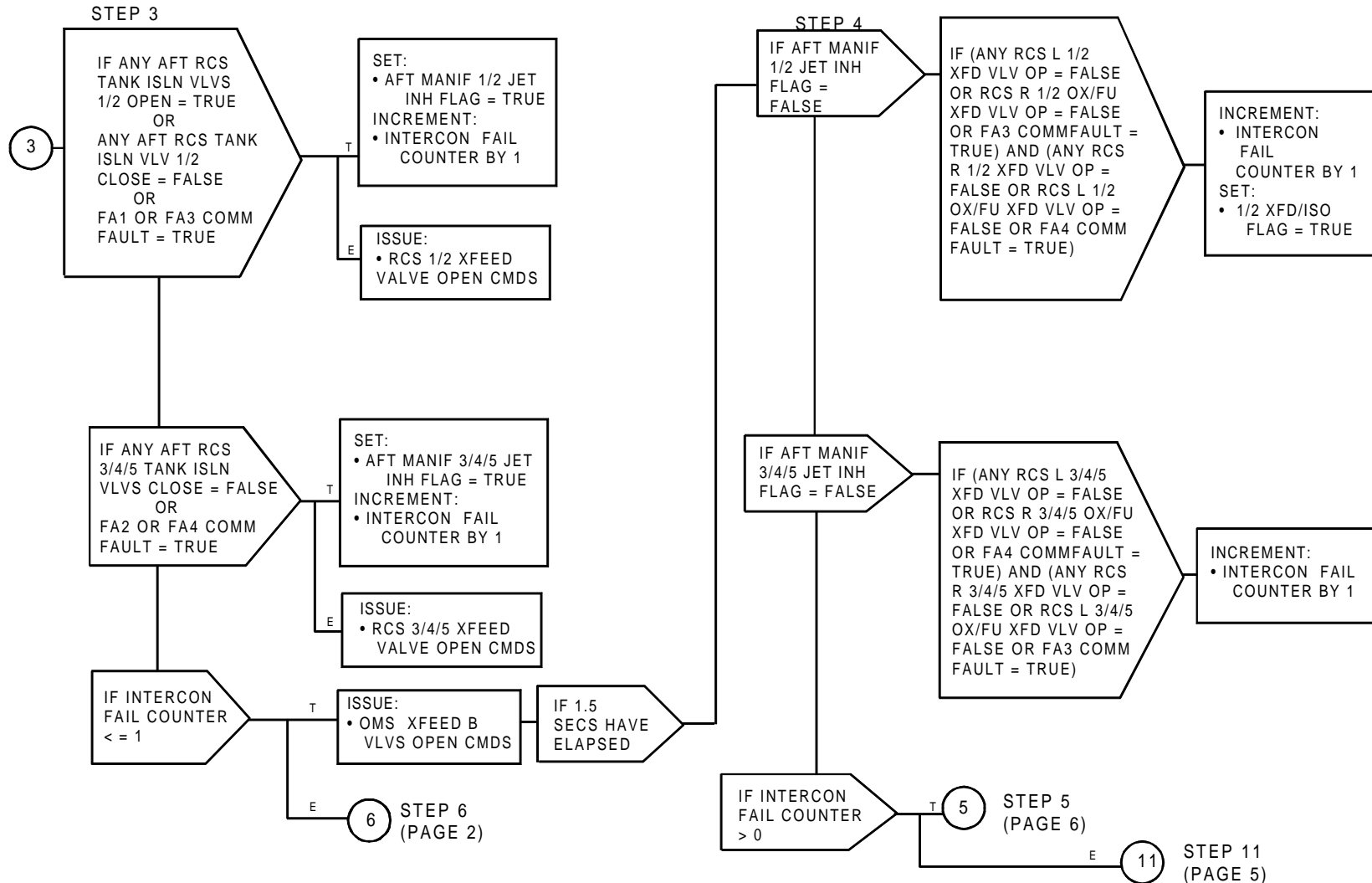


FIGURE 4.184.(3) Abort OMS/RCS Interconnect Sequence (Sheet 3 of 7)

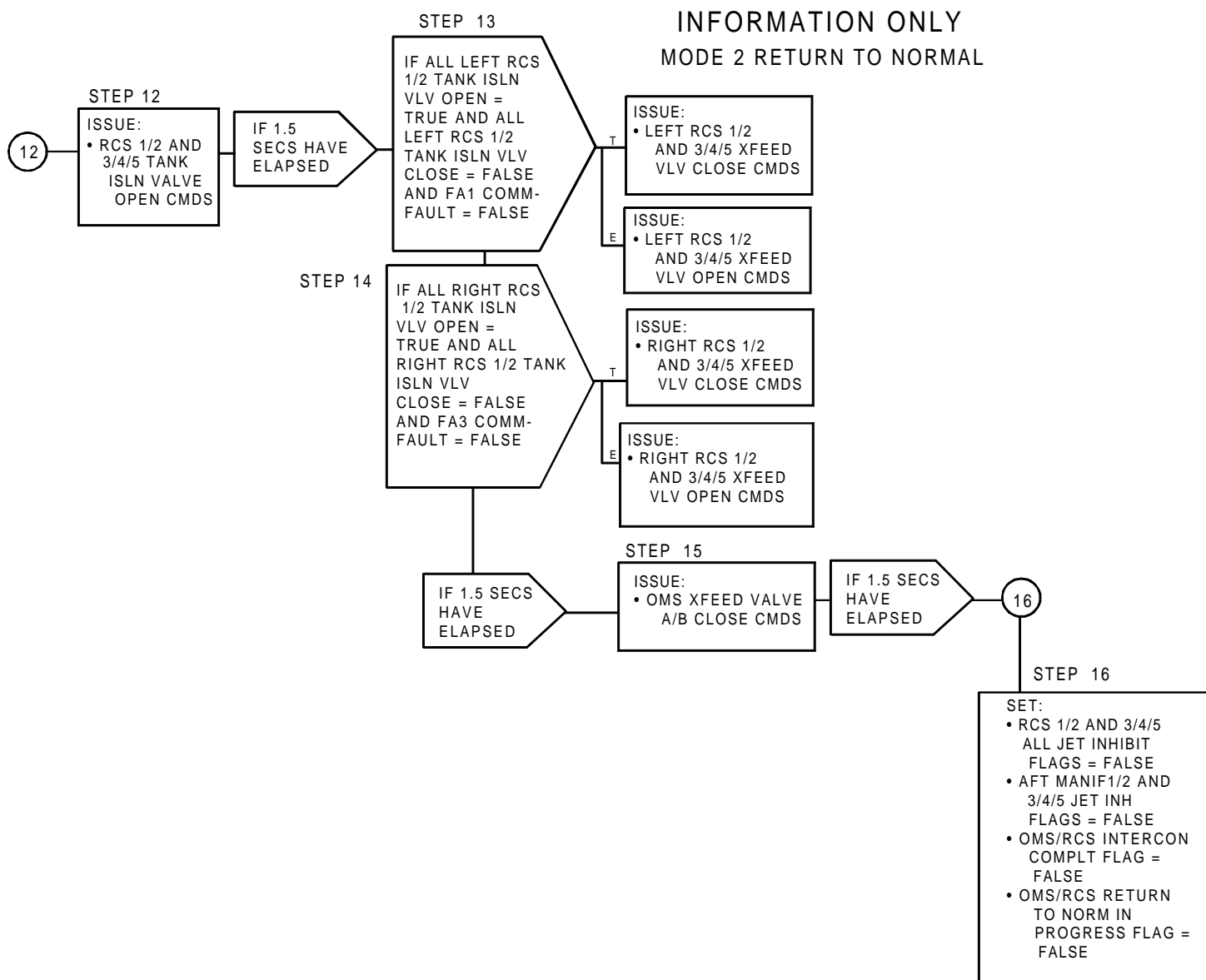


FIGURE 4.184.(4) Abort OMS/RCS Interconnect Sequence (Sheet 4 of 7)

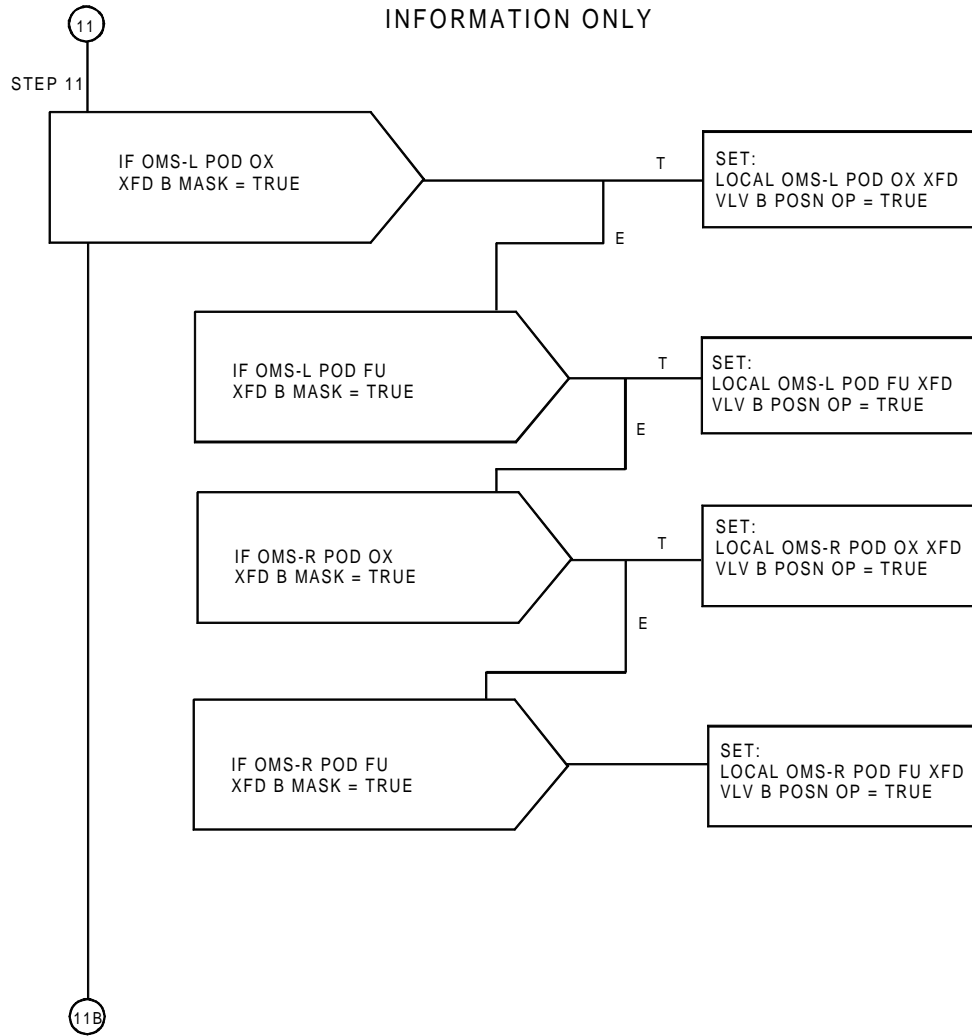


FIGURE 4.184(4A) Abort OMS/RCS Interconnect Sequence (Sheet 4A of 7)

INFORMATION ONLY

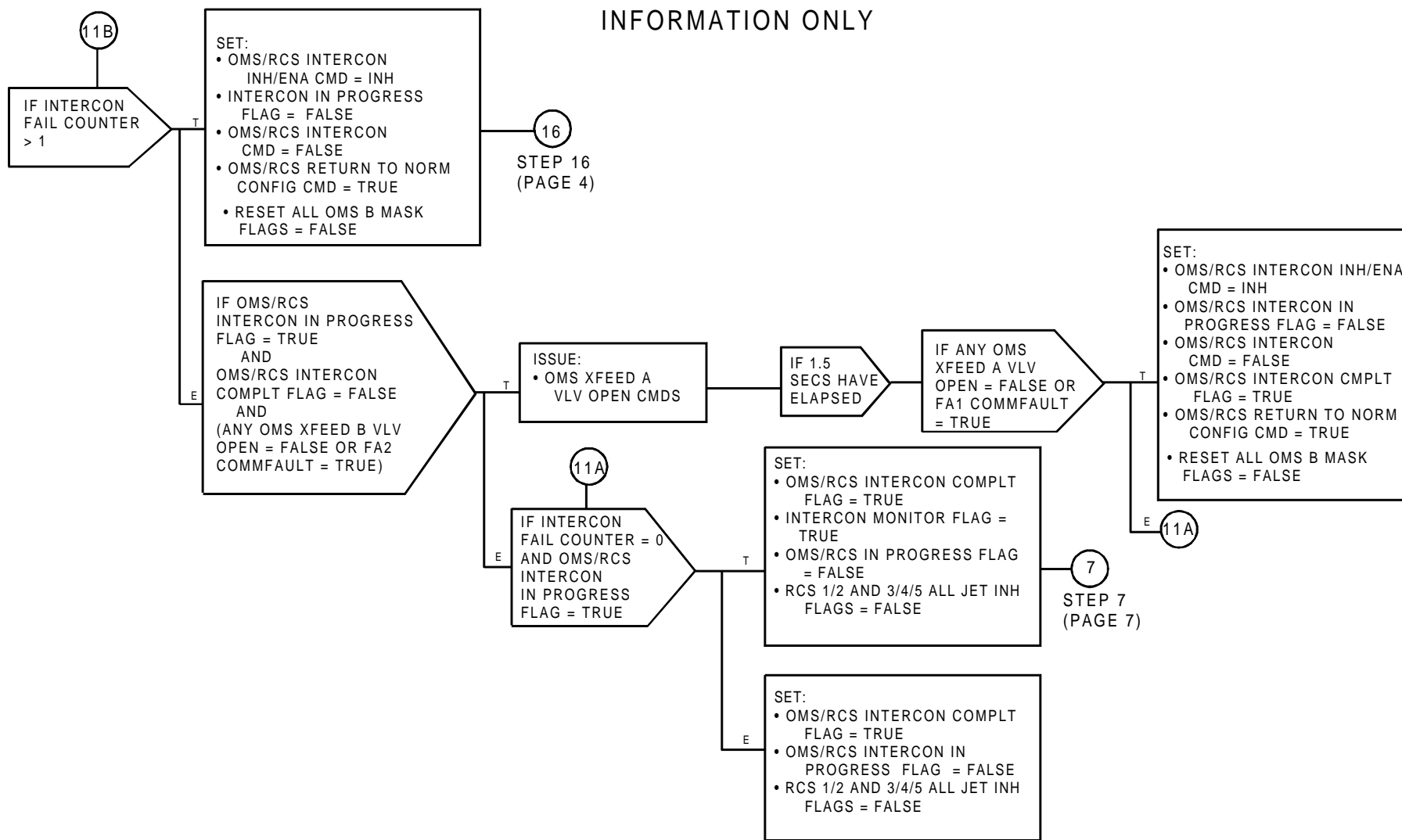


FIGURE 4.184.(5) Abort OMS/RCS Interconnect Sequence (Sheet 5 of 7)

INFORMATION ONLY
FAILURE PROCESSING

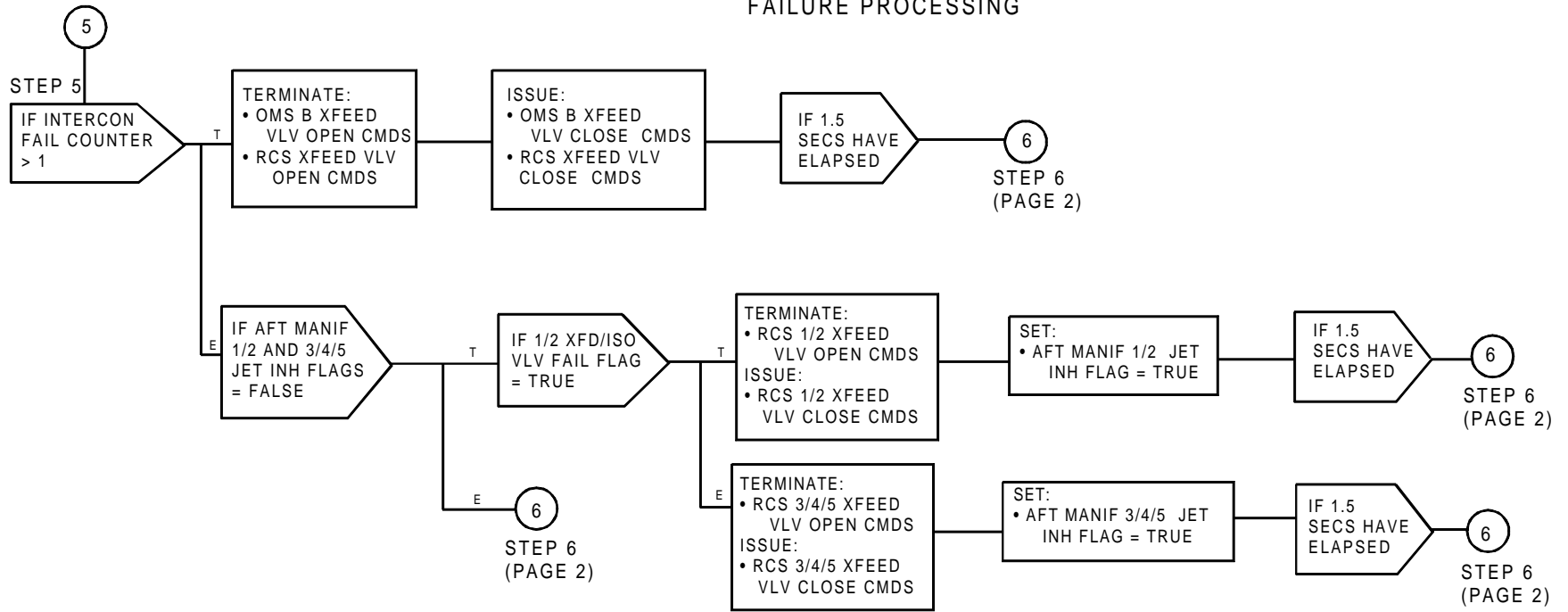


FIGURE 4.184.(6) Abort OMS/RCS Interconnect Sequence (Sheet 6 of 7)

INFORMATION ONLY
MONITOR MODE

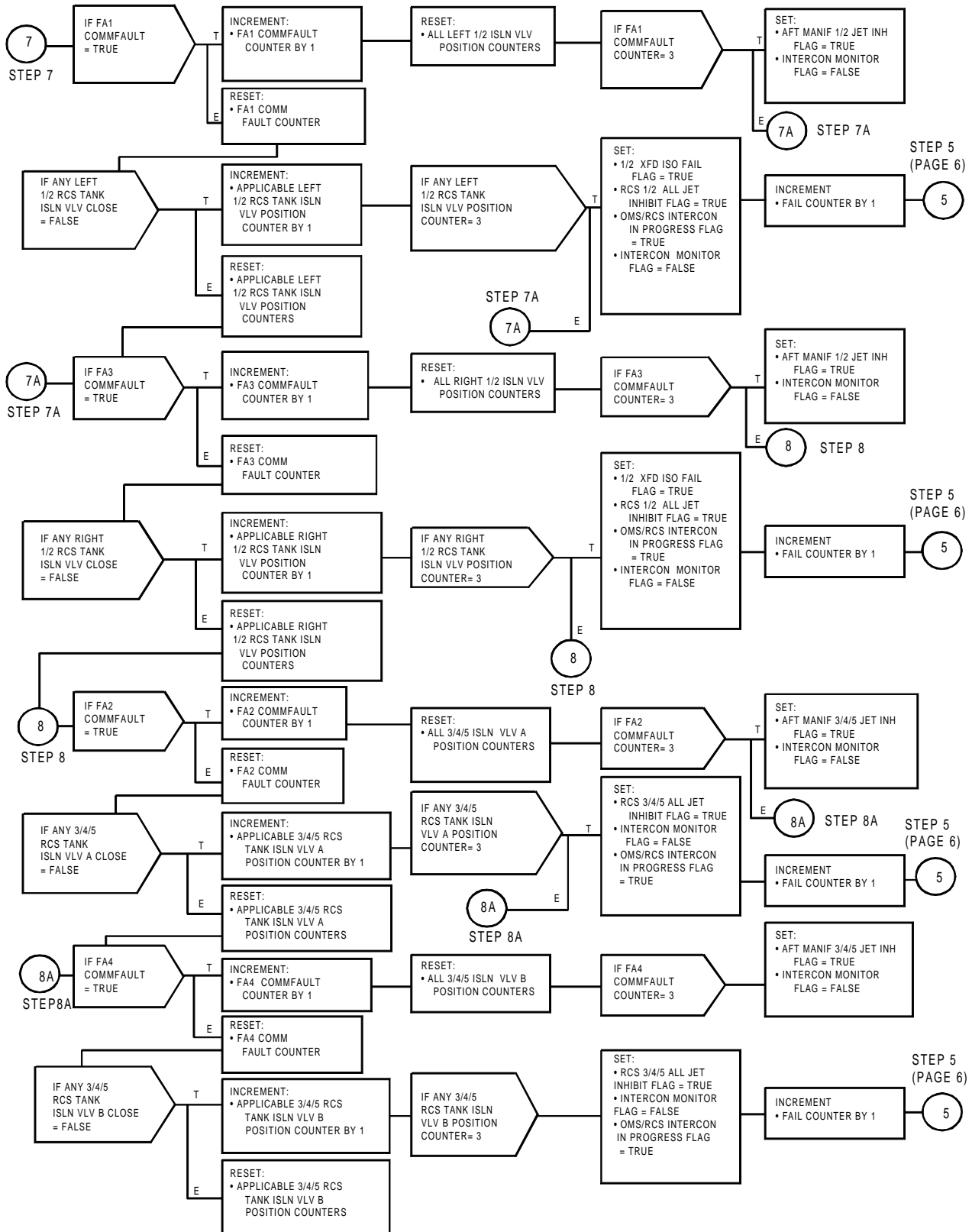


FIGURE 4.184.(7) Abort OMS/RCS Interconnect Sequence (Sheet 7 of 7)

TABLE 4.3.2.4-1. INPUT FUNCTIONAL PARAMETERS FOR ABORT OMS/RCS INTERCONNECT FUNCTION (G4.184)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-------------------------|------------|------------------------------------|----------------|-------|--------------|------------------|---------|-------------|
| MODE_2_INDICATOR | V90X8308X | MODE 2 INDICATOR | ABT CNTL SEQ | | BD | | 90705H | |
| MODE_2_INDICATOR | V90X8308XA | MODE 2 INDICATOR | CONT 3E/O GUID | | BD | | 90705H | |
| OMS_L_POD_FU_XFD_B_MASK | V99X0017X | OMS-L POD FU XFD B MASK | VU | EVENT | BD | | 93017G | * |
| OMS_L_POD_FU_XFD_B_MASK | V99X0017XA | OMS-L POD FU XFD B MASK | RCS/RCS XFEED | | BD | | 93093A | |
| OMS_L_POD_OX_XFD_B_MASK | V99X0016X | OMS-L POD OX XFD B MASK | VU | EVENT | BD | | 93017G | * |
| OMS_L_POD_OX_XFD_B_MASK | V99X0016XA | OMS-L POD OX XFD B MASK | RCS/RCS XFEED | | BD | | 93093A | |
| OMS_R_POD_FU_XFD_B_MASK | V99X0019X | OMS-R POD FU XFD B MASK | VU | EVENT | BD | | 93017G | * |
| OMS_R_POD_FU_XFD_B_MASK | V99X0019XA | OMS-R POD FU XFD B MASK | RCS/RCS XFEED | | BD | | 93093A | |
| OMS_R_POD_OX_XFD_B_MASK | V99X0018X | OMS-R POD OX XFD B MASK | VU | EVENT | BD | | 93017G | * |
| OMS_R_POD_OX_XFD_B_MASK | V99X0018XA | OMS-R POD OX XFD B MASK | RCS/RCS XFEED | | BD | | 93093A | |
| | V42X2220X | RCS L AFT OX TANK ISLN VLV-1/2 OP | MCA A3 | | BD | | 93017G | * |
| | V42X2221X | RCS-L AFT OX TANK ISLN VLV-1/2 CL | MCA A3 | | BD | | 93017G | * |
| | V42X2223X | RCS-L AFT OX TK ISLN VLV-3/4/5A CL | MCA A1 | | BD | | 93017G | * |
| | V42X2225X | RCS-L AFT OX TK ISLN VLV-3/4/5B CL | MCA A2 | | BD | | 93017G | * |
| | V42X2236X | RCS-L AFT OX XFD VLV-1/2 OP | MCA A3 | | BD | | 93017G | * |
| | V42X2238X | RCS-L AFT OX XFD VLV-3/4/5 OP | MCA A2 | | BD | | 93017G | * |
| | V42X2251X | RCS L OX/FU XFD VLV 1/2 OP | MCA A3 | | BD | | 93017G | * |
| | V42X2252X | RCS R OX/FU XFD VLV 1/2 OP | MCA A3 | | BD | | 93017G | * |
| | V42X2253X | RCS L OX/FU XFD VLV 3/4/5 OP | MCA A1 | | BD | | 93017G | * |
| | V42X2254X | RCS R OX/FU XFD VLV 3/4/5 OP | MCA A1 | | BD | | 93017G | * |
| | V42X2320X | RCS L AFT FU TANK ISLN VLV-1/2 OP | MCA A3 | | BD | | 93017G | * |
| | V42X2321X | RCS-L AFT FU TANK ISLN VLV-1/2 CL | MCA A3 | | BD | | 93017G | * |
| | V42X2323X | RCS-L AFT FU TK ISLN VLV-3/4/5A CL | MCA A1 | | BD | | 93017G | * |
| | V42X2325X | RCS-L AFT FU TK ISLN VLV-3/4/5B CL | MCA A2 | | BD | | 93017G | * |
| | V42X2336X | RCS-L AFT FU XFD VLV-1/2 OP | MCA A3 | | BD | | 93017G | * |
| | V42X2338X | RCS-L AFT FU XFD VLV-3/4/5 OP | MCA A2 | | BD | | 93017G | * |
| | V42X3220X | RCS R AFT OX TANK ISLN VLV-1/2 OP | MCA A3 | | BD | | 93017G | * |
| | V42X3221X | RCS-R AFT OX TANK ISLN VLV-1/2 CL | MCA A3 | | BD | | 93017G | * |
| | V42X3223X | RCS-R AFT OX TK ISLN VLV-3/4/5A CL | MCA A1 | | BD | | 93017G | * |
| | V42X3225X | RCS-R AFT OX TK ISLN VLV-3/4/5B CL | MCA A2 | | BD | | 93017G | * |
| | V42X3236X | RCS R AFT OX XFD VLV-1/2 OPEN | MCA A3 | | BD | | 93017G | * |
| | V42X3238X | RCS R AFT OX XFD VLV-3/4/5 OP | MCA A1 | | BD | | 93017G | * |
| | V42X3320X | RCS R AFT FU TANK ISLN VLV-1/2 OP | MCA A3 | | BD | | 93017G | * |
| | V42X3321X | RCS-R AFT FU TANK ISLN VLV-1/2 CL | MCA A3 | | BD | | 93017G | * |
| | V42X3323X | RCS-R AFT FU TK ISLN VLV-3/4/5A CL | MCA A1 | | BD | | 93017G | * |
| | V42X3325X | RCS-R AFT FU TK ISLN VLV-3/4/5B CL | MCA A2 | | BD | | 93017G | * |
| | V42X3336X | RCS R AFT FU XFD VLV-1/2 OPEN | MCA A3 | | BD | | 93017G | * |
| | V42X3338X | RCS R AFT FU XFD VLV-3/4/5 OPEN | MCA A1 | | BD | | 93017G | * |
| | V43X4256X | OMS-L POD OX XFD VLV A POSN OP | MCA A1 | | BD | | 93017G | * |
| | V43X4258X | OMS-L POD OX XFD VLV B POSN OP | MCA A2 | | BD | | 93017G | * |
| | V43X4356X | OMS-L POD FU XFD VLV A POSN OP | MCA A1 | | BD | | 93017G | * |
| | V43X4358X | OMS-L POD FU XFD VLV B POSN OP | MCA A2 | | BD | | 93017G | * |
| | V43X5256X | OMS-R POD OX XFD VLV A POSN OP | MCA A3 | | BD | | 93017G | * |
| | V43X5258X | OMS-R POD OX XFD VLV B POSN OP | MCA A2 | | BD | | 93017G | * |
| | V43X5356X | OMS-R POD FU XFD VLV A POSN OP | MCA A3 | | BD | | 93017G | * |
| | V43X5358X | OMS-R POD FU XFD VLV B POSN OP | MCA A2 | | BD | | 93017G | * |

TABLE 4.3.2.4-1. INPUT FUNCTIONAL PARAMETERS FOR ABORT OMS/RCS INTERCONNECT FUNCTION (G4.184)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------------|--------------|-------|-----------|---------|---------|-------|
| | V90X8312X | OMS TO RCS INTERCONNECT CMD | ABT CNTL SEQ | | BD | | 93017G | * |
| | V90X8313X | OMS TO RCS RTRN TO NORM CONFIG CMD | ABT CNTL SEQ | | BD | | 93017G | * |
| | V91X2845X | FA1 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 89991E | |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2848X | FA4 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 92316B | |

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

TABLE 4.3.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ABORT OMS/RCS INTERCONNECT FUNCTION (G4.184)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------|--------|------------------------------|-------------|-------|--------------|------------------|---------|-------------|
| V42K2342XB | RCS-L | AFT TK ISLN V-1/2 GPC OP A | MCA A3 | | | | | |
| V42K2343XB | RCS-L | AFT OX TK ISLN V1/2 GPC OP B | MCA A3 | | | | | |
| V42K2344XB | RCS-L | AFT FU TK ISLN V1/2 GPC OP B | MCA A3 | | | | | |
| V42K2346XA | RCS-L | AFT OX TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| V42K2347XA | RCS-L | AFT FU TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| V42K2349XA | RCS-L | AFT OX TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| V42K2350XA | RCS-L | AFT FU TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| V42K2353XA | RCS-L | AFT TK ISLN V-1/2 GPC CL A | MCA A3 | | | | | |
| V42K2354XA | RCS-L | AFT OX TK ISLN V1/2 GPC CL B | MCA A3 | | | | | |
| V42K2355XA | RCS-L | AFT FU TK ISLN V1/2 GPC CL B | MCA A3 | | | | | |
| V42K2357XA | RCS-L | AFT OX TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| V42K2358XA | RCS-L | AFT FU TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| V42K2360XA | RCS-L | AFT OX TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| V42K2361XA | RCS-L | AFT FU TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| V42K2402XB | RCS-L | AFT XFD VLV 1/2 GPC OP A | MCA A3 | | | | | |
| V42K2403XB | RCS-L | AFT OX XFD VLV-1/2 GPC OP B | MCA A3 | | | | | |
| V42K2404XB | RCS-L | AFT FU XFD VLV 1/2 GPC OP B | MCA A3 | | | | | |
| V42K2408XB | RCS-L | AFT XFD VLV 3/4/5 GPC OP A | MCA A2 | | | | | |
| V42K2409XB | RCS-L | AFT OX XFD V-3/4/5 GPC OP B | MCA A2 | | | | | |
| V42K2410XB | RCS-L | AFT FU XFD V-3/4/5 GPC OP B | MCA A2 | | | | | |
| V42K2416XB | RCS-L | AFT XFD VLV-1/2 GPC CL A | MCA A3 | | | | | |
| V42K2418XB | RCS-L | AFT OX XFD VLV-1/2 GPC CL B | MCA A3 | | | | | |
| V42K2422XB | RCS-L | AFT FU XFD VLV-1/2 GPC CL B | MCA A3 | | | | | |
| V42K2428XB | RCS-L | AFT XFD V-3/4/5 GPC CL A | MCA A2 | | | | | |
| V42K2430XB | RCS-L | AFT OX XFD V-3/4/5 GPC CL B | MCA A2 | | | | | |
| V42K2434XB | RCS-L | AFT FU XFD V-3/4/5 GPC CL B | MCA A2 | | | | | |
| V42K3342XA | RCS-R | AFT TK ISLN V-1/2 GPC OP A | MCA A3 | | | | | |
| V42K3343XA | RCS-R | AFT OX TK ISLN V-1/2 GPC OPB | MCA A3 | | | | | |
| V42K3344XA | RCS-R | AFT FU TK ISLN V-1/2 GPC OPB | MCA A3 | | | | | |
| V42K3346XA | RCS-R | AFT OX TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| V42K3347XA | RCS-R | AFT FU TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| V42K3349XA | RCS-R | AFT OX TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| V42K3350XA | RCS-R | AFT FU TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| V42K3353XA | RCS-R | AFT TK ISLN V-1/2 GPC CL A | MCA A3 | | | | | |
| V42K3354XA | RCS-R | AFT OX TK ISLN V-1/2 GPC CLB | MCA A3 | | | | | |
| V42K3355XA | RCS-R | AFT FU TK ISLN V-1/2 GPC CLB | MCA A3 | | | | | |
| V42K3357XA | RCS-R | AFT OX TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| V42K3358XA | RCS-R | AFT FU TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| V42K3360XA | RCS-R | AFT OX TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| V42K3361XA | RCS-R | AFT FU TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| V42K3402XB | RCS R | AFT XFD VLV-1/2 GPC OPEN A | MCA A3 | | | | | |
| V42K3403XB | RCS R | AFT OX XFD V-1/2 GPC OPEN B | MCA A3 | | | | | |
| V42K3404XB | RCS R | AFT FU XFD V-1/2 GPC OPEN B | MCA A3 | | | | | |
| V42K3408XB | RCS R | AFT XFD VLV-3/4/5 GPC OPEN A | MCA A1 | | | | | |
| V42K3409XB | RCS R | AFT OX XFD V-3/4/5 GPC OP B | MCA A1 | | | | | |
| V42K3410XB | RCS R | AFT FU XFD V-3/4/5 GPC OP B | MCA A1 | | | | | |

TABLE 4.3.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ABORT OMS/RCS INTERCONNECT FUNCTION (G4.184)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|---|-------|-----------|---------|---------|-------|
| | V42K3416XB | RCS R AFT XFD VLV-1/2 GPC CLOSE A | MCA A3 | | | | | |
| | V42K3418XB | RCS R AFT OX XFD V-1/2 GPC CLOSE B | MCA A3 | | | | | |
| | V42K3422XB | RCS R AFT FU XFD V-1/2 GPC CLOSE B | MCA A3 | | | | | |
| | V42K3428XB | RCS R AFT XFD VLV-3/4/5 GPC CL A | MCA A1 | | | | | |
| | V42K3430XB | RCS-R AFT OX XFD V-3/4/5 GPC CL B | MCA A1 | | | | | |
| | V42K3434XB | RCS-R AFT FU XFD V-3/4/5 GPC CL B | MCA A1 | | | | | |
| | V43K4282XB | OMS-L POD XFD VLVS A CMD 1 OP | MCA A1 | | | | | |
| | V43K4283XB | OMS-L POD XFD VLVS A CMD 1 CL | MCA A1 | | | | | |
| | V43K4284XB | OMS-L POD OXDZR XFD VLV A CMD 2 OP | MCA A1 | | | | | |
| | V43K4285XB | OMS-L POD OXDZR XFD VLV A CMD 2 CL | MCA A1 | | | | | |
| | V43K4286XB | OMS-L POD XFD VLVS B CMD 1 OP | MCA A2 | | | | | |
| | V43K4287XB | OMS-L POD XFD VLVS B CMD 1 CL | MCA A2 | | | | | |
| | V43K4288XB | OMS-L POD OXDZR XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K4289XB | OMS-L POD OXDZR XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V43K4384XB | OMS-L POD FUEL XFD VLV A CMD 2 OP | MCA A1 | | | | | |
| | V43K4385XB | OMS-L POD FUEL XFD VLV A CMD 2 CL | MCA A1 | | | | | |
| | V43K4388XB | OMS-L POD FUEL XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K4389XB | OMS-L POD FUEL XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V43K5282XB | OMS-R POD XFD VLVS A CMD 1 OP | MCA A3 | | | | | |
| | V43K5283XB | OMS-R POD XFD VLVS A CMD 1 CL | MCA A3 | | | | | |
| | V43K5284XB | OMS-R POD OXDZR XFD VLV A CMD 2 OP | MCA A3 | | | | | |
| | V43K5285XB | OMS-R POD OXDZR XFD VLV A CMD 2 CL | MCA A3 | | | | | |
| | V43K5286XB | OMS-R POD XFD VLVS B CMD 1 OP | MCA A2 | | | | | |
| | V43K5287XB | OMS-R POD XFD VLVS B CMD 1 CL | MCA A2 | | | | | |
| | V43K5288XB | OMS-R POD OXDZR XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K5289XB | OMS-R POD OXDZR XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V43K5384XB | OMS-R POD FUEL XFD VLV A CMD 2 OP | MCA A3 | | | | | |
| | V43K5385XB | OMS-R POD FUEL XFD VLV A CMD 2 CL | MCA A3 | | | | | |
| | V43K5388XB | OMS-R POD FUEL XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K5389XB | OMS-R POD FUEL XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V90X8282X | OMS TO RCS INTERCONNECT COMP FLAG | ABT CNTL SEQ ASC RCS CMD SOP DL FMT 21/A DL FMT 23/A DL FMT 32/A E/L RCS CMD SOP MSC OVERRIDE DISP RCS REG SEQ RCS/RCS XFEED | | BD | | 93017G | * |
| | V90X8285X | AFT MANIFOLD 1/2 JET INH FLAG | ABT CNTL SEQ ASC RCS CMD SOP DL FMT 21/A E/L RCS CMD SOP | | BD | | 93017G | * |

TABLE 4.3.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ABORT OMS/RCS INTERCONNECT FUNCTION (G4.184)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|----------------------------------|---|-------|--------------|------------------|---------|-------------|
| | V90X8286X | AFT MANIFOLD 3/4/5 JET INH FLAG | ABT CNTL SEQ ASC RCS CMD SOP DL FMT 21/A E/L RCS CMD SOP | | BD | | 93017G | * |
| | V90X8290X | RCS 1/2 ALL JET INHIBIT FLAG | ASC RCS CMD SOP CONT 3E/O GUID E/L RCS CMD SOP | | BD | | 90705H | |
| | V90X8291X | RCS 3/4/5 ALL JET INHIBIT FLAG | ASC RCS CMD SOP CONT 3E/O GUID E/L RCS CMD SOP | | BD | | 90705H | |
| | V93M0508PC | CGSB_FLAG_WORD2 | DL FMT 21/A DL FMT 23/A DL FMT 32/A | | | | 93017G | * |
| | V93X5348XC | OMS/RCS INTERCONNECT INH/ENA CMD | ABT CNTL SEQ OVERRIDE DISP | | BD | | 90964 | |

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 4.3.2.4-3. ABORT OMS/RCS INTERCONNECT FUNCTION (G4.184) 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 4.3.2.4-4. ABORT OMS/RCS INTERCONNECT FUNCTION (G4.184) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD 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.

TABLE 4.3.2.4-5. ABORT OMS/RCS INTERCONNECT FUNCTION (G4.184) 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.

4.3.3 MPS Entry Dump Sequence (4.69)

4.3.3.1 Introduction

The MPS entry dump sequence performs the function of expelling the LO₂ and LH₂ trapped in the orbiter propellant lines and in the main engines during a Trans Atlantic Abort Landing (TAL) and during an Abort–Once–Around (AOA). The propellants are dumped overboard to minimize hazardous conditions upon atmospheric reentry, to reduce landing weight, and to improve orbiter center of gravity considerations.

4.3.3.2 Overview

The MPS entry dump sequence is scheduled at a frequency of 1.04 Hz by the GN&C moding, sequencing, and control (MSC) function from transition to Major Mode 303 to transition to OPS 9.

The LH₂ dump sequence consists of opening the propellant manifold to allow the LH₂ to vent out for 20 seconds. The LH₂ inboard fill/drain valve is then closed and the propellant lines are purged with pressurized helium for 80 seconds. The pressure is then allowed to vent down until the Ground Relative Velocity cue is equal to or less than 5,300 ft/sec. The propellant lines are then closed.

An unpressurized LO₂ venting through the main engines, and through the fill/drain line when Ground Relative Velocity is at or less than 20,000 ft/sec, is performed. The LO₂ venting is terminated when the Ground Relative Velocity cue is equal to or less than 5,300 ft/sec. Terminate sequence output commands to the main engines with corresponding binary/BCH command words will be generated in two 16-bit words for output to the EIU, in accordance with the main engine command requirements specified in Section 4.8.2.3.8 and Table 4.8.2–1 of the SSME SOP (4.181).

At the completion of the entry propellant dump for TAL and AOA aborts, and for a nominal reentry, the MPS manifolds and feedlines are repressurized, and a helium purge of the aft compartment, OMS PODS, and ET Umbilical Cavity is performed to prevent ingestion of contaminants and to inert the environment.

4.3.3.3 Detailed Requirements

Step 1. This step starts helium pressurization.

On first entry into this step, set outputs (1) through (22) true and proceed to Step 2. On subsequent passes, proceed to Step 2.

| | | |
|------|-------------------------------------|-----------|
| (1) | MPS E1 HE INTCN OUT (LV60) OP CMD A | V41K1168X |
| (2) | MPS E2 HE INTCN IN (LV61) OP CMD A | V41K1262X |
| (3) | MPS E2 HE INTCN IN (LV61) OP CMD B | V41K1263X |
| (4) | MPS E3 HE INTCN OUT (LV64) OP CMD A | V41K1368X |
| (5) | MPS REG HE XOVER VLV (LV10) OP CMD | V41K1613X |
| (6) | MPS E1 HE ISO VLV B (LV2) OP CMD A | V41K1156X |
| (7) | MPS E1 HE ISO VLV B (LV2) OP CMD B | V41K1157X |
| (8) | MPS E1 HE ISO VLV A (LV1) OP CMD | V41K1155X |
| (9) | MPS E2 HE ISO VLV B (LV4) OP CMD A | V41K1256X |
| (10) | MPS E2 HE ISO VLV B (LV4) OP CMD B | V41K1257X |
| (11) | MPS E2 HE ISO VLV A (LV3) OP CMD | V41K1255X |
| (12) | MPS E3 HE ISO VLV B (LV6) OP CMD A | V41K1356X |
| (13) | MPS E3 HE ISO VLV B (LV6) OP CMD B | V41K1357X |

| | | |
|------|--------------------------------------|-----------|
| (14) | MPS E3 HE ISO VLV A (LV5) OP CMD | V41K1355X |
| (15) | MPS LH2 RTLS INBD DV (PV17) OP CMD A | V41K1923X |
| (16) | MPS LH2 RTLS INBD DV (PV17) OP CMD B | V41K1924X |
| (17) | MPS LH2 RTLS INBD DV (PV17) OP CMD C | V41K1925X |
| (18) | MPS LH2 RTLS OTBD DV (PV18) OP CMD A | V41K1913X |
| (19) | MPS LH2 RTLS OTBD DV (PV18) OP CMD B | V41K1914X |
| (20) | MPS LH2 RTLS OTBD DV (PV18) OP CMD C | V41K1915X |
| (21) | MPS PNEU HE ISO VLV 1 (LV7) OP CMD | V41K1607X |
| (22) | MPS PNEU HE ISO VLV 2 (LV8) OP CMD | V41K1608X |

Step 2. This step provides for branching in the Entry MPS dump sequence. In TAL and AOA abort cases, it also opens the propellant system valves for the dump function.

Monitor the following signals:

| | | |
|-----|---------------------|-----------|
| (a) | MAJOR MODE 304 FLAG | V90X8161X |
| (b) | MAJOR MODE 305 FLAG | V90X8162X |

If (a) or (b) is true, proceed to monitor signals (c) and (d) below, otherwise return to Step 1.

| | | |
|-----|----------------------|------------|
| (c) | TAL ABORT DECLARED | V90X8658X |
| (d) | AOA ABORT DECLARED | V90X8636X |
| (e) | MPS PRPLT DUMP TIMER | (INTERNAL) |

If (c) or (d) is true, on first pass, start timer (e) and set outputs (1) through (28) true and outputs (29) and (30) false, and return to Step 1. On subsequent passes, proceed to monitor timer (e). Otherwise proceed to Step 5.

If twenty or more seconds have elapsed since starting timer (e), on first pass, set outputs (30) through (36) true and outputs (17) and (18) false, and proceed to monitor (f), (g), (h), and (i) below. On subsequent passes, proceed to monitor (f), (g), (h) and (i). Otherwise return to Step 1.

| | | |
|-----|--------------------------------------|-----------|
| (f) | GND REL VEL MAGNITUDE IN M50 SYS | V95L0151C |
| (g) | MPS LO2 17IN FEED MANF PRESS | V41P1533C |
| (h) | FA2 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2842X |
| (i) | HE_PURGE_VEL | V96U8958C |

If (((i) <= (f) <= 20,000 ft/sec) and (g) < 30 psia and (h) is false), on first pass, set outputs (37) through (39) true and outputs (40) and (41) false, and proceed to Step 3. Otherwise proceed to Step 3.

| | | |
|------|----------------------------------|-----------|
| (1) | ME-1 OXIDIZER DUMP CMD | E41K1219B |
| (2) | ME-2 OXIDIZER DUMP CMD | E41K2219B |
| (3) | ME-3 OXIDIZER DUMP CMD | E41K3219B |
| (4) | MPS E1 LO2 PREVLV (PV1) OP CMD A | V41K1136X |
| (5) | MPS E1 LO2 PREVLV (PV1) OP CMD B | V41K1137X |
| (6) | MPS E1 LO2 PREVLV (PV1) OP CMD C | V41K1138X |
| (7) | MPS E1 LO2 PREVLV (PV1) OP CMD D | V41K1143X |
| (8) | MPS E2 LO2 PREVLV (PV2) OP CMD A | V41K1236X |
| (9) | MPS E2 LO2 PREVLV (PV2) OP CMD B | V41K1237X |
| (10) | MPS E2 LO2 PREVLV (PV2) OP CMD C | V41K1238X |

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| | | |
|------|--------------------------------------|-----------|
| (11) | MPS E2 LO2 PREVLV (PV2) OP CMD D | V41K1243X |
| (12) | MPS E3 LO2 PREVLV (PV3) OP CMD A | V41K1336X |
| (13) | MPS E3 LO2 PREVLV (PV3) OP CMD B | V41K1337X |
| (14) | MPS E3 LO2 PREVLV (PV3) OP CMD C | V41K1338X |
| (15) | MPS E3 LO2 PREVLV (PV3) OP CMD D | V41K1343X |
| (16) | MPS LH2 OTBD F/D VLV (PV11) OP CMD | V41K1391X |
| (17) | MPS LH2 INBD F/D (PV12) OP CMD A | V41K1401X |
| (18) | MPS LH2 INBD F/D (PV12) OP CMD B | V41K1402X |
| (19) | MPS LH2 TOPPING VALVE (PV13) OP CMD | V41K1411X |
| (20) | MPS E1 LH2 PREVLV (PV4) OP CMD A | V41K1119X |
| (21) | MPS E1 LH2 PREVLV (PV4) OP CMD B | V41K1120X |
| (22) | MPS E1 LH2 PREVLV (PV4) OP CMD C | V41K1121X |
| (23) | MPS E2 LH2 PREVLV (PV5) OP CMD A | V41K1219X |
| (24) | MPS E2 LH2 PREVLV (PV5) OP CMD B | V41K1220X |
| (25) | MPS E2 LH2 PREVLV (PV5) OP CMD C | V41K1221X |
| (26) | MPS E3 LH2 PREVLV (PV6) OP CMD A | V41K1319X |
| (27) | MPS E3 LH2 PREVLV (PV6) OP CMD B | V41K1320X |
| (28) | MPS E3 LH2 PREVLV (PV6) OP CMD C | V41K1321X |
| (29) | MPS LH2 OTBD F/D VLV (PV11) CL CMD | V41K1393X |
| (30) | MPS LH2 INBD F/D (PV12) CL CMD | V41K1412X |
| (31) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD A | V41K1905X |
| (32) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD A | V41K1906X |
| (33) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD B | V41K1907X |
| (34) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD B | V41K1908X |
| (35) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD C | V41K1909X |
| (36) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD C | V41K1910X |
| (37) | MPS LO2 INBD F/D (PV10) OP CMD A | V41K1501X |
| (38) | MPS LO2 INBD F/D (PV10) OP CMD B | V41K1502X |
| (39) | MPS LO2 OTBD F/D VLV (PV9) OP CMD | V41K1518X |
| (40) | MPS LO2 INBD F/D VLV (PV10) CL CMD | V41K1512X |
| (41) | MPS LO2 OTBD F/D VLV (PV9) CL CMD | V41K1515X |

Step 3. This step removes LH2 RTLS pressurization after 100 seconds into the dump or if LH2 manifold pressure constraints are violated.

Monitor the following:

- | | | |
|-----|-------------------------------------|------------|
| (a) | MPS PRPLT DUMP TIMER | (INTERNAL) |
| (b) | MPS LH2 17IN FEED MANF PRESS | V41P1433C |
| (c) | FA1 INPUT PROM SEG 1,2 STATUS (MFE) | V91X2841X |

If ((60 psia < (b) <= 90 psia) and (c) is false) or 100 or more seconds have elapsed since starting timer (a), on first pass, set outputs (1) through (6) false and proceed to Step 4. Otherwise proceed to Step 4.

- | | | |
|-----|--------------------------------------|-----------|
| (1) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD A | V41K1905X |
| (2) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD A | V41K1906X |
| (3) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD B | V41K1907X |
| (4) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD B | V41K1908X |
| (5) | MPS LH2 RTLS REPRS 1 (LV74) OP CMD C | V41K1909X |
| (6) | MPS LH2 RTLS REPRS 2 (LV75) OP CMD C | V41K1910X |

Step 4. This step terminates the vacuum inert at a specified ground relative velocity cue.

Monitor the following:

- | | | |
|-----|--------------------------------------|------------|
| (a) | GND REL VEL MAGNITUDE IN M50 SYS | V95L0151C |
| (b) | HE_PURGE_VEL | V96U8958C |
| (c) | 20 SEC FILL/DRAIN TIMER | (INTERNAL) |
| (d) | MPS LO2 OTBD F/D VLV (PV9) CL IND | V41X1514X |
| (e) | FA3 INPUT PROM SEG 3,10 STATUS (HFE) | V91X2847X |
| (f) | MPS LH2 OTBD F/D VLV (PV11) CL IND | V41X1389X |
| (g) | FA2 INPUT PROM SEG 3,10 STATUS (HFE) | V91X2846X |

If (a) <= (b) , on first pass, set outputs (1) through (5) true and outputs (7) and (8) false, start timer (c) and proceed to Step 5. On subsequent passes, proceed to monitor timer (c). Otherwise proceed to Step 5.

If twenty or more seconds have elapsed since starting timer (c), on first pass, proceed to monitor signals (d) and (e). Otherwise, proceed to Step 5. On subsequent passes, proceed to Step 5.

If (d) is false or (e) is true, set outputs (9) and (10) false and output (11) true and proceed to monitor signals (f) and (g). Otherwise, proceed to monitor signals (f) and (g).

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If (f) is false or (g) is true, set output (6) false and proceed to Step 5. Otherwise, proceed to Step 5.

| | | |
|------|-------------------------------------|-----------|
| (1) | ME-1 TERMINATE SEQUENCE CMD | E41K1218B |
| (2) | ME-2 TERMINATE SEQUENCE CMD | E41K2218B |
| (3) | ME-3 TERMINATE SEQUENCE CMD | E41K3218B |
| (4) | MPS LO2 OTBD F/D VLV (PV9) CL CMD | V41K1515X |
| (5) | MPS LH2 OTBD F/D VLV (PV11) CL CMD | V41K1393X |
| (6) | MPS LH2 TOPPING VALVE (PV13) OP CMD | V41K1411X |
| (7) | MPS LO2 OTBD F/D VLV (PV9) OP CMD | V41K1518X |
| (8) | MPS LH2 OTBD F/D VLV (PV11) OP CMD | V41K1391X |
| (9) | MPS LO2 INBD F/D (PV10) OP CMD A | V41K1501X |
| (10) | MPS LO2 INBD F/D (PV10) OP CMD B | V41K1502X |
| (11) | MPS LO2 INBD F/D VLV (PV10) CL CMD | V41K1512X |

Step 5. This step provides for an entry helium purge and termination of the entry dump sequence function.

Monitor the following:

| | | |
|-----|----------------------------------|------------|
| (a) | GND REL VEL MAGNITUDE IN M50 SYS | V95L0151C |
| (b) | HE_PURGE_VEL | V96U8958C |
| (c) | HE_PURGE_TIME | V96U8959C |
| (d) | HE PURGE TIMER | (INTERNAL) |

If (a) <= (b), on first pass, start timer (d) and set outputs (34) through (51) true, and set outputs (14) through (25) and (52) through (57) false and return to Step 1. On subsequent passes, proceed to monitor timer (d). Otherwise, return to Step 1.

If (d) ≥ (c), on the first pass set outputs (1) through (13), (26) through (35), (40) through (51), (58) and (59) false, and return to Step 1. On subsequent passes, return to Step 1. Otherwise return to Step 1.

| | | |
|------|-----------------------------------|-----------|
| (1) | MPS E1 LH2 PREVLV (PV4) OP CMD A | V41K1119X |
| (2) | MPS E1 LH2 PREVLV (PV4) OP CMD B | V41K1120X |
| (3) | MPS E1 LH2 PREVLV (PV4) OP CMD C | V41K1121X |
| (4) | MPS E2 LH2 PREVLV (PV5) OP CMD A | V41K1219X |
| (5) | MPS E2 LH2 PREVLV (PV5) OP CMD B | V41K1220X |
| (6) | MPS E2 LH2 PREVLV (PV5) OP CMD C | V41K1221X |
| (7) | MPS E3 LH2 PREVLV (PV6) OP CMD A | V41K1319X |
| (8) | MPS E3 LH2 PREVLV (PV6) OP CMD B | V41K1320X |
| (9) | MPS E3 LH2 PREVLV (PV6) OP CMD C | V41K1321X |
| (10) | MPS LH2 4IN DISC VLV (PD3) CL CMD | V41K1422X |
| (11) | MPS LO2 OVBD B/V (PV19) CL CMD A | V41K1584X |
| (12) | MPS LO2 OVBD B/V (PV19) CL CMD B | V41K1585X |
| (13) | MPS LO2 OVBD B/V (PV19) CL CMD C | V41K1586X |
| (14) | MPS E1 LO2 PREVLV (PV1) OP CMD A | V41K1136X |
| (15) | MPS E1 LO2 PREVLV (PV1) OP CMD B | V41K1137X |
| (16) | MPS E1 LO2 PREVLV (PV1) OP CMD C | V41K1138X |
| (17) | MPS E1 LO2 PREVLV (PV1) OP CMD D | V41K1143X |
| (18) | MPS E2 LO2 PREVLV (PV2) OP CMD A | V41K1236X |
| (19) | MPS E2 LO2 PREVLV (PV2) OP CMD B | V41K1237X |
| (20) | MPS E2 LO2 PREVLV (PV2) OP CMD C | V41K1238X |

| | | |
|------|--------------------------------------|-----------|
| (21) | MPS E2 LO2 PREVLV (PV2) OP CMD D | V41K1243X |
| (22) | MPS E3 LO2 PREVLV (PV3) OP CMD A | V41K1336X |
| (23) | MPS E3 LO2 PREVLV (PV3) OP CMD B | V41K1337X |
| (24) | MPS E3 LO2 PREVLV (PV3) OP CMD C | V41K1338X |
| (25) | MPS E3 LO2 PREVLV (PV3) OP CMD D | V41K1343X |
| (26) | REPLACE LH2 ULL PRESS XD CR 1 CMD | V41K1700X |
| (27) | REPLACE LH2 ULL PRESS XD CR 2 CMD | V41K1701X |
| (28) | REPLACE LH2 ULL PRESS XD CR 3 CMD | V41K1702X |
| (29) | REPLACE LO2 ULL PRESS XD CR 1 CMD | V41K1750X |
| (30) | REPLACE LO2 ULL PRESS XD CR 2 CMD | V41K1751X |
| (31) | REPLACE LO2 ULL PRESS XD CR 3 CMD | V41K1752X |
| (32) | ET/ORB SEP CAMERAS ON CMD | V56K0000X |
| (33) | ET/ORB SEP CAMERAS-HTR/PWR ON CMD | V56K0010X |
| (34) | MPS HE SPLY BLWDWN 1 (LV26) OP CMD | V41K1631X |
| (35) | MPS HE SPLY BLWDWN 2 (LV27) OP CMD | V41K1633X |
| (36) | MPS LO2 MANF REPRSS 1 (LV40) OP CMD | V41K1535X |
| (37) | MPS LO2 MANF REPRSS 2 (LV41) OP CMD | V41K1537X |
| (38) | MPS LH2 MANF REPRSS 1 (LV42) OP CMD | V41K1435X |
| (39) | MPS LH2 MANF REPRSS 2 (LV43) OP CMD | V41K1437X |
| (40) | MPS E1 LO2 PREVLV (PV1) CL CMD A | V41K1139X |
| (41) | MPS E1 LO2 PREVLV (PV1) CL CMD B | V41K1140X |
| (42) | MPS E1 LO2 PREVLV (PV1) CL CMD C | V41K1141X |
| (43) | MPS E1 LO2 PREVLV (PV1) CL CMD D | V41K1142X |
| (44) | MPS E2 LO2 PREVLV (PV2) CL CMD A | V41K1239X |
| (45) | MPS E2 LO2 PREVLV (PV2) CL CMD B | V41K1240X |
| (46) | MPS E2 LO2 PREVLV (PV2) CL CMD C | V41K1241X |
| (47) | MPS E2 LO2 PREVLV (PV2) CL CMD D | V41K1242X |
| (48) | MPS E3 LO2 PREVLV (PV3) CL CMD A | V41K1339X |
| (49) | MPS E3 LO2 PREVLV (PV3) CL CMD B | V41K1340X |
| (50) | MPS E3 LO2 PREVLV (PV3) CL CMD C | V41K1341X |
| (51) | MPS E3 LO2 PREVLV (PV3) CL CMD D | V41K1342X |
| (52) | MPS LH2 RTLS INBD DV (PV17) OP CMD A | V41K1923X |
| (53) | MPS LH2 RTLS INBD DV (PV17) OP CMD B | V41K1924X |
| (54) | MPS LH2 RTLS INBD DV (PV17) OP CMD C | V41K1925X |
| (55) | MPS LH2 RTLS OTBD DV (PV18) OP CMD A | V41K1913X |
| (56) | MPS LH2 RTLS OTBD DV (PV18) OP CMD B | V41K1914X |
| (57) | MPS LH2 RTLS OTBD DV (PV18) OP CMD C | V41K1915X |
| (58) | MPS LO2 INBD F/D (PV10) OP CMD A | V41K1501X |
| (59) | MPS LO2 INBD F/D (PV10) OP CMD B | V41K1502X |

INFORMATION ONLY

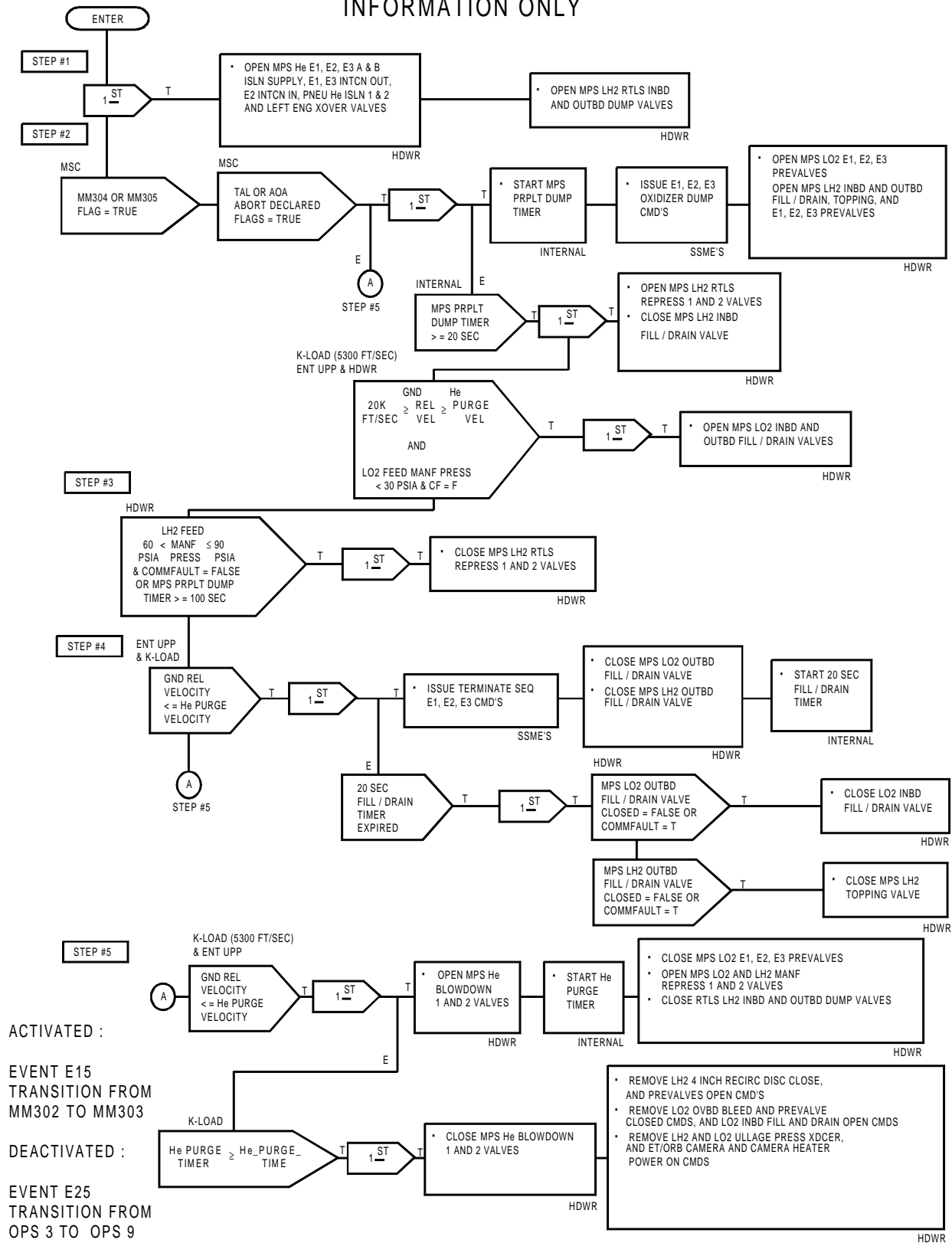


FIGURE 4.69. MPS Entry Dump Sequence System Overview

TABLE 4.3.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR MAIN PROPULSION SYSTEM ENTRY DUMP SEQUENCER (G4.69)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------|------------|------------------------------------|--------------|-------|-----------|---------|---------|-------|
| MM_CODE_304/MM_304 | V90X8161X | MAJOR MODE 304 FLAG | MSC | | | | 92355B | |
| MM_CODE_305/MM_305 | V90X8162X | MAJOR MODE 305 FLAG | MSC | | | | 92355B | |
| REL_VEL_MAG/V | V95L0151CC | GND REL VEL MAGNITUDE IN M50 SYS | ENT UPP | FT/S | SPL | | 93017G | * |
| S_AOA | V90X8636X | AOA ABORT DECLARED | MSC | | BD | | 92355B | |
| TAL_ABORT_DECLARED | V90X8658X | TAL ABORT DECLARED | MSC | | | | 93090E | |
| | V41P1433C | MPS LH2 17IN FEED MANF PRESS | HDWR | | AMU | | 93017G | * |
| | V41P1533C | MPS LO2 17IN FEED MANF PRESS | HDWR | | AMU | | 93017G | * |
| | V41X1389X | MPS LH2 OTBD F/D VLV (PV11) CL IND | LH2 OTBD VLV | | BD | | 93017G | * |
| | V41X1514X | MPS LO2 OTBD F/D VLV (PV9) CL IND | LO2 OTBD VLV | | BD | | 93017G | * |
| | V91X2841X | FA1 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2842X | FA2 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |

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

TABLE 4.3.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MAIN PROPULSION SYSTEM ENTRY DUMP SEQUENCER (G4.69)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------|------------|------------------------------------|-------------|-------|-----------|---------|---------|-------|
| ME1_LO2_DUMP | E41K1219BB | ME-1 OXIDIZER DUMP CMD | EIU 1 | | | | 90007G | |
| ME1_TERM_SEQ | E41K1218BB | ME-1 TERMINATE SEQUENCE CMD | EIU 1 | | | | 90007G | |
| ME2_LO2_DUMP | E41K2219BB | ME-2 OXIDIZER DUMP CMD | EIU 2 | | | | 90007G | |
| ME2_TERM_SEQ | E41K2218BB | ME-2 TERMINATE SEQUENCE CMD | EIU 2 | | | | 90007G | |
| ME3_LO2_DUMP | E41K3219BB | ME-3 OXIDIZER DUMP CMD | EIU 3 | | | | 90007G | |
| ME3_TERM_SEQ | E41K3218BB | ME-3 TERMINATE SEQUENCE CMD | EIU 3 | | | | 90007G | |
| | V41K1119XD | MPS E1 LH2 PREVLV (PV4) OP CMD A | PCA A1 | | | | 90007G | |
| | V41K1120XD | MPS E1 LH2 PREVLV (PV4) OP CMD B | LCA A1 | | | | 90007G | |
| | V41K1121XD | MPS E1 LH2 PREVLV (PV4) OP CMD C | LCA A2 | | | | 90007G | |
| | V41K1136XD | MPS E1 LO2 PREVLV (PV1) OP CMD A | PCA A1 | | | | 90007G | |
| | V41K1137XD | MPS E1 LO2 PREVLV (PV1) OP CMD B | LCA A1 | | | | 90007G | |
| | V41K1138XD | MPS E1 LO2 PREVLV (PV1) OP CMD C | LCA A2 | | | | 90007G | |
| | V41K1139XD | MPS E1 LO2 PREVLV (PV1) CL CMD A | PCA A1 | | | | 90007G | |
| | V41K1140XD | MPS E1 LO2 PREVLV (PV1) CL CMD B | LCA A1 | | | | 90007G | |
| | V41K1141XD | MPS E1 LO2 PREVLV (PV1) CL CMD C | LCA A2 | | | | 90007G | |
| | V41K1142XD | MPS E1 LO2 PREVLV (PV1) CL CMD D | HDWR | | | | 90007G | |
| | V41K1143XD | MPS E1 LO2 PREVLV (PV1) OP CMD D | HDWR | | | | 90007G | |
| | V41K1155XA | MPS E1 HE ISO VLV A (LV1) OP CMD | HDWR | | BD | | 90007G | |
| | V41K1156XA | MPS E1 HE ISO VLV B (LV2) OP CMD A | HDWR | | BD | | 90007G | |
| | V41K1157XA | MPS E1 HE ISO VLV B (LV2) OP CMD B | HDWR | | BD | | 90007G | |
| | V41K1168XB | MPS E1 HE INTCN OUT(LV60) OP CMD A | HDWR | | | | 90007G | |
| | V41K1219XD | MPS E2 LH2 PREVLV (PV5) OP CMD A | PCA A2 | | | | 90007G | |
| | V41K1220XD | MPS E2 LH2 PREVLV (PV5) OP CMD B | LCA A2 | | | | 90007G | |
| | V41K1221XD | MPS E2 LH2 PREVLV (PV5) OP CMD C | LCA A3 | | | | 90007G | |
| | V41K1236XD | MPS E2 LO2 PREVLV (PV2) OP CMD A | PCA A2 | | | | 90007G | |
| | V41K1237XD | MPS E2 LO2 PREVLV (PV2) OP CMD B | LCA A2 | | | | 90007G | |
| | V41K1238XD | MPS E2 LO2 PREVLV (PV2) OP CMD C | LCA A3 | | | | 90007G | |
| | V41K1239XD | MPS E2 LO2 PREVLV (PV2) CL CMD A | PCA A2 | | | | 90007G | |
| | V41K1240XD | MPS E2 LO2 PREVLV (PV2) CL CMD B | LCA A2 | | | | 90007G | |
| | V41K1241XD | MPS E2 LO2 PREVLV (PV2) CL CMD C | LCA A3 | | | | 90007G | |
| | V41K1242XD | MPS E2 LO2 PREVLV (PV2) CL CMD D | HDWR | | | | 90007G | |
| | V41K1243XD | MPS E2 LO2 PREVLV (PV2) OP CMD D | HDWR | | | | 90007G | |
| | V41K1255XA | MPS E2 HE ISO VLV A (LV3) OP CMD | HDWR | | | | 90007G | |
| | V41K1256XB | MPS E2 HE ISO VLV B (LV4) OP CMD A | HDWR | | | | 90007G | |
| | V41K1257XB | MPS E2 HE ISO VLV B (LV4) OP CMD B | HDWR | | | | 90007G | |
| | V41K1262XB | MPS E2 HE INTCN IN (LV61) OP CMD A | HDWR | | | | 90007G | |
| | V41K1263XB | MPS E2 HE INTCN IN (LV61) OP CMD B | HDWR | | | | 90007G | |
| | V41K1319XD | MPS E3 LH2 PREVLV (PV6) OP CMD A | PCA A3 | | | | 90007G | |
| | V41K1320XD | MPS E3 LH2 PREVLV (PV6) OP CMD B | LCA A3 | | | | 90007G | |
| | V41K1321XD | MPS E3 LH2 PREVLV (PV6) OP CMD C | LCA A1 | | | | 90007G | |
| | V41K1336XD | MPS E3 LO2 PREVLV (PV3) OP CMD A | PCA A3 | | | | 90007G | |
| | V41K1337XD | MPS E3 LO2 PREVLV (PV3) OP CMD B | LCA A3 | | | | 90007G | |
| | V41K1338XD | MPS E3 LO2 PREVLV (PV3) OP CMD C | LCA A1 | | | | 90007G | |
| | V41K1339XD | MPS E3 LO2 PREVLV (PV3) CL CMD A | PCA A3 | | | | 90007G | |
| | V41K1340XD | MPS E3 LO2 PREVLV (PV3) CL CMD B | LCA A3 | | | | 90007G | |
| | V41K1341XD | MPS E3 LO2 PREVLV (PV3) CL CMD C | LCA A1 | | | | 90007G | |

TABLE 4.3.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MAIN PROPULSION SYSTEM ENTRY DUMP SEQUENCER (G4.69)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------|----------|-----------------------------|-------------|-------|-----------|---------|---------|-------|
| V41K1342XD | MPS E3 | LO2 PREVLV (PV3) CL CMD D | HDWR | | | | 90007G | |
| V41K1343XD | MPS E3 | LO2 PREVLV (PV3) OP CMD D | HDWR | | | | 90007G | |
| V41K1355XA | MPS E3 | HE ISO VLV A (LV5) OP CMD | HDWR | | | | 90007G | |
| V41K1356XA | MPS E3 | HE ISO VLV B (LV6) OP CMD A | HDWR | | | | 90007G | |
| V41K1357XA | MPS E3 | HE ISO VLV B (LV6) OP CMD B | HDWR | | | | 90007G | |
| V41K1368XB | MPS E3 | HE INTCN OUT(LV64) OP CMD A | HDWR | | | | 90007G | |
| V41K1391XC | MPS LH2 | OTBD F/D VLV (PV11) OP CMD | LCA A2 | | | | 90007G | |
| V41K1393XC | MPS LH2 | OTBD F/D VLV (PV11) CL CMD | LCA A2 | | | | 90007G | |
| V41K1401XB | MPS LH2 | INBD F/D (PV12) OP CMD A | LCA A1 | | | | 90007G | |
| V41K1402XB | MPS LH2 | INBD F/D (PV12) OP CMD B | LCA A1 | | | | 90007G | |
| V41K1411XB | MPS LH2 | TOPPING VLV (PV13) OP CMD | LCA A1 | | | | 90007G | |
| V41K1412XB | MPS LH2 | INBD F/D (PV12) CL CMD | LCA A1 | | | | 90007G | |
| V41K1422XD | MPS LH2 | 4IN DISC VLV (PD3) CL CMD | HDWR | | BD | | 90007G | |
| V41K1435XB | MPS LH2 | MANF REPRSS 1(LV42) OP CMD | LCA A2 | | | | 90007G | |
| V41K1437XB | MPS LH2 | MANF REPRSS 2(LV43) OP CMD | LCA A2 | | | | 90007G | |
| V41K1501XB | MPS LO2 | INBD F/D (PV10) OP CMD A | LCA A2 | | | | 90007G | |
| V41K1502XB | MPS LO2 | INBD F/D (PV10) OP CMD B | LCA A2 | | | | 90007G | |
| V41K1512XB | MPS LO2 | INBD F/D VLV (PV10) CL CMD | LCA A2 | | | | 90007G | |
| V41K1515XC | MPS LO2 | OTBD F/D VLV (PV9) CL CMD | LCA A3 | | | | 90007G | |
| V41K1518XC | MPS LO2 | OTBD F/D VLV (PV9) OP CMD | LCA A3 | | | | 90007G | |
| V41K1535XB | MPS LO2 | MANF REPRSS 1(LV40) OP CMD | LCA A3 | | | | 90007G | |
| V41K1537XB | MPS LO2 | MANF REPRSS 2(LV41) OP CMD | LCA A3 | | | | 90007G | |
| V41K1584XC | MPS LO2 | OVBD B/V (PV19) CL CMD A | PCA A3 | | | | 90007G | |
| V41K1585XC | MPS LO2 | OVBD B/V (PV19) CL CMD B | LCA A3 | | | | 90007G | |
| V41K1586XC | MPS LO | OVBD B/V (PV19) CL CMD C | LCA A2 | | | | 90007G | |
| V41K1607XB | MPS PNEU | HE ISO VLV 1 (LV7) OP CMD | HDWR | | | | 90007G | |
| V41K1608XB | MPS PNEU | HE ISO VLV 2 (LV8) OP CMD | HDWR | | | | 90007G | |
| V41K1613XC | MPS REG | HE XOVER VLV (LV10) OP CMD | HDWR | | | | 90007G | |
| V41K1631XB | MPS HE | SPLY BLWDWN 1 (LV26) OP CMD | HDWR | | | | 90007G | |
| V41K1633XB | MPS HE | SPLY BLWDWN 2 (LV27) OP CMD | HDWR | | | | 90007G | |
| V41K1700XA | REPLACE | LH2 ULL PRESS XDCR 1 CMD | LCA A1 | | BD | | 90007G | |
| V41K1701XA | REPLACE | LH2 ULL PRESS XDCR 2 CMD | LCA A2 | | BD | | 90007G | |
| V41K1702XA | REPLACE | LH2 ULL PRESS XDCR 3 CMD | LCA A3 | | BD | | 90007G | |
| V41K1750XA | REPLACE | LO2 ULL PRESS XDCR 1 CMD | LCA A1 | | BD | | 90007G | |
| V41K1751XA | REPLACE | LO2 ULL PRESS XDCR 2 CMD | LCA A2 | | BD | | 90007G | |
| V41K1752XA | REPLACE | LO2 ULL PRESS XDCR 3 CMD | LCA A3 | | BD | | 90007G | |
| V41K1905XA | MPS LH2 | RTLS REPRS 1(LV74)OP CMD A | PCA A3 | | BD | | 90007G | |
| V41K1906XA | MPS LH2 | RTLS REPRS 2(LV75)OP CMD A | PCA A3 | | BD | | 90007G | |
| V41K1907XA | MPS LH2 | RTLS REPRS 1(LV74)OP CMD B | PCA A1 | | BD | | 90007G | |
| V41K1908XA | MPS LH2 | RTLS REPRS 2(LV75)OP CMD B | PCA A1 | | BD | | 90007G | |
| V41K1909XA | MPS LH2 | RTLS REPRS 1(LV74)OP CMD C | LCA A1 | | BD | | 90007G | |
| V41K1910XA | MPS LH2 | RTLS REPRS 2(LV75)OP CMD C | LCA A1 | | BD | | 90007G | |
| V41K1913XC | MPS LH2 | RTLS OTBD DV(PV18)OP CMD A | HDWR | | | | 90007G | |
| V41K1914XC | MPS LH2 | RTLS OTBD DV(PV18)OP CMD B | HDWR | | | | 90007G | |
| V41K1915XC | MPS LH2 | RTLS OTBD DV(PV18)OP CMD C | HDWR | | | | 90007G | |
| V41K1923XC | MPS LH2 | RTLS INBD DV(PV17)OP CMD A | HDWR | | | | 90007G | |

TABLE 4.3.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MAIN PROPULSION SYSTEM ENTRY DUMP SEQUENCER (G4.69)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|-------------|-------|--------------|------------------|---------|-------------|
| | V41K1924XC | MPS LH2 RTLS INBD DV(PV17)OP CMD B | HDWR | | | | 90007G | |
| | V41K1925XC | MPS LH2 RTLS INBD DV(PV17)OP CMD C | HDWR | | | | 90007G | |
| | V56K0000XD | ET/ORB SEP CAMERAS ON CMD | HDWR | | | | 92902 | |
| | V56K0010XC | ET/ORB SEP CAMERAS-HTR/PWR ON CMD | HDWR | | | | 92902 | |

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 4.3.3.4-3. MAIN PROPULSION SYSTEM ENTRY DUMP SEQUENCER (G4.69) 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 4.3.3.4-4. MAIN PROPULSION SYSTEM ENTRY DUMP SEQUENCER (G4.69) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--------------------------|-----------|----|-------------|-------------|----|--------|---|----------------|---------|-------------|
| HE_PURGE_TIME | V96U8959C | 00 | +6.50 | E+02 SEC | F | D | C | G4.69 G4.70 | 90007G | |
| HE_PURGE_VEL | V96U8958C | 00 | +5.3 | E+03 FT/SEC | F | S | C | G4.69 G4.70 | 90007G | |

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

TABLE 4.3.3.4-5. MAIN PROPULSION SYSTEM ENTRY DUMP SEQUENCER (G4.69) 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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4.4 MECHANICAL SYSTEMS

4.4.1 Vent Doors (4.161)

4.4.1.1 Introduction

The orbiter's vent and purge system is made up of 14 active doors and is divided into the following five groups: left and right doors 1 and 2, left and right doors 3, left and right doors 5, left and right doors 6, and left and right doors 8 and 9.

All vent doors have a purge position with the exception of left and right vents 3 and 5.

The purge position is required to maintain a positive pressure in the orbiter's payload bay area to prevent contamination and to vent any residue gases in the orbiter and for overall vehicle thermal control during ground turnaround phase. During the ascent and entry phases, the active vent doors are open to vent/repressurize the orbiter to preclude damaging pressures across the structure. On orbit, the vent doors remain open to permit molecular venting of the vehicle cavities and insulation blankets to achieve the required low internal blanket pressure.

Operation of the vent system is controlled exclusively through software.

4.4.1.2 Overview

The sequencing of the active vent doors is by the software program in the redundant set computer. The doors are cycled to the open or close position as required in each mission phase. Positioning of the active doors is performed by the software either automatically or manually initiated by the crew.

The automatic functions provided by the PASS software are as follows:

During the countdown, upon receipt of a cue from the Redundant Set Launch Sequencer (RSLs), this sequence will open all doors for launch. The status of all of the vent doors position will be output to the RSLs to determine that the doors have achieved the desired open positions. If during the pre-SRB ignition phase a launch abort has occurred, the vent door system will be reconfigured to the prelaunch configuration by the LPS.

In an RTLS abort upon entering MM 602 or in a TAL abort at ET SEP commanded or during a nominal entry at the MM 304 transition, the vent doors are commanded to the closed position to prevent ingestion of propellant during the propellant dump and to prevent thermal damage to the vehicle interior during the high heat regime. In MM 304, MM 305, MM 602, or MM 603 the vent doors are reopened when a predetermined ground relative velocity has been attained.

The manual functions provided by the PASS software are as follows:

All manual functions are performed through the Override display, SPEC 51, using item 43 (vent open) and item 44 (vent close) to command the doors. When a command is entered, an asterisk indicating the current commanded position of the vent doors will be displayed on the Override display. When an open/close operation is completed, the respective character string "OP" or "CL" will be displayed beside the asterisk. These character strings will be blanked out while an operation is in progress. If a manual open/close operation is requested while another operation is in progress (either manual or automatic) an "ILLEGAL ENTRY" message will be displayed.

If a manual operation is requested, the VENT DOOR SEQ INIT flag is set by the MSC and initiates the manual open or close operations in the Vent Door Sequence. An asterisk (*) will be driven next to the item 43 (OPEN) or 44 (CLOSE) after it is commanded from the keyboard entry or by the automatic Vent Door Sequence to indicate that the command is in progress. After completion of the open or close vent door process, the “OP” or “CL” string will be displayed after item 43 (OPEN) or 44 (CLOSE).

Manual open commands are legal during OPS 3, MM 602, and MM 603. Manual close commands are legal during MM 301, MM 302, MM 303, MM 304, MM 602, and during MM 305 or MM 603 after the rollout flag has been set. Execution of these item entries in any other mode will result in an “ILLEGAL ENTRY” CRT message. The crew has the ability to either open or close all of the vent doors via the Override display items 43 (OPEN) or 44 (CLOSE) entries with the exception of the following cases:

- A manual close (item 44) performed in MM 301 will result in all vent doors being closed; subsequently, vent door groups 1 and 6 on the left side will be automatically reopened. In this case the asterisk indicates that the command has been sent and the “CL” string driven next to the item entry indicates the completion of the closed vent doors configuration for MM 301.
- A manual open (item 43) performed in MM 304 will result in vent door groups 1 and 6 of the left side being open and all the other vent door groups remaining closed. In this case the asterisk indicates that the command has been sent and the “OP” string driven next to the item entry indicates the completion of the open vent doors configuration for MM 304.

The sequence will also perform an automatic closure of the ET umbilical doors upon entering MM 304 if a TAL abort has been declared.

Termination of commands after performing any specific vent door activity will place both A and B SET commands equal to false. For open commands, the A and B RESET command will be set equal to true, and then the A RESET command will be set equal to false and the B RESET command will remain equal to true. For termination following closure, the A and B RESET commands will be set first to true, then to the values specified in Table 4.4-1. These configurations define the dormant state of the active vent system functional software sequence. RTC mode can only be used to control individual vent doors on orbit.

4.4.1.3 Detail Requirements

This sequence controls the operation of the doors based on mission times and mission events.

Tables 4.4-1 and 4.4-2 list the commands to position the vent doors to a closed and open position.

Table 4.4-3 lists the purge 1 and 2 commands for vent group 5.

Tables 4.4-4 and 4.4-5 list the feedback signals of the vent doors closed and open configurations. Although the vent control sequence was deleted from OPS-2 after OFT-1, the parameters listed in Tables 4.4-4 and 4.4-5 are required to support telemetry requirements in MC 1, 2, and 3 for all missions.

For times that are greater than six times the process execution time (reciprocal of the execution cycle), the accuracy shall be ± 1 execution time; otherwise, the accuracy shall be +1, -0 execution times.

Once an open or close sequence starts, it must be completed prior to starting another open or close sequence.

Step 1. This step determines if the vent doors are to be configured for launch.

The following signals are monitored:

- | | | |
|-----|------------------------------------|-----------|
| (a) | CONFIGURE VENT DOOR FOR LAUNCH CMD | V90X8375X |
| (b) | MISSION ELAPSED TIME | V91W1990C |

If (b) < 0.00 sec, monitor (a) above; otherwise proceed to Step 2.

If (a) is true, set the group 5 (vent 6) purge 1 and purge 2 A RESET CMDS equal to false (see Table 4.4–3), and proceed to Step 9; otherwise, return to Step 1.

Step 2. This step determines if the vent doors are to be automatically closed for an RTLS or TAL abort.

The following signals are monitored:

- | | | |
|-----|----------------------------------|-----------|
| (a) | MISSION ELAPSED TIME | V91W1990C |
| (b) | MAJOR MODE 602 FLAG | V90X8174X |
| (c) | ET SEPARATION CMD FLAG | V90X8250X |
| (d) | TAL ABORT DECLARED | V90X8658X |
| (e) | GND REL VEL MAGNITUDE IN M50 SYS | V95L0151C |
| (f) | GROUND_REL_VEL_THRESHOLD | V97U9806C |

If (a) > 100 sec and [(b) is true, or if (c) and (d) are both true], one time only set (1) equal to 0.48 sec and proceed to the next if statement; otherwise proceed to Step 2A.

If (e) > (f), proceed to Step 8. Otherwise, proceed to Step 2A.

- | | | |
|-----|----------------------|-----------|
| (1) | VENT_CMDS_TIME_DELAY | V97U9859C |
|-----|----------------------|-----------|

Step 2a. This step checks for MM 304 and upon entry, if a TAL abort has been declared, provides for the automatic closure of the ET umbilical doors.

Monitor the following signals:

- | | | |
|-----|---------------------|-----------|
| (a) | MAJOR MODE 304 FLAG | V90X8161X |
| (b) | TAL ABORT DECLARED | V90X8658X |

If (a) or (b) is false, proceed to Step 5.

If (a) and (b) are both true, on first pass, start an ET umbilical door timer and set (1) through (8) below true, and proceed to Step 5. On subsequent passes, proceed to the next if statement.

If 66 seconds have elapsed since the ET umbilical door timer was started, on first pass, set (9) through (11) and (17) through (24) false, and proceed to Step 5. On subsequent passes, proceed to Step 5. Otherwise, proceed to the next if statement.

If 54 seconds have elapsed since the ET umbilical door timer was started, on first pass, set (12) through (16) false, (17) through (24) true, and proceed to Step 5. On subsequent passes, proceed to Step 5. Otherwise, proceed to the next if statement.

If 12 seconds have elapsed since the ET umbilical door timer was started, on first pass, set (1) through (8) false and proceed to Step 5. Otherwise, proceed to the next if statement.

If 6 seconds have elapsed since the ET umbilical door timer was started, on first pass, set (9) through (16) true and proceed to Step 5. On subsequent passes, proceed to Step 5. Otherwise, proceed to Step 5.

| | | |
|------|------------------------------------|-----------|
| (1) | ET DR C/L LCH 1A1/2A2 FA1 STOW CMD | V56K1271X |
| (2) | ET DR C/L LCH 1A2/2A1 FA1 STOW CMD | V56K1272X |
| (3) | ET DR C/L LCH 1A1/2B2 FA2 STOW CMD | V56K1273X |
| (4) | ET DR C/L LCH 1B2/2B1 FA2 STOW CMD | V56K1274X |
| (5) | ET DR C/L LCH 1B1/2A2 FA4 STOW CMD | V56K1371X |
| (6) | ET DR C/L LCH 1A2/2B1 FA4 STOW CMD | V56K1372X |
| (7) | ET DR C/L LCH 1B1/2B2 FA3 STOW CMD | V56K1373X |
| (8) | ET DR C/L LCH 1B2/2A1 FA3 STOW CMD | V56K1374X |
| (9) | ET DR DRV & CL LCH DC ARM AMCA 1/2 | V56K0141X |
| (10) | ET DR DRV & CL LCH DC ARM AMCA 1/3 | V56K0142X |
| (11) | ET DR DRV & CL LCH DC ARM AMCA 2/3 | V56K0143X |
| (12) | ET UMB DR L-B2/R-B1 CLOSE CMD | V56K3111X |
| (13) | ET UMB DR R-B2 CLOSE CMD | V56K3112X |
| (14) | ET UMB DR R-B1/B2 CLOSE CMD | V56K4121X |
| (15) | ET UMB DR L-B1 CLOSE CMD | V56K4122X |
| (16) | ET UMB DR L-B1/B2 CLOSE CMD | V56K0140X |
| (17) | ET L UMB COUT DOOR LATCH FA1 CMD | V56K3531X |
| (18) | ET R UMB COUT DOOR LATCH FA1 CMD | V56K3532X |
| (19) | ET L UMB COUT DOOR LATCH FA4 CMD | V56K3533X |
| (20) | ET R UMB COUT DOOR LATCH FA4 CMD | V56K3534X |
| (21) | ET L UMB COUT DOOR LATCH FA3 CMD | V56K4531X |
| (22) | ET R UMB COUT DOOR LATCH FA3 CMD | V56K4532X |
| (23) | ET L UMB COUT DOOR LATCH FA2 CMD | V56K4533X |
| (24) | ET R UMB COUT DOOR LATCH FA2 CMD | V56K4534X |

Step 3. Deleted.

Step 4. Deleted.

Step 5. This step determines if left vent groups 1 and 6 are to be opened in response to an open command during MM 304 and provides auto closure capability for all vent doors upon transition into MM 304.

The following signals are monitored:

| | | |
|-----|------------------------------|------------|
| (a) | ALL VENT CLOSE CMD | V93X7201X |
| (b) | MAJOR MODE 304 FLAG | V90X8161X |
| (c) | VENT DOOR SEQUENCE INIT | V95X0235X |
| (d) | LEFT VENTS 1 AND 6 OPEN FLAG | (INTERNAL) |

If (b) is true and (c) and (d) are false, proceed to Step 8.

If (b) and (c) are true and (a) is false, set (1) = 0, then issue the following groups of commands, maintaining the commands to each group for 10 seconds. Then set A and B OPEN SET

CMDS = false and A and B OPEN RESET CMDS = true. Then, three minor cycles later, set A OPEN RESET CMDS = false. Set (d) = true, set (1) = 1 and proceed to Step 6.

Table 4.4-2, Group 1 left vents
Table 4.4-2, Group 6 left vents

If none of the above conditions are met, proceed to Step 6.

(1) VENT CONFIGURATION V93J1601C

Step 6. This step initiates the automatic vent door opening in MM 304, MM 305, MM 602, or MM 603 when the vehicle reaches a predetermined velocity.

The following signals are monitored:

| | | |
|-----|----------------------------------|-----------|
| (a) | GND REL VEL MAGNITUDE IN M50 SYS | V95L0151C |
| (b) | MAJOR MODE 304 FLAG | V90X8161X |
| (c) | MAJOR MODE 602 FLAG | V90X8174X |
| (d) | MAJOR MODE 305 FLAG | V90X8162X |
| (e) | MAJOR MODE 603 FLAG | V90X8122X |
| (f) | GROUND_REL_VEL_THRESHOLD | V97U9806C |
| (g) | VENT DOOR SEQ INIT | V95X0235X |

If (a) \leq (f) and [(b) or (c) or (d) or (e)] is true and (g) is false, proceed to Step 9; otherwise proceed to Step 7.

Step 7. This step provides manual control of vent door operations during OPS 3.

The following signals are monitored:

| | | |
|-----|---------------------|-----------|
| (a) | ALL VENT CLOSE CMD | V93X7201X |
| (b) | MAJOR MODE 304 FLAG | V90X8161X |
| (c) | VENT DOOR SEQ INIT | V95X0235X |
| (d) | VENT CONFIGURATION | V93J1601C |

If (c) is true and (a) and (b) are false, proceed to Step 9.

If (a) and (c) are true, proceed to Step 8.

If (c) is false, (a) is true, and (d) = 0 proceed to Step 8. Otherwise return to Step 1.

Step 8. This step initiates the vent door close activities. On first entry into this step, using (a) below, do the following:

(a) VENT_CMDS_TIME_DELAY V97U9859C

On first pass set (1) below true, set (2) = 0 and then issue the following groups of commands at intervals of (a) seconds, maintaining the commands to each group for 10 seconds. Then set the A and B CLOSE SET CMDS equal to false, and A and B CLOSE RESET CMDS equal to true. Then, three minor cycles later, set the A CLOSE RESET CMD equal to Table 4.4-1 DORMANT STATE before proceeding.

Table 4.4-1, Group 1
Table 4.4-1, Group 2
Table 4.4-1, Group 3
Table 4.4-1, Group 5
Table 4.4-1, Group 6

Then monitor for (b) below:

- (b) MM 301 FLAG V90X8183X

If (b) is true, then issue open commands to the following groups of doors, maintaining commands to each group for 10 seconds. Then set A and B OPEN SET CMDS equal to false and A and B OPEN RESET CMDS equal to true. Then, three minor cycles later, set A OPEN RESET CMDS equal to false, set (2) = 2 and return to Step 1.

Table 4.4-2, Group 1 left vents
Table 4.4-2, Group 6 left vents

If (b) is false, set (2) = 2 and return to Step 1.

- (1) ALL VENT CLOSE CMD V93X7201X
(2) VENT CONFIGURATION V93J1601C

Step 9. This step initiates the vent door open activities. On first entry into this step, using (a) below, do the following:

- (a) VENT_CMDS_TIME_DELAY V97U9859C

On first pass set (1) below false, set (2) = 0 and then issue the following groups of commands at intervals of (a) seconds, maintaining the commands to each group for 10 seconds. Then set the A and B OPEN SET CMDS equal to false and A and B OPEN RESET CMDS equal to true. Then, three minor cycles later, set A OPEN RESET CMDS equal to false before proceeding.

Table 4.4-2, Group 2
Table 4.4-2, Group 5
Table 4.4-2, Group 3
Table 4.4-2, Group 1
Table 4.4-2, Group 6

On the first pass, initialize the status word (b) below to all zeros, and for 6.4 seconds after issuing the Group 6 command above, monitor the corresponding parameters in Table 4.4-5 for status word updates. For each vent door (L,R), the status shall be set true if either one of the dual redundant status discrettes is true; otherwise, the status shall be set false. If any of the commfaults (c) through (j) below occur, use the latest noncommfaulted values for subsequent status word update.

- (b) ORBITER VENT DOOR STATUS WORD 1 V90J8201C
(c) FF1 INPUT PROM SEG 2, 6 STATUS (HFE) V91X2288X
(d) FF2 INPUT PROM SEG 2, 6 STATUS (HFE) V91X2289X

- (e) FF3 INPUT PROM SEG 2, 6 STATUS (HFE) V91X2290X
- (f) FF4 INPUT PROM SEG 2, 6 STATUS (HFE) V91X2291X
- (g) FA1 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2845X
- (h) FA2 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2846X
- (i) FA3 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2847X
- (j) FA4 INPUT PROM SEG 3, 10 STATUS (HFE) V91X2848X

When all commands have been issued, set (2) = 1 and return to Step 1.

- (1) ALL VENT CLOSE CMD V93X7201X
- (2) VENT CONFIGURATION V93J1601C

Table 4.4-1. Vent Group Close Commands

| | | RESET DORMANT STATE | | | |
|--------------|---|---------------------------|---|-------------|------------------|
| Vent Group 1 | a | V59K3000X | 0 | L FWD VENTS | 1&2 CLOSE CMD 1A |
| Left & Right | b | V59K3001X | 1 | L FWD VENTS | 1&2 CLOSE CMD 1B |
| Fwd Vent | c | V59K3010X | 0 | L FWD VENTS | 1&2 CLOSE CMD 2A |
| Port 1 & 2 | d | V59K3011X | 1 | L FWD VENTS | 1&2 CLOSE CMD 2B |
| | e | V59K4000X | 0 | R FWD VENTS | 1&2 CLOSE CMD 1A |
| | f | V59K4001X | 0 | R FWD VENTS | 1&2 CLOSE CMD 1B |
| | g | V59K4010X | 1 | R FWD VENTS | 1&2 CLOSE CMD 2A |
| | h | V59K4011X | 1 | R FWD VENTS | 1&2 CLOSE CMD 2B |
| Vent Group 2 | a | V59K3200X | 0 | L PB VENT | 3 CLOSE CMD 1A |
| Left & Right | b | V59K3201X | 1 | L PB VENT | 3 CLOSE CMD 1B |
| Mid Fus Vent | c | V59K3210X | 0 | L PB VENT | 3 CLOSE CMD 2A |
| Port 3 | d | V59K3211X | 1 | L PB VENT | 3 CLOSE CMD 2B |
| | e | V59K4200X | 0 | R PB VENT | 3 CLOSE CMD 1A |
| | f | V59K4201X | 0 | R PB VENT | 3 CLOSE CMD 1B |
| | g | V59K4210X | 1 | R PB VENT | 3 CLOSE CMD 2A |
| | h | V59K4211X | 1 | R PB VENT | 3 CLOSE CMD 2B |
| Vent Group 3 | a | V59K3400X | 1 | L PB VENT | 5 CLOSE CMD 1A |
| Left & Right | b | V59K3401X | 1 | L PB VENT | 5 CLOSE CMD 1B |
| Mid Fus Vent | c | V59K3410X | 1 | L PB VENT | 5 CLOSE CMD 2A |
| Port 5 | d | V59K3411X | 1 | L PB VENT | 5 CLOSE CMD 2B |
| | e | V59K4400X | 0 | R PB VENT | 5 CLOSE CMD 1A |
| | f | V59K4401X | 0 | R PB VENT | 5 CLOSE CMD 1B |

| Table 4.4-1. Vent Group Close Commands | | | | |
|--|---|---------------------------|---|------------------------------|
| | | RESET DORMANT STATE | | |
| | g | V59K4410X | 0 | R PB VENT 5 CLOSE CMD 2A |
| | h | V59K4411X | 0 | R PB VENT 5 CLOSE CMD 2B |
| Vent Group 5 | a | V59K3500X | 0 | L PB VENT 6 CLOSE CMD 1A |
| Left & Right | b | V59K3501X | 0 | L PB VENT 6 CLOSE CMD 1B |
| Aft Pld Vent | c | V59K3510X | 0 | L PB VENT 6 CLOSE CMD 2A |
| Port 6 | d | V59K3511X | 1 | L PB VENT 6 CLOSE CMD 2B |
| | e | V59K4500X | 1 | R PB VENT 6 CLOSE CMD 1A |
| | f | V59K4501X | 1 | R PB VENT 6 CLOSE CMD 1B |
| | g | V59K4510X | 0 | R PB VENT 6 CLOSE CMD 2A |
| | h | V59K4511X | 1 | R PB VENT 6 CLOSE CMD 2B |
| Vent Group 6 | a | V59K3800X | 0 | L AFT VENTS 8&9 CLOSE CMD 1A |
| Left & Right | b | V59K3801X | 1 | L AFT VENTS 8&9 CLOSE CMD 1B |
| Aft Vent | c | V59K3810X | 0 | L AFT VENTS 8&9 CLOSE CMD 2A |
| Port 8 & 9 | d | V59K3811X | 1 | L AFT VENTS 8&9 CLOSE CMD 2B |
| | e | V59K4800X | 1 | R AFT VENTS 8&9 CLOSE CMD 1A |
| | f | V59K4801X | 1 | R AFT VENTS 8&9 CLOSE CMD 1B |
| | g | V59K4810X | 0 | R AFT VENTS 8&9 CLOSE CMD 2A |
| | h | V59K4811X | 0 | R AFT VENTS 8&9 CLOSE CMD 2B |

| Table 4.4-2. Vent Group Open Commands | | | | |
|---------------------------------------|---|-----------|--|-----------------------------|
| Vent Group 1 | a | V59K3050X | | L FWD VENTS 1&2 OPEN CMD 1A |
| Left & Right | b | V59K3051X | | L FWD VENTS 1&2 OPEN CMD 1B |
| Fwd Vent | c | V59K3060X | | L FWD VENTS 1&2 OPEN CMD 2A |
| Port 1 & 2 | d | V59K3061X | | L FWD VENTS 1&2 OPEN CMD 2B |
| | e | V59K4050X | | R FWD VENTS 1&2 OPEN CMD 1A |
| | f | V59K4051X | | R FWD VENTS 1&2 OPEN CMD 1B |
| | g | V59K4060X | | R FWD VENTS 1&2 OPEN CMD 2A |
| | h | V59K4061X | | R FWD VENTS 1&2 OPEN CMD 2B |
| Vent Group 2 | a | V59K3250X | | L PB VENT 3 OPEN CMD 1A |
| Left & Right | b | V59K3251X | | L PB VENT 3 OPEN CMD 1B |

Table 4.4-2. Vent Group Open Commands

| | | | |
|--|---|-----------|-----------------------------|
| Mid Fus Vent Port 3 | c | V59K3260X | L PB VENT 3 OPEN CMD 2A |
| | d | V59K3261X | L PB VENT 3 OPEN CMD 2B |
| | e | V59K4250X | R PB VENT 3 OPEN CMD 1A |
| | f | V59K4251X | R PB VENT 3 OPEN CMD 1B |
| | g | V59K4260X | R PB VENT 3 OPEN CMD 2A |
| | h | V59K4261X | R PB VENT 3 OPEN CMD 2B |
| Vent Group 3 Left & Right Mid Fus Vent Port 5 | a | V59K3450X | L PB VENT 5 OPEN CMD 1A |
| | b | V59K3451X | L PB VENT 5 OPEN CMD 1B |
| | c | V59K3460X | L PB VENT 5 OPEN CMD 2A |
| | d | V59K3461X | L PB VENT 5 OPEN CMD 2B |
| | e | V59K4450X | R PB VENT 5 OPEN CMD 1A |
| | f | V59K4451X | R PB VENT 5 OPEN CMD 1B |
| | g | V59K4460X | R PB VENT 5 OPEN CMD 2A |
| | h | V59K4461X | R PB VENT 5 OPEN CMD 2B |
| Vent Group 5 Left & Right Aft Pld Vent Port 6 | a | V59K3550X | L PB VENT 6 OPEN CMD 1A |
| | b | V59K3551X | L PB VENT 6 OPEN CMD 1B |
| | c | V59K3560X | L PB VENT 6 OPEN CMD 2A |
| | d | V59K3561X | L PB VENT 6 OPEN CMD 2B |
| | e | V59K4550X | R PB VENT 6 OPEN CMD 1A |
| | f | V59K4551X | R PB VENT 6 OPEN CMD 1B |
| | g | V59K4560X | R PB VENT 6 OPEN CMD 2A |
| | h | V59K4561X | R PB VENT 6 OPEN CMD 2B |
| Vent Group 6 Left & Right Aft Vent Port 8 & 9 | a | V59K3850X | L AFT VENTS 8&9 OPEN CMD 1A |
| | b | V59K3851X | L AFT VENTS 8&9 OPEN CMD 1B |
| | c | V59K3860X | L AFT VENTS 8&9 OPEN CMD 2A |
| | d | V59K3861X | L AFT VENTS 8&9 OPEN CMD 2B |
| | e | V59K4850X | R AFT VENTS 8&9 OPEN CMD 1A |
| | f | V59K4851X | R AFT VENTS 8&9 OPEN CMD 1B |
| | g | V59K4860X | R AFT VENTS 8&9 OPEN CMD 2A |
| | h | V59K4861X | R AFT VENTS 8&9 OPEN CMD 2B |

| Table 4.4-3. Vent Group Purge Configuration Commands | | | |
|--|---|-----------|---------------------------|
| Vent Group 5 | a | V59K3600X | LPB VENT 6 PURGE 1 CMD 1A |
| Left & Right | b | V59K3700X | LPB VENT 6 PURGE 2 CMD 1A |
| Purge 1 and 2 | c | V59K4610X | RPB VENT 6 PURGE 1 CMD 2A |
| Port 6 | d | V59K4710X | RPB VENT 6 PURGE 2 CMD 2A |
| | e | V59K4600X | RPB VENT 6 PURGE 1 CMD 1A |
| | f | V59K4700X | RPB VENT 6 PURGE 2 CMD 1A |
| | g | V59K3610X | LPB VENT 6 PURGE 1 CMD 2A |
| | h | V59K3710X | LPB VENT 6 PURGE 2 CMD 2A |

| Table 4.4-4. Vent Group Close Measurements | | | |
|--|---|-----------|--------------------------|
| Vent Group 1 | a | V59X3005X | L FWD VENTS 1&2 CLOSED 1 |
| Left & Right | b | V59X3015X | L FWD VENTS 1&2 CLOSED 2 |
| Fwd Vent | c | V59X4005X | R FWD VENTS 1&2 CLOSED 1 |
| Port 1 & 2 | d | V59X4015X | R FWD VENTS 1&2 CLOSED 2 |
| Vent Group 2 | a | V59X3205X | L PB VENT 3 CLOSED 1 |
| Left & Right | b | V59X3215X | L PB VENT 3 CLOSED 2 |
| Mid Fus Vent | c | V59X4205X | R PB VENT 3 CLOSED 1 |
| Port 3 | d | V59X4215X | R PB VENT 3 CLOSED 2 |
| Vent Group 3 | a | V59X3405X | L PB VENT 5 CLOSED 1 |
| Left & Right | b | V59X3415X | L PB VENT 5 CLOSED 2 |
| Mid Fus Vent | c | V59X4405X | R PB VENT 5 CLOSED 1 |
| Port 5 | d | V59X4415X | R PB VENT 5 CLOSED 2 |
| Vent Group 5 | a | V59X3505X | L PB VENT 6 CLOSED 1 |
| Left & Right | b | V59X3515X | L PB VENT 6 CLOSED 2 |
| Aft Pld Vent | c | V59X4505X | R PB VENT 6 CLOSED 1 |
| Port 6 | d | V59X4515X | R PB VENT 6 CLOSED 2 |
| Vent Group 6 | a | V59X3805X | L AFT VENTS 8&9 CLOSED 1 |
| Left & Right | b | V59X3815X | L AFT VENTS 8&9 CLOSED 2 |
| Aft Vent | c | V59X4805X | R AFT VENTS 8&9 CLOSED 1 |
| Port 8 & 9 | d | V59X4815X | R AFT VENTS 8&9 CLOSED 2 |

| | | | |
|-------------------|---|-----------|------------------------|
| Vent Group 1 | a | V59X3055X | L FWD VENTS 1&2 OPEN 1 |
| Left and Right | b | V59X3065X | L FWD VENTS 1&2 OPEN 2 |
| Forward Vent | c | V59X4055X | L FWD VENTS 1&2 OPEN 1 |
| Ports 1 and 2 | d | V59X4065X | L FWD VENTS 1&2 OPEN 2 |
| Vent Group 2 | a | V59X3255X | L PB VENT 3 OPEN 1 |
| Left and Right | b | V59X3265X | L PB VENT 3 OPEN 2 |
| Mid Fuselage Vent | c | V59X4255X | R PB VENT 3 OPEN 1 |
| Port 3 | d | V59X4265X | R PB VENT 3 OPEN 2 |
| Vent Group 3 | a | V59X3455X | L PB VENT 5 OPEN 1 |
| Left and Right | b | V59X3465X | L PB VENT 5 OPEN 2 |
| Mid Fuselage Vent | c | V59X4455X | R PB VENT 5 OPEN 1 |
| Port 5 | d | V59X4465X | R PB VENT 5 OPEN 2 |
| Vent Group 5 | a | V59X3555X | L PB VENT 6 OPEN 1 |
| Left and Right | b | V59X3565X | L PB VENT 6 OPEN 2 |
| Aft Payload Vent | c | V59X4555X | L PB VENT 6 OPEN 1 |
| Port 6 | d | V59X4565X | L PB VENT 6 OPEN 2 |
| Vent Group 6 | a | V59X3855X | L AFT VENTS 8&9 OPEN 1 |
| Left and Right | b | V59X3865X | L AFT VENTS 8&9 OPEN 2 |
| Aft Vent | c | V59X4855X | R AFT VENTS 8&9 OPEN 1 |
| Ports 8 and 9 | d | V59X4865X | R AFT VENTS 8&9 OPEN 2 |

4.4.1.4 Constraints and Assumptions

The software will not protect against requesting an OPS transition while the vent door sequence is in progress. The sequence may not properly compute the time delays for the issuing and terminating of commands if an OPS transition to OPS 0 and back to the original OPS is requested while a vent door open or close sequence is in progress.

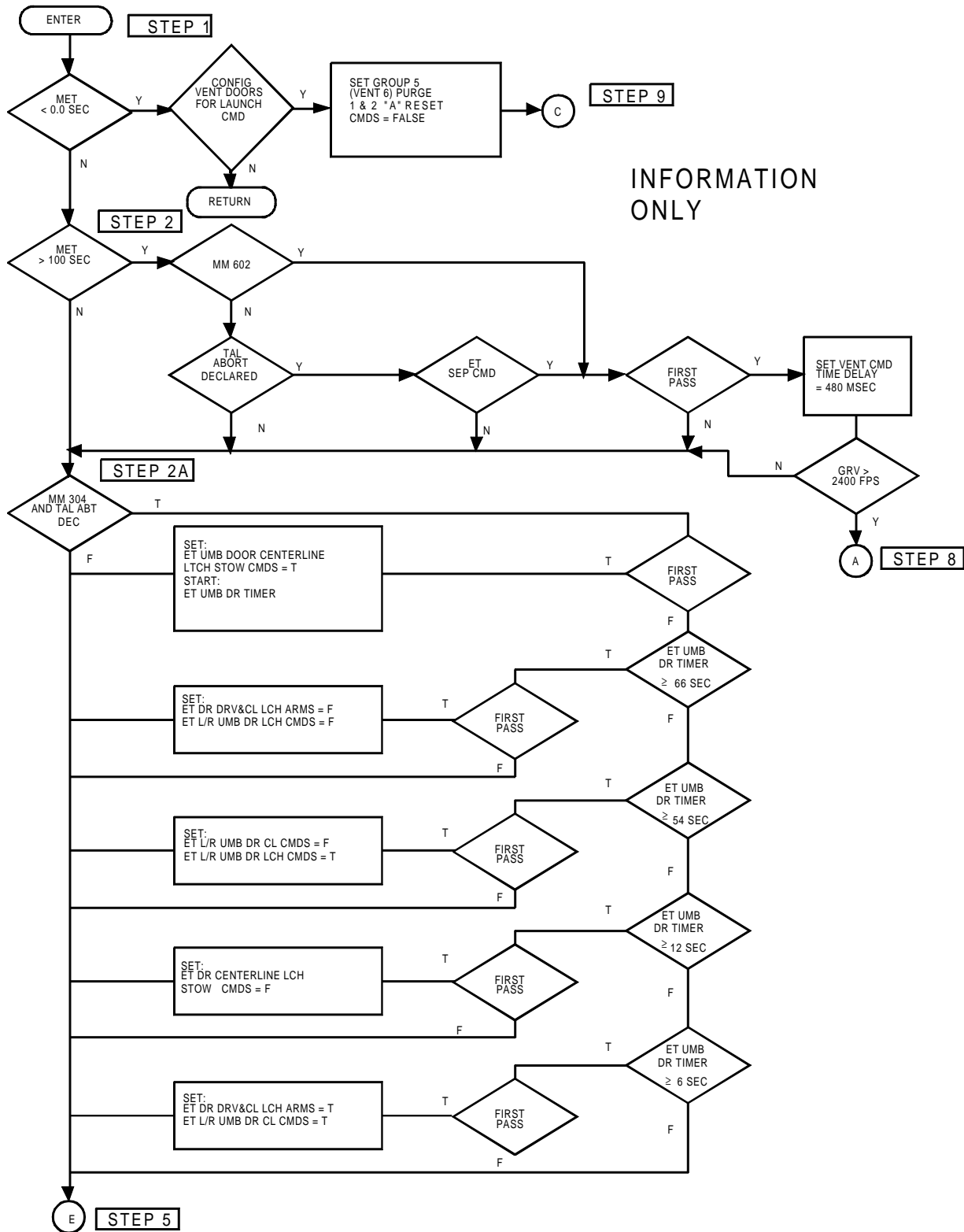
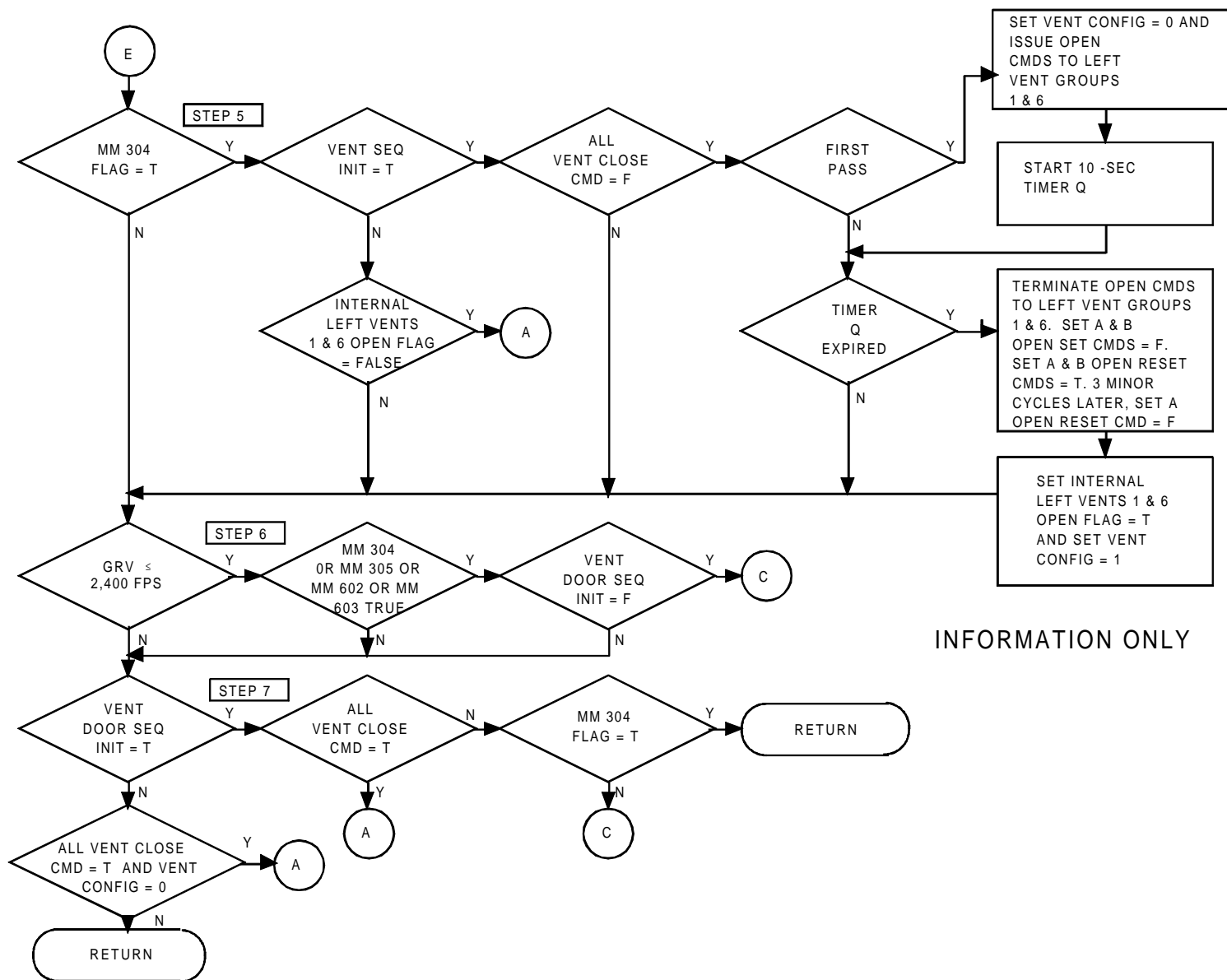


FIGURE 4.161.(1) Vent Door Sequence (Sheet 1 of 6)



INFORMATION ONLY

FIGURE 4.161.(2) Vent Door Sequence (Sheet 2 of 6)

INFORMATION ONLY

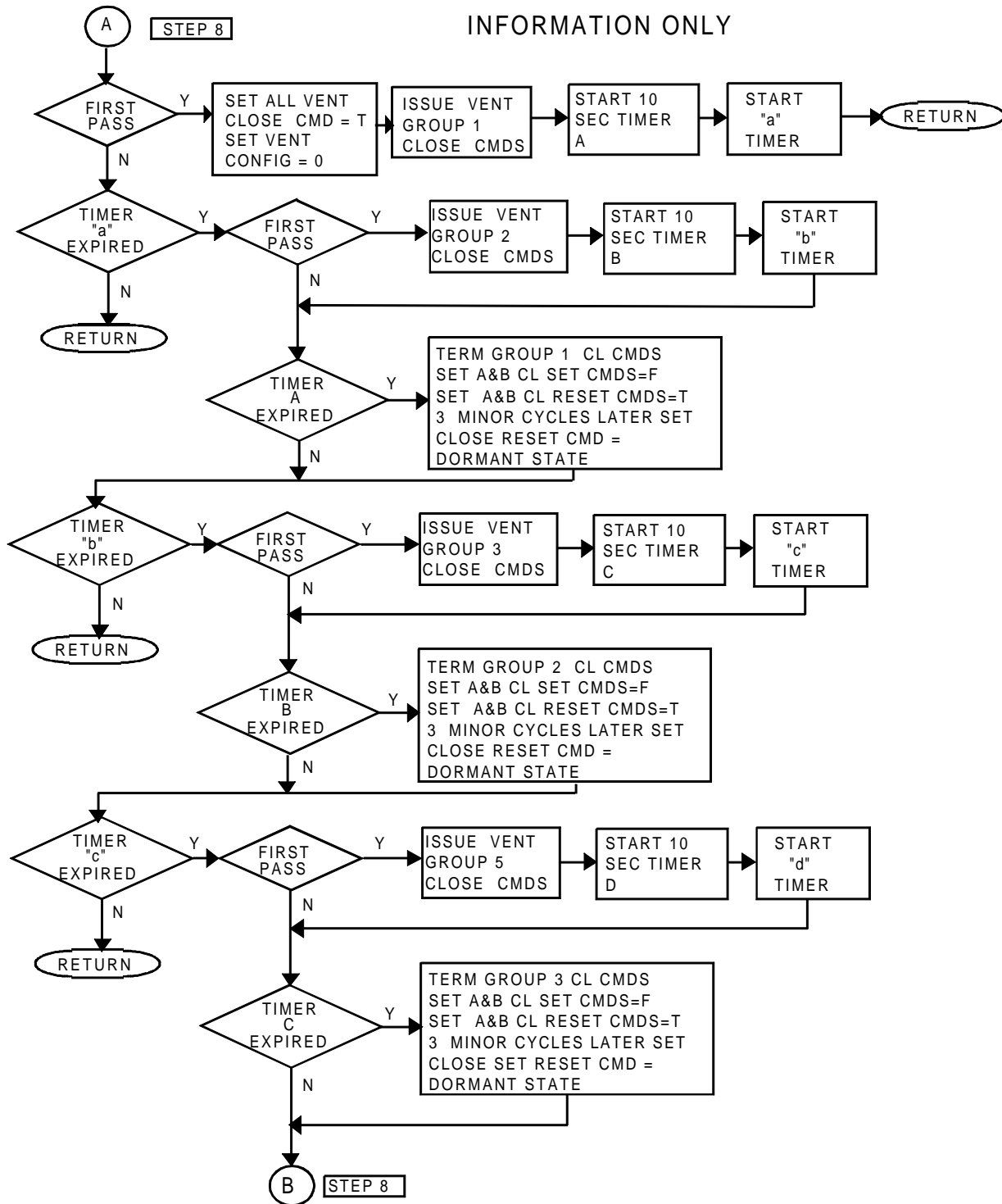


FIGURE 4.161.(3) Vent Door Sequence (Sheet 3 of 6)

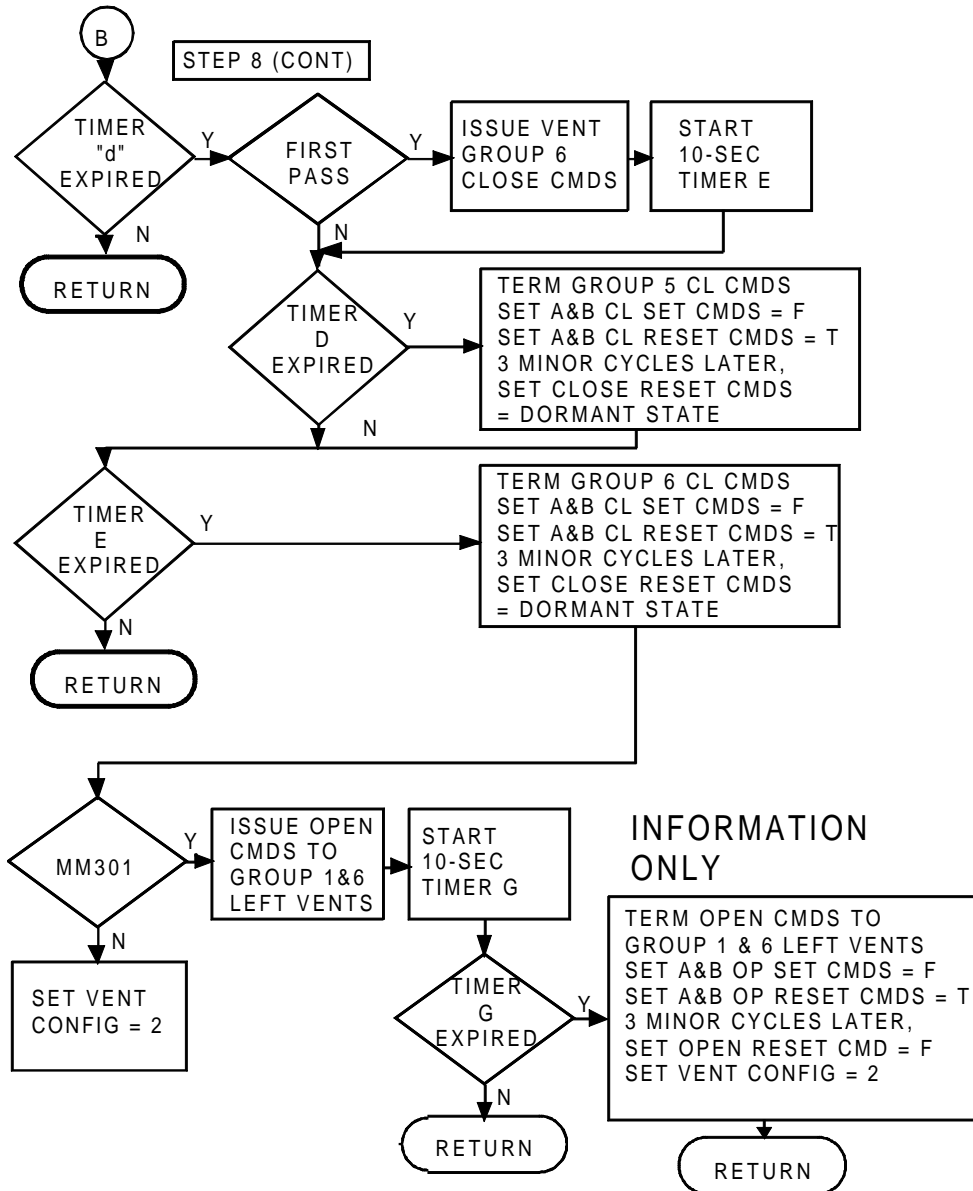


FIGURE 4.161.(4) Vent Door Sequence (Sheet 4 of 6)

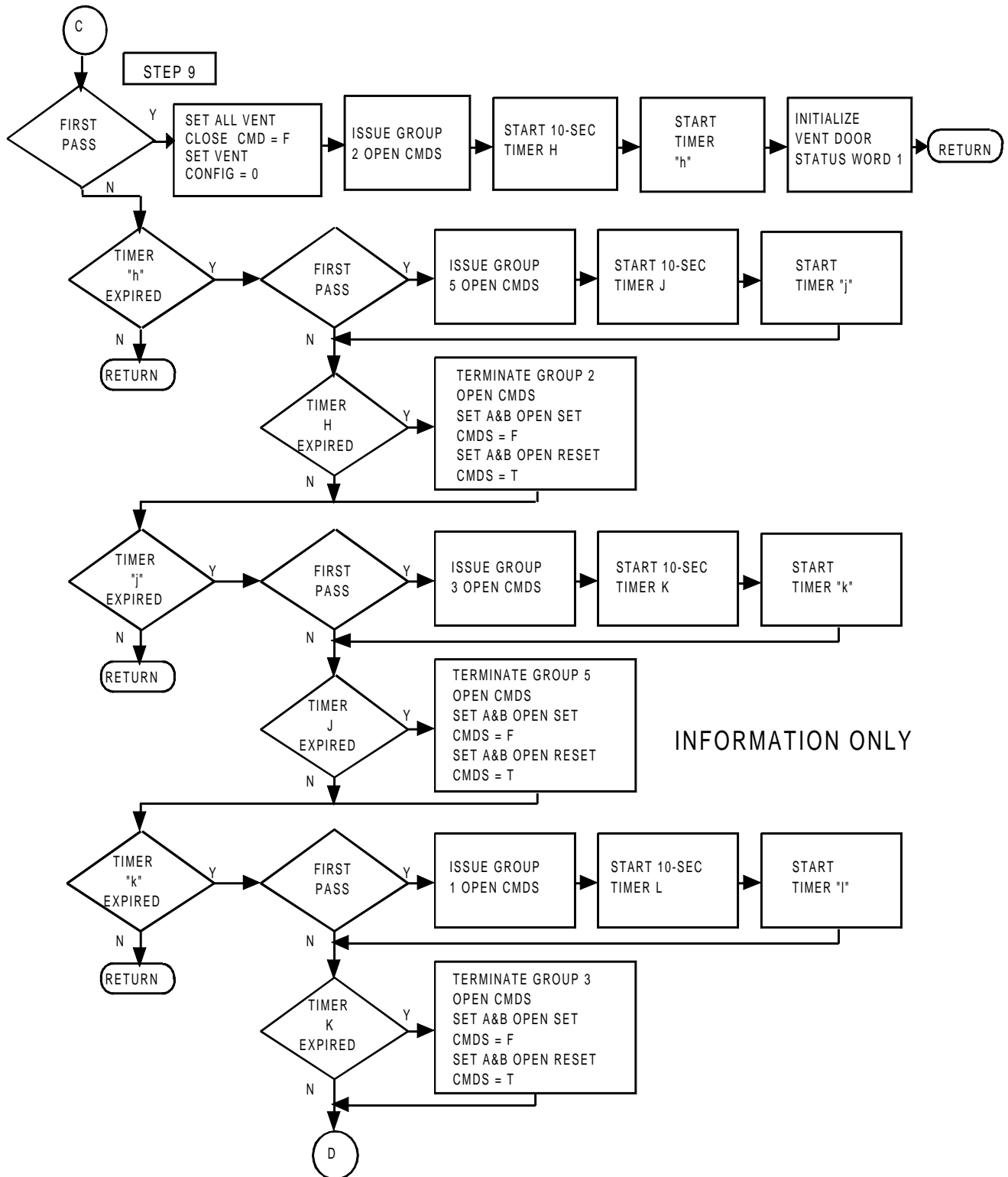


FIGURE 4.161.(5) Vent Door Sequence (Sheet 5 of 6)

INFORMATION ONLY

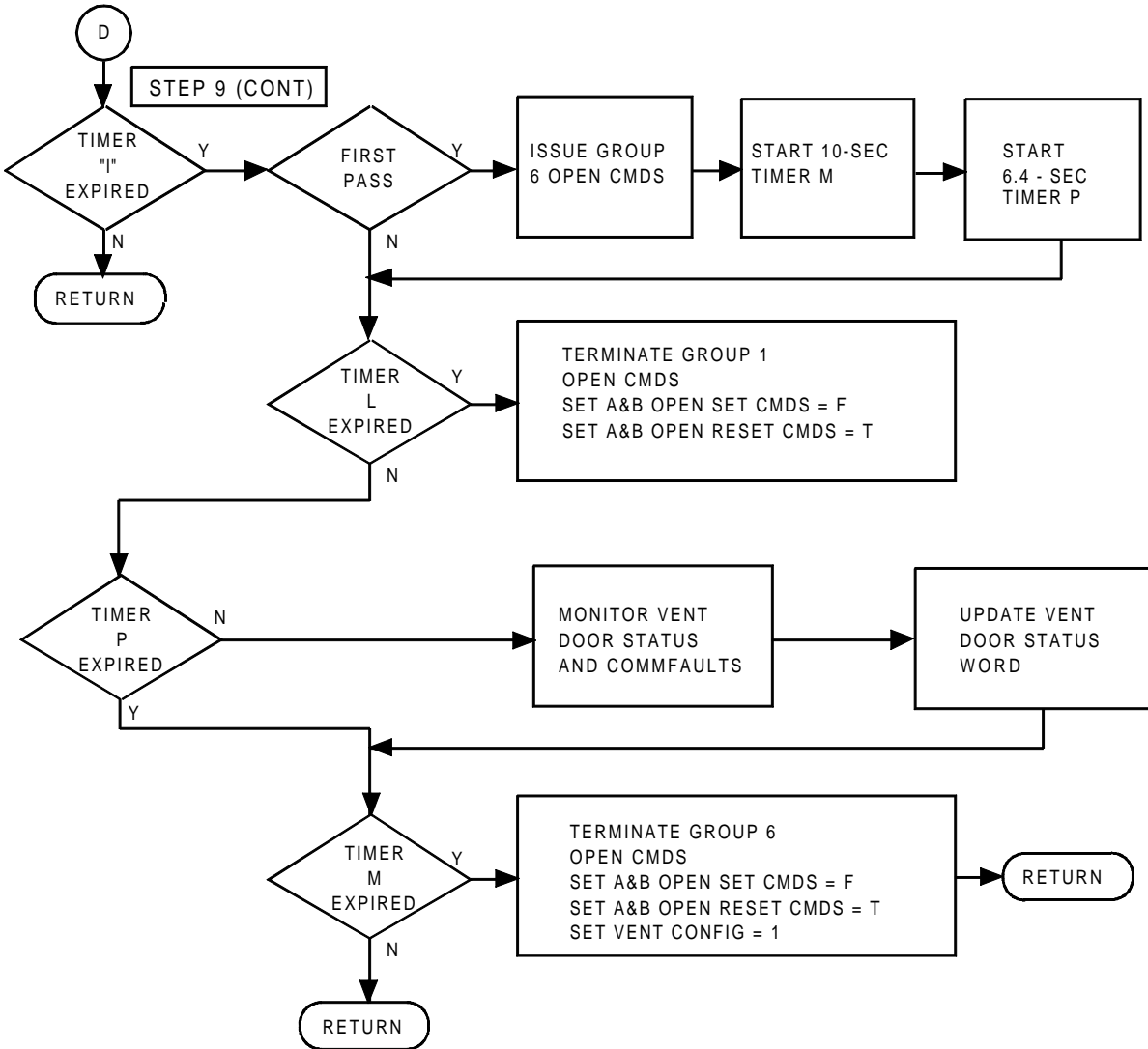


FIGURE 4.161.(6) Vent Door Sequence (Sheet 6 of 6)

TABLE 4.4.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------|------------|----------------------------------|-------------|-------|-----------|---------|---------|-------|
| (MT) | V91W1990C | DISPLAY MSN TIME | FCOS | S | VAR | | 93090E | |
| CLOCK/CLOCKTIME | V91W5000C | CLOCK-COMPUTER(GMT) | FCOS | S | | | 93160B | * |
| CONF_VENT_DOORS | V90X8375X | CONFIG VENT DOORS FOR LAUNCH CMD | R/S LCH SEQ | | | | 89599C | |
| ET_SEP_CMD | V90X8250X | ET SEPARATION CMD FLAG | ET SEP SEQ | | BD | | 93017G | * |
| 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_305/MM_305 | V90X8162X | MAJOR MODE 305 FLAG | MSC | | | | 92355B | |
| MM_CODE_602/MM_602 | V90X8174X | MAJOR MODE 602 FLAG | MSC | | | | 92355B | |
| MM_CODE_603/MM_603 | V90X8122X | MAJOR MODE 603 FLAG | MSC | | | | 92355B | |
| REL_VEL_MAG | V95L0151CA | GND REL VEL MAGNITUDE IN M50 SYS | RTLS UPP | FT/S | | SPL | 93017G | * |
| REL_VEL_MAG/V | V95L0151CC | GND REL VEL MAGNITUDE IN M50 SYS | ENT UPP | FT/S | | SPL | 93017G | * |
| REL_VEL_MAG/V | V95L0151CD | GND REL VEL MAGNITUDE IN M50 SYS | TAEM UPP | FT/S | | SPL | 93017G | * |
| TAL_ABORT_DECLARED | V90X8658X | TAL ABORT DECLARED | MSC | | | | 93090E | |
| | V59X3005X | L FWD VENTS 1&2 CLOSED 1 | MCA F3 | | BD | | 93017G | * |
| | V59X3015X | L FWD VENTS 1&2 CLOSED 2 | MCA F2 | | BD | | 93017G | * |
| | V59X3055X | L FWD VENTS 1&2 OPEN 1 | MCA F3 | | BD | | 93017G | * |
| | V59X3065X | L FWD VENTS 1&2 OPEN 2 | MCA F2 | | BD | | 93017G | * |
| | V59X3205X | L PB VENT 3 CLOSED 1 | MCA M3 | | BD | | 93017G | * |
| | V59X3215X | L PB VENT 3 CLOSED 2 | MCA M2 | | BD | | 93017G | * |
| | V59X3255X | L PB VENT 3 OPEN 1 | MCA M3 | | BD | | 93017G | * |
| | V59X3265X | L PB VENT 3 OPEN 2 | MCA M2 | | BD | | 93017G | * |
| | V59X3405X | L PB VENT 5 CLOSED 1 | MCA M3 | | BD | | 93017G | * |
| | V59X3415X | L PB VENT 5 CLOSED 2 | MCA M1 | | BD | | 93017G | * |
| | V59X3455X | L PB VENT 5 OPEN 1 | MCA M3 | | BD | | 93017G | * |
| | V59X3465X | L PB VENT 5 OPEN 2 | MCA M1 | | BD | | 93017G | * |
| | V59X3505X | L PB VENT 6 CLOSED 1 | MCA M3 | | BD | | 93017G | * |
| | V59X3515X | L PB VENT 6 CLOSED 2 | MCA M2 | | BD | | 93017G | * |
| | V59X3555X | L PB VENT 6 OPEN 1 | MCA M3 | | BD | | 93017G | * |
| | V59X3565X | L PB VENT 6 OPEN 2 | MCA M2 | | BD | | 93017G | * |
| | V59X3805X | L AFT VENTS 8&9 CLOSED 1 | MCA A1 | | BD | | 93017G | * |
| | V59X3815X | L AFT VENTS 8&9 CLOSED 2 | MCA A2 | | BD | | 93017G | * |
| | V59X3855X | L AFT VENTS 8&9 OPEN 1 | MCA A1 | | BD | | 93017G | * |
| | V59X3865X | L AFT VENTS 8&9 OPEN 2 | MCA A2 | | BD | | 93017G | * |
| | V59X4005X | R FWD VENTS 1&2 CLOSED 1 | MCA F1 | | BD | | 93017G | * |
| | V59X4015X | R FWD VENTS 1&2 CLOSED 2 | MCA F2 | | BD | | 93017G | * |
| | V59X4055X | R FWD VENTS 1&2 OPEN 1 | MCA F1 | | BD | | 93017G | * |
| | V59X4065X | R FWD VENTS 1&2 OPEN 2 | MCA F2 | | BD | | 93017G | * |
| | V59X4205X | R PB VENT 3 CLOSED 1 | MCA M1 | | BD | | 93017G | * |
| | V59X4215X | R PB VENT 3 CLOSED 2 | MCA M4 | | BD | | 93017G | * |
| | V59X4255X | R PB VENT 3 OPEN 1 | MCA M1 | | BD | | 93017G | * |
| | V59X4265X | R PB VENT 3 OPEN 2 | MCA M4 | | BD | | 93017G | * |
| | V59X4405X | R PB VENT 5 CLOSED 1 | MCA M1 | | BD | | 93017G | * |
| | V59X4415X | R PB VENT 5 CLOSED 2 | MCA M4 | | BD | | 93017G | * |
| | V59X4455X | R PB VENT 5 OPEN 1 | MCA M1 | | BD | | 93017G | * |
| | V59X4465X | R PB VENT 5 OPEN 2 | MCA M4 | | BD | | 93017G | * |
| | V59X4505X | R PB VENT 6 CLOSED 1 | MCA M1 | | BD | | 93017G | * |

TABLE 4.4.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|---------------|-------|-----------|------------------|---------|-------------|
| | V59X4515X | R PB VENT 6 CLOSED 2 | MCA M4 | | BD | | 93017G | * |
| | V59X4555X | R PB VENT 6 OPEN 1 | MCA M1 | | BD | | 93017G | * |
| | V59X4565X | R PB VENT 6 OPEN 2 | MCA M4 | | BD | | 93017G | * |
| | V59X4805X | R AFT VENTS 8&9 CLOSED 1 | MCA A3 | | BD | | 93017G | * |
| | V59X4815X | R AFT VENTS 8&9 CLOSED 2 | MCA A2 | | BD | | 93017G | * |
| | V59X4855X | R AFT VENTS 8&9 OPEN 1 | MCA A3 | | BD | | 93017G | * |
| | V59X4865X | R AFT VENTS 8&9 OPEN 2 | MCA A2 | | BD | | 93017G | * |
| | V91X2288X | FF1 INPUT PROM SEG 2,6 STATUS(HFE) | FCOS | | | | 89598A | |
| | V91X2289X | FF2 INPUT PROM SEG 2,6 STATUS(HFE) | FCOS | | | | 89598A | |
| | V91X2290X | FF3 INPUT PROM SEG 2,6 STATUS(HFE) | FCOS | | | | 89598A | |
| | V91X2291X | FF4 INPUT PROM SEG 2,6 STATUS(HFE) | FCOS | | | | 89598A | |
| | V91X2845X | FA1 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 89991E | |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2848X | FA4 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 92316B | |
| | V93X7201XB | ALL VENT CLOSE CMD | OVERRIDE DISP | | | | | |
| | V95X0235XF | VENT DOOR SEQ INIT | MSC | | BD | | 89599C | |

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

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|-------------|-------|-----------|---------|---------|-------|
| | V56K0140XA | ET UMB DR L-B1/B2 CLOSE CMD | HDWR | | BD | | 89354G | |
| | | | TLM | | | | | |
| | V56K0141XA | ET DR DVR & CL LCH DC ARM A MCA1/2 | HDWR | | BD | | 89354G | |
| | V56K0142XA | ET DR DVR & CL LCH DC ARM A MCA1/3 | HDWR | | BD | | 89354G | |
| | V56K0143XA | ET DR DVR & CL LCH DC ARM A MCA2/3 | HDWR | | BD | | 89354G | |
| | V56K1271XA | ET DR C/L LCH 1A1/2A2 FA1 STOW CMD | HDWR | | BD | | 89354G | |
| | V56K1272XA | ET DR C/L LCH 1A2/2A1 FA1 STOW CMD | HDWR | | BD | | 89354G | |
| | V56K1273XA | ET DR C/L LCH 1A1/2B2 FA2 STOW CMD | HDWR | | BD | | 89354G | |
| | V56K1274XA | ET DR C/L LCH 1B2/2B1 FA2 STOW CMD | HDWR | | BD | | 89354G | |
| | V56K1275XA | ET DR C/L LCH 1A1/2A2 FA1 LOCK CMD | HDWR | | BD | | 89354G | |
| | V56K1276XA | ET DR C/L LCH 1A2/2B1 FA1 LOCK CMD | HDWR | | BD | | 89354G | |
| | V56K1277XA | ET DR C/L LCH 1A1/2B2 FA2 LOCK CMD | HDWR | | BD | | 89354G | |
| | V56K1278XA | ET DR C/L LCH 1B2/2A1 FA2 LOCK CMD | HDWR | | BD | | 89354G | |
| | V56K1371XA | ET DR C/L LCH 1B1/2A2 FA4 STOW CMD | HDWR | | BD | | 89354G | |
| | V56K1372XA | ET DR C/L LCH 1A2/2B1 FA4 STOW CMD | HDWR | | BD | | 89354G | |
| | V56K1373XA | ET DR C/L LCH 1B1/2B2 FA3 STOW CMD | HDWR | | BD | | 89354G | |
| | V56K1374XA | ET DR C/L LCH 1B2/2A1 FA3 STOW CMD | HDWR | | BD | | 89354G | |
| | V56K1375XA | ET DR C/L LCH 1B1/2A2 FA4 LOCK CMD | HDWR | | BD | | 89354G | |
| | V56K1376XA | ET DR C/L LCH 1A2/2A1 FA4 LOCK CMD | HDWR | | BD | | 89354G | |
| | V56K1377XA | ET DR C/L LCH 1B1/2B2 FA3 LOCK CMD | HDWR | | BD | | 89354G | |
| | V56K1378XA | ET DR C/L LCH 1B2/2B1 FA3 LOCK CMD | HDWR | | BD | | 89354G | |
| | V56K3111XA | ET UMB DR L-B2/R-B1 CLOSE CMD | HDWR | | BD | | 89354G | |
| | V56K3112XA | ET UMB DR R-B2 CLOSE CMD | HDWR | | BD | | 89354G | |
| | V56K3531XA | ET L UMB COUT DOOR LATCH FA1 CMD | HDWR | | BD | | 89354G | |
| | V56K3532XA | ET R UMB COUT DOOR LATCH FA1 CMD | HDWR | | BD | | 89354G | |
| | V56K3533XA | ET L UMB COUT DOOR LATCH FA4 CMD | HDWR | | BD | | 89354G | |
| | V56K3534XA | ET R UMB COUT DOOR LATCH FA4 CMD | HDWR | | BD | | 89354G | |
| | V56K4121XA | ET UMB DR R-B1/B2 CLOSE CMD | HDWR | | BD | | 89354G | |
| | V56K4122XA | ET UMB DR L-B1 CLOSE CMD | HDWR | | BD | | 89354G | |
| | V56K4531XA | ET L UMB COUT DOOR LATCH FA3 CMD | HDWR | | BD | | 89354G | |
| | V56K4532XA | ET R UMB COUT DOOR LATCH FA3 CMD | HDWR | | BD | | 89354G | |
| | V56K4533XA | ET L UMB COUT DOOR LATCH FA2 CMD | HDWR | | BD | | 89354G | |
| | V56K4534XA | ET R UMB COUT DOOR LATCH FA2 CMD | HDWR | | BD | | 89354G | |
| | V59K3000X | L FWD VENTS 1&2 CLOSE CMD 1A | DL FMT 21/A | | BD | | 93017G | * |
| | | | DL FMT 23/1 | | | | | |
| | | | DL FMT 32/1 | | | | | |
| | | | MCA F3 | | | | | |
| | V59K3001X | L FWD VENTS 1&2 CLOSE CMD 1B | DL FMT 23/1 | | BD | | 93017G | * |
| | | | MCA F3 | | | | | |
| | V59K3010X | L FWD VENTS 1&2 CLOSE CMD 2A | DL FMT 23/1 | | BD | | 93017G | * |
| | | | DL FMT 32/1 | | | | | |
| | | | MCA F2 | | | | | |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------|--|-------|-----------|---------|---------|-------|
| | V59K3011X | L FWD VENTS 1&2 CLOSE CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA F2 | | BD | | 93017G | * |
| | V59K3050X | L FWD VENTS 1&2 OPEN CMD 1A | DL FMT 23/1 DL FMT 32/1 MCA F3 | | BD | | 93017G | * |
| | V59K3051X | L FWD VENTS 1&2 OPEN CMD 1B | DL FMT 23/1 DL FMT 32/1 MCA F3 | | BD | | 93017G | * |
| | V59K3060X | L FWD VENTS 1&2 OPEN CMD 2A | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 MCA F2 | | BD | | 93017G | * |
| | V59K3061X | L FWD VENTS 1&2 OPEN CMD 2B | DL FMT 23/1 MCA F2 | | BD | | 93017G | * |
| | V59K3200X | L PB VENT 3 CLOSE CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/A MCA M3 | | BD | | 93017G | * |
| | V59K3201X | L PB VENT 3 CLOSE CMD 1B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M3 | | BD | | 93017G | * |
| | V59K3210X | L PB VENT 3 CLOSE CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M2 | | BD | | 93017G | * |
| | V59K3211X | L PB VENT 3 CLOSE CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M2 | | BD | | 93017G | * |
| | V59K3250X | L PB VENT 3 OPEN CMD 1A | DL FMT 23/1 DL FMT 32/1 MCA M3 | | BD | | 93017G | * |
| | V59K3251X | L PB VENT 3 OPEN CMD 1B | DL FMT 23/1 DL FMT 32/1 MCA M3 | | BD | | 93017G | * |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|--------------------------|--|-------|-----------|---------|---------|-------|
| | V59K3260X | L PB VENT 3 OPEN CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M2 | | BD | | 93017G | * |
| | V59K3261X | L PB VENT 3 OPEN CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M2 | | BD | | 93017G | * |
| | V59K3400X | L PB VENT 5 CLOSE CMD 1A | DL FMT 23/1 MCA M3 | | BD | | 93017G | * |
| | V59K3401X | L PB VENT 5 CLOSE CMD 1B | DL FMT 23/1 MCA M3 | | BD | | 93017G | * |
| | V59K3410X | L PB VENT 5 CLOSE CMD 2A | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A MCA M1 | | BD | | 93017G | * |
| | V59K3411X | L PB VENT 5 CLOSE CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M1 | | BD | | 93017G | * |
| | V59K3450X | L PB VENT 5 OPEN CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M3 | | BD | | 93017G | * |
| | V59K3451X | L PB VENT 5 OPEN CMD 1B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M3 | | BD | | 93017G | * |
| | V59K3460X | L PB VENT 5 OPEN CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M1 | | BD | | 93017G | * |
| | V59K3461X | L PB VENT 5 OPEN CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M1 | | BD | | 93017G | * |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------|--|-------|-----------|---------|---------|-------|
| | V59K3500X | L PB VENT 6 CLOSE CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M3 | | BD | | 93017G | * |
| | V59K3501X | L PB VENT 6 CLOSE CMD 1B | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M3 | | BD | | 93017G | * |
| | V59K3510X | L PB VENT 6 CLOSE CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/A MCA M2 | | BD | | 93017G | * |
| | V59K3511X | L PB VENT 6 CLOSE CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M2 | | BD | | 93017G | * |
| | V59K3550X | L PB VENT 6 OPEN CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/A MCA M3 | | BD | | 93017G | * |
| | V59K3551X | L PB VENT 6 OPEN CMD 1B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A MCA M3 | | BD | | 93017G | * |
| | V59K3560X | L PB VENT 6 OPEN CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M2 | | BD | | 93017G | * |
| | V59K3561X | L PB VENT 6 OPEN CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M2 | | BD | | 93017G | * |
| | V59K3600X | L PB VENT 6 PURGE 1 CMD 1A | MCA M3 | | BD | | 89598A | |
| | V59K3610X | L PB VENT 6 PURGE 1 CMD 2A | MCA M2 | | BD | | 89598A | |
| | V59K3700X | L PB VENT 6 PURGE 2 CMD 1A | MCA M3 | | BD | | 89598A | |
| | V59K3710X | L PB VENT 6 PURGE 2 CMD 2A | MCA M2 | | BD | | 89598A | |
| | V59K3800X | L AFT VENTS 8&9 CLOSE CMD 1A | DL FMT 23/1 MCA A1 | | BD | | 93017G | * |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------|--|-------|-----------|------------------|---------|-------------|
| | V59K3801X | L AFT VENTS 8&9 CLOSE CMD 1B | DL FMT 23/1 MCA A1 | | BD | | 93017G | * |
| | V59K3810X | L AFT VENTS 8&9 CLOSE CMD 2A | DL FMT 23/1 MCA A2 | | BD | | 93017G | * |
| | V59K3811X | L AFT VENTS 8&9 CLOSE CMD 2B | DL FMT 23/1 MCA A2 | | BD | | 93017G | * |
| | V59K3850X | L AFT VENTS 8&9 OPEN CMD 1A | DL FMT 23/1 MCA A1 | | BD | | 93017G | * |
| | V59K3851X | L AFT VENTS 8&9 OPEN CMD 1B | DL FMT 23/1 MCA A1 | | BD | | 93017G | * |
| | V59K3860X | L AFT VENTS 8&9 OPEN CMD 2A | DL FMT 23/1 MCA A2 | | BD | | 93017G | * |
| | V59K3861X | L AFT VENTS 8&9 OPEN CMD 2B | DL FMT 23/1 MCA A2 | | BD | | 93017G | * |
| | V59K4000X | R FWD VENTS 1&2 CLOSE CMD 1A | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 MCA F1 | | BD | | 93017G | * |
| | V59K4001X | R FWD VENTS 1&2 CLOSE CMD 1B | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 MCA F1 | | BD | | 93017G | * |
| | V59K4010X | R FWD VENTS 1&2 CLOSE CMD 2A | DL FMT 23/2 DL FMT 32/1 MCA F2 | | BD | | 93017G | * |
| | V59K4011X | R FWD VENTS 1&2 CLOSE CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA F2 | | BD | | 93017G | * |
| | V59K4050X | R FWD VENTS 1&2 OPEN CMD 1A | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 MCA F1 | | BD | | 93017G | * |
| | V59K4051X | R FWD VENTS 1&2 OPEN CMD 1B | DL FMT 23/2 DL FMT 32/1 MCA F1 | | BD | | 93017G | * |
| | V59K4060X | R FWD VENTS 1&2 OPEN CMD 2A | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 MCA F2 | | BD | | 93017G | * |
| | V59K4061X | R FWD VENTS 1&2 OPEN CMD 2B | DL FMT 23/1 MCA F2 | | BD | | 93017G | * |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|--------------------------|--|-------|-----------|---------|---------|-------|
| | V59K4200X | R PB VENT 3 CLOSE CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M1 | | BD | | 93017G | * |
| | V59K4201X | R PB VENT 3 CLOSE CMD 1B | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M1 | | BD | | 93017G | * |
| | V59K4210X | R PB VENT 3 CLOSE CMD 2A | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A MCA M4 | | BD | | 93017G | * |
| | V59K4211X | R PB VENT 3 CLOSE CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M4 | | BD | | 93017G | * |
| | V59K4250X | R PB VENT 3 OPEN CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/A MCA M1 | | BD | | 93017G | * |
| | V59K4251X | R PB VENT 3 OPEN CMD 1B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A MCA M1 | | BD | | 93017G | * |
| | V59K4260X | R PB VENT 3 OPEN CMD 2A | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 MCA M4 | | BD | | 93017G | * |
| | V59K4261X | R PB VENT 3 OPEN CMD 2B | DL FMT 23/1 MCA M4 | | BD | | 93017G | * |
| | V59K4400X | R PB VENT 5 CLOSE CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M1 | | BD | | 93017G | * |
| | V59K4401X | R PB VENT 5 CLOSE CMD 1B | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M1 | | BD | | 93017G | * |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|--------------------------|--|-------|-----------|---------|---------|-------|
| | V59K4410X | R PB VENT 5 CLOSE CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/A MCA M4 | | BD | | 93017G | * |
| | V59K4411X | R PB VENT 5 CLOSE CMD 2B | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M4 | | BD | | 93017G | * |
| | V59K4450X | R PB VENT 5 OPEN CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/A MCA M1 | | BD | | 93017G | * |
| | V59K4451X | R PB VENT 5 OPEN CMD 1B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A MCA M1 | | BD | | 93017G | * |
| | V59K4460X | R PB VENT 5 OPEN CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M4 | | BD | | 93017G | * |
| | V59K4461X | R PB VENT 5 OPEN CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M4 | | BD | | 93017G | * |
| | V59K4500X | R PB VENT 6 CLOSE CMD 1A | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A MCA M1 | | BD | | 93017G | * |
| | V59K4501X | R PB VENT 6 CLOSE CMD 1B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M1 | | BD | | 93017G | * |
| | V59K4510X | R PB VENT 6 CLOSE CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M4 | | BD | | 93017G | * |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------|--|-------|-----------|---------|---------|-------|
| | V59K4511X | R PB VENT 6 CLOSE CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M4 | | BD | | 93017G | * |
| | V59K4550X | R PB VENT 6 OPEN CMD 1A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M1 | | BD | | 93017G | * |
| | V59K4551X | R PB VENT 6 OPEN CMD 1B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M1 | | BD | | 93017G | * |
| | V59K4560X | R PB VENT 6 OPEN CMD 2A | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 MCA M4 | | BD | | 93017G | * |
| | V59K4561X | R PB VENT 6 OPEN CMD 2B | DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/1 MCA M4 | | BD | | 93017G | * |
| | V59K4600X | R PB VENT 6 PURGE 1 CMD 1A | MCA M1 | | BD | | 89598A | |
| | V59K4610X | R PB VENT 6 PURGE 1 CMD 2A | MCA M4 | | BD | | 89598A | |
| | V59K4700X | R PB VENT 6 PURGE 2 CMD 1A | MCA M1 | | BD | | 89598A | |
| | V59K4710X | R PB VENT 6 PURGE 2 CMD 2A | MCA M4 | | BD | | 89598A | |
| | V59K4800X | R AFT VENTS 8&9 CLOSE CMD 1A | DL FMT 23/1 MCA A3 | | BD | | 93017G | * |
| | V59K4801X | R AFT VENTS 8&9 CLOSE CMD 1B | DL FMT 23/1 MCA A3 | | BD | | 93017G | * |
| | V59K4810X | R AFT VENTS 8&9 CLOSE CMD 2A | DL FMT 23/1 MCA A2 | | BD | | 93017G | * |
| | V59K4811X | R AFT VENTS 8&9 CLOSE CMD 2B | DL FMT 23/1 MCA A2 | | BD | | 93017G | * |
| | V59K4850X | R AFT VENTS 8&9 OPEN CMD 1A | DL FMT 23/1 MCA A3 | | BD | | 93017G | * |
| | V59K4851X | R AFT VENTS 8&9 OPEN CMD 1B | DL FMT 23/1 MCA A3 | | BD | | 93017G | * |
| | V59K4860X | R AFT VENTS 8&9 OPEN CMD 2A | DL FMT 23/1 MCA A2 | | BD | | 93017G | * |
| | V59K4861X | R AFT VENTS 8&9 OPEN CMD 2B | DL FMT 23/1 MCA A2 | | BD | | 93017G | * |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|-----------------------|-------------|--|-----------|------------------|---------|-------------|
| | V72M6624PB | MDM FF01 DSCR OUT SET | CD 02 CH 0 | DL FMT 23/2 DL FMT 32/1 | | | 93017G | * |
| | V72M6626PC | 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 | | | 93017G | * |
| | V72M6630PC | MDM FF01 DSCR OUT SET | CD 10 CH 0 | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 | | | 93017G | * |
| | V72M6632PA | MDM FF01 DSCR OUT SET | CD 10 CH 2 | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/A | | | 93017G | * |
| | V72M6674P | MDM FF02 DSCR OUT SET | CD 02 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M6675P | MDM FF02 DSCR OUT SET | CD 02 CH 1 | DL FMT 23/1 | | | 93017G | * |
| | V72M6676PA | 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 | | | 93017G | * |
| | V72M6680PC | MDM FF02 DSCR OUT SET | CD 10 CH 0 | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 | | | 93017G | * |
| | V72M6682PA | MDM FF02 DSCR OUT SET | CD 10 CH 2 | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 | | | 93017G | * |
| | V72M6724PB | MDM FF03 DSCR OUT SET | CD 02 CH 0 | DL FMT 23/1 DL FMT 32/1 | | | 93017G | * |
| | V72M6726PA | 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 | | | 93017G | * |
| | V72M6730PA | MDM FF03 DSCR OUT SET | CD 10 CH 0 | DL FMT 23/1 DL FMT 32/1 | | | 93017G | * |
| | V72M6732PA | MDM FF03 DSCR OUT SET | CD 10 CH 2 | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 | | | 93017G | * |
| | V72M6774PA | MDM FF04 DSCR OUT SET | CD 02 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M6775P | MDM FF04 DSCR OUT SET | CD 02 CH 1 | DL FMT 23/1 | | | 93017G | * |
| | V72M6776PA | 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 | | | 93017G | * |

TABLE 4.4.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM VENT DOOR CONTROL SEQUENCER (G4.161)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|--------------------------------|-------------|--|-----------|---------|---------|-------|
| | V72M6780PC | MDM FF04 DSCR OUT SET | CD 10 CH 0 | DL FMT 21/A DL FMT 23/1 DL FMT 32/1 | | | 93017G | * |
| | V72M6782PA | MDM FF04 DSCR OUT SET | CD 10 CH 2 | DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/1 | | | 93017G | * |
| | V72M7820P | MDM FA01 DSCR OUT SET | CD 07 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M7827P | MDM FA01 DSCR OUT SET | CD 15 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M7840P | MDM FA02 DSCR OUT SET | CD 07 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M7847P | MDM FA02 DSCR OUT SET | CD 15 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M7860P | MDM FA03 DSCR OUT SET | CD 07 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M7867P | MDM FA03 DSCR OUT SET | CD 15 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M7880P | MDM FA04 DSCR OUT SET | CD 07 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V72M7887P | MDM FA04 DSCR OUT SET | CD 15 CH 0 | DL FMT 23/1 | | | 93017G | * |
| | V90J8201C | ORBITER VENT DOORS STATUS WORD | | DL FMT 21/1 R/S LCH SEQ | BSU | | 93017G | * |
| | V93J1601C | VENT CONFIGURATION | | OVERRIDE DISP | BSU | | 89944H | |
| | V93X7201XA | ALL VENT CLOSE CMD | | OVERRIDE DISP | | | | |

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 4.4.1.4-3. VENT DOOR CONTROL SEQUENCER (G4.161) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|----------------------|-----------|-----------|----|----|---|---|---------|----------|------------|---------|-------------|
| VENT_CMDS_TIME_DELAY | V97U9859C | SEC | F | D | M | C | G4.161 | 01 03 | ZFF ZFF | 89944H | |

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

TABLE 4.4.1.4-4. VENT DOOR CONTROL SEQUENCER (G4.161) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--|-----------|----|-------------|-------------|----|--------|---|----------|---------|-------------|
| GROUND_REL_VEL_THRESHOLD GROUND REL VEL THRESHOLD | V97U9806C | 00 | +2.4000000 | E+03 FT/SEC | F | | S | C G4.161 | 59957 | |

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

TABLE 4.4.1.4-5. VENT DOOR CONTROL SEQUENCER (G4.161) 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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4.5 HYDRAULICS

4.5.1 LDG GEAR VLV CNTL (4.215)

4.5.1.1 Introduction

This sequence is used during entry to provide automatic control of the three hydraulic system brake isolation valves, a hydraulic system landing gear extend isolation valve, and the three hydraulic system MPS thrust vector control valves. These valves are latching valves.

The hydraulic system 1 landing gear isolation valve is opened by the sequence at a specified ground relative velocity cue to provide hydraulic pressure to deploy the landing gear. The hydraulic system landing brake isolation valves are commanded open upon receiving a Brake Isolation Valve Open Flag from the Landing SOP. A momentary switch is provided for manual control of each hydraulic system landing brake isolation valve and hydraulic system landing gear isolation valve. The center position of the manual switch is nonfunctional but is designated GPC to remind the crew that the valves will be automatically opened during entry.

During MM 304, the sequence opens the three hydraulic system MPS thrust vector control isolation valves to allow repositioning of the SSMEs to enable deployment of the drag chute without path interference from the SSMEs. The automatic control of the three hydraulic system MPS thrust vector control isolation valves can be bypassed by a crew SSME reposition inhibit item 19 entry on the Override Spec 051.

4.5.1.2 Overview

In Nominal Entry, the sequence is initiated when the Orbiter ground relative velocity is 8000 fps. During a RTLS Entry, the sequence is initiated upon transition into MM 603.

During MM 304, the automatic control of the three MPS thrust vector control (TVC) valves is initiated when the Orbiter ground relative velocity is between 3,500 fps and 8,000 fps and the crew has not inhibited the sequence via Override Spec 051. The Auxiliary Power Units (APU's) are checked when the orbiter relative velocity has diminished to 8,000 fps. If at least two out of three APU's are operational, the sequence proceeds to command the three hydraulic system MPS thrust vector control isolation valves open simultaneously. The valves will not be opened below a orbiter relative velocity of 3500 fps. The sequence will command the MPS thrust vector control valves closed upon: completion of SSME repositioning for chute deploy; or when less than two operational APU's are available; or if less than two valves are opened when commanded open. In the event of halted repositioning, a CRT message line and a Class 3 alert light and tone is provided.

During either MM 305 or MM 603, when the Orbiter ground relative velocity has decreased to 800 fps, the hydraulic system landing gear valve is commanded open. The hydraulic system brake isolation valves are then commanded open upon receiving a Brake Isolation Valve Open Flag from the Landing SOP.

The sequence terminates the open and close commands 5 or more seconds after each isolation valve is commanded and the valve will remain latched in its commanded position.

4.5.1.3 Detailed Requirements

Step 1. In MM 304 this step opens hydraulic system 1, 2, and 3 MPS TVC isolation valves during a predefined ground relative velocity if the crew has not inhibited this function. This step also indicates a crew alert if the crew has inhibited the SSME reposition while it was in progress.

Monitor the following signals:

- | | | |
|-----|-------------------------------------|------------|
| (a) | MAJOR MODE 304 FLAG | V90X8161X |
| (b) | CREW SSME REPOSITION | V93X5480X |
| (c) | SSME REPOSITION START FLAG | (INTERNAL) |
| (d) | GROUND REL VEL MAGNITUDE IN M50 SYS | V95L0151C |
| (e) | SSME REPOSITION STOP FLAG | V95X1623X |
| (f) | SSME CHUTE DEPLOY POSITION CMPLT | V95X1624X |

If (a) is true, proceed to monitor (b). Otherwise, proceed to Step 8.

If (b) is true, proceed to monitor (c) and (d). Otherwise, proceed to monitor (c), (e), and (f).

If (c) is true or $8000 \text{ fps} \geq (d) \geq 3500 \text{ fps}$, on first pass, set (1) through (9) true, start (12), and proceed to Step 2. On subsequent passes, proceed to Step 2. Otherwise, return to Step 1.

If (c) is true and both (e) and (f) are false, set (10) true to generate a CRT message line and Class 3 alert light and tone, set (11) false, and proceed to Step 5. Otherwise, proceed to Step 5.

- | | | |
|------|-------------------------------------|------------|
| (1) | HYD SYS 1 ME/TVC ISLN V OP/CL ENA A | V58K1129X |
| (2) | HYD SYS 1 ME/TVC ISLN V OP/CL ENA B | V58K1132X |
| (3) | HYD SYS 1 ME/TVC ISLN V OP | V58K1134X |
| (4) | HYD SYS 2 ME/TVC ISLN V OP/CL ENA A | V58K1229X |
| (5) | HYD SYS 2 ME/TVC ISLN V OP/CL ENA B | V58K1232X |
| (6) | HYD SYS 2 ME/TVC ISLN V OP | V58K1234X |
| (7) | HYD SYS 3 ME/TVC ISLN V OP/CL ENA | V58K1332X |
| (8) | HYD SYS 3 ME/TVC ISLN V OP | V58K1334X |
| (9) | SSME REPOSITION START FLAG | (INTERNAL) |
| (10) | SSME REPOSITION STOP FLAG | V95X1623X |
| (11) | DRAG CHUTE GIMBAL POSITION FLAG | V90X5521X |
| (12) | MPS TVC VLV OPEN TIMER | (INTERNAL) |

Step 2. This step terminates the open commands to the hydraulic system 1, 2, and 3 MPS TVC isolation valves.

Monitor the following signals:

- | | | |
|-----|---------------------------|------------|
| (a) | SSME REPOSITION STOP FLAG | V95X1623X |
| (b) | MPS TVC VLV OPEN TIMER | (INTERNAL) |

If (a) is true or less than 5 seconds have elapsed since (b) started, proceed to Step 4.

If (a) is false and 5 or more seconds have elapsed since (b) started, on first pass, set (1) through (8) false and proceed to Step 3. On subsequent passes, proceed to Step 4.

- | | | |
|-----|-------------------------------------|-----------|
| (1) | HYD SYS 1 ME/TVC ISLN V OP/CL ENA A | V58K1129X |
| (2) | HYD SYS 1 ME/TVC ISLN V OP/CL ENA B | V58K1132X |
| (3) | HYD SYS 1 ME/TVC ISLN V OP | V58K1134X |
| (4) | HYD SYS 2 ME/TVC ISLN V OP/CL ENA A | V58K1229X |
| (5) | HYD SYS 2 ME/TVC ISLN V OP/CL ENA B | V58K1232X |
| (6) | HYD SYS 2 ME/TVC ISLN V OP | V58K1234X |
| (7) | HYD SYS 3 ME/TVC ISLN V OP/CL ENA | V58K1332X |
| (8) | HYD SYS 3 ME/TVC ISLN V OP | V58K1334X |

Step 3. This step provides a crew alert for the case of at least two hydraulic systems not available for SSME repositioning. A hydraulic system can become unavailable either due to a failed hydraulic system and/or a MPS TVC isolation valve that fails to open. This step is executed once after at least 5 seconds have elapsed since the MPS TVC valves are commanded opened. If two or more hydraulic systems are available, a flag for priority rate limiting and for SSME repositioning are issued.

Monitor the following signals:

- | | | |
|-----|---------------------------------------|------------|
| (a) | HYD SYS 1 FAIL STATUS | V96X3005X |
| (b) | HYD SYS 2 FAIL STATUS | V96X3006X |
| (c) | HYD SYS 3 FAIL STATUS | V96X3007X |
| (d) | HYD SYS 1 ME/TVC ISLN V OP IND | V58X1136X |
| (e) | HYD SYS 2 ME/TVC ISLN V OP IND | V58X1236X |
| (f) | HYD SYS 3 ME/TVC ISLN V OP IND | V58X1336X |
| (g) | FA1 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2845X |
| (h) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (i) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (j) | HYD SYS 1 AVAIL | (INTERNAL) |
| (k) | HYD SYS 2 AVAIL | (INTERNAL) |
| (l) | HYD SYS 3 AVAIL | (INTERNAL) |
| (m) | HYD MPS TVC SYS UNAVAIL CTR | (INTERNAL) |

If (a) is true or (d) is false or (g) is true, set (j) false and increment (m) by one, and proceed to monitor (b), (e), and (h). Otherwise monitor (b), (e), and (h).

If (b) is true or (e) is false or (h) is true, set (k) false and increment (m) by one, and proceed to monitor (c), (f), and (i). Otherwise monitor (c), (f), and (i).

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If (c) is true or (f) is false or (i) is true, set (l) false and increment (m) by one, and proceed to monitor (m). Otherwise monitor (m).

If (m) > 1, set (1) true to generate a CRT message line and Class 3 alert light and tone, and proceed to Step 4. Otherwise, set (2) and (3) true and proceed to Step 4.

- | | | |
|-----|---------------------------------|-----------|
| (1) | SSME REPOSITION STOP FLAG | V95X1623X |
| (2) | DRAG CHUTE GIMBAL POSITION FLAG | V90X5521X |
| (3) | PRL TVC ISO VLV OPEN FLAG | V90X5522X |

Step 4. This step monitors hydraulic system fail flags to ensure that at least two hydraulic systems remain available. A flag will be set to initiate MPS TVC isolation valve closure and a crew alert when less than two hydraulic systems are available and the SSME repositioning has not been completed.

Set counter (g) to zero and proceed to monitor the following signals:

- | | | |
|-----|----------------------------------|------------|
| (a) | HYD SYS 1 FAIL STATUS | V96X3005X |
| (b) | HYD SYS 2 FAIL STATUS | V96X3006X |
| (c) | HYD SYS 3 FAIL STATUS | V96X3007X |
| (d) | HYD SYS 1 AVAIL | (INTERNAL) |
| (e) | HYD SYS 2 AVAIL | (INTERNAL) |
| (f) | HYD SYS 3 AVAIL | (INTERNAL) |
| (g) | HYD SYS CTR | (INTERNAL) |
| (h) | SSME CHUTE DEPLOY POSITION CMPLT | V95X1624X |

If (a) is true or (d) is false, increment (g) by one, and proceed to monitor (b) and (e). Otherwise monitor (b) and (e).

If (b) is true or (e) is false, increment (g) by one, and proceed to monitor (c) and (f). Otherwise monitor (c) and (f).

If (c) is true or (f) is false, increment (g) by one, and proceed to monitor (g). Otherwise monitor (g).

If (g) > 1 and (h) is false, set (1) true to generate a CRT message line and Class 3 alert light and tone and proceed to Step 5. Otherwise, proceed to Step 5.

- | | | |
|-----|---------------------------|-----------|
| (1) | SSME REPOSITION STOP FLAG | V95X1623X |
|-----|---------------------------|-----------|

Step 5. This step commands MPS TVC isolation valves closed if SSME repositioning will not occur or if SSME repositioning for drag chute deploy is complete.

Monitor the following signals:

- | | | |
|-----|----------------------------------|-----------|
| (a) | SSME CHUTE DEPLOY POSITION CMPLT | V95X1624X |
| (b) | SSME REPOSITION STOP FLAG | V95X1623X |

If (a) or (b) is true, on first pass, set (1) through (8) true, set (9) through (11) false, start (12) and proceed to Step 6. On subsequent passes, proceed to Step 6. Otherwise, return to Step 1.

- | | | |
|-----|-------------------------------------|-----------|
| (1) | HYD SYS 1 ME/TVC ISLN V OP/CL ENA A | V58K1129X |
| (2) | HYD SYS 1 ME/TVC ISLN V OP/CL ENA B | V58K1132X |

| | | |
|------|-------------------------------------|------------|
| (3) | HYD SYS 1 ME/TVC ISLN V CL | V58K1135X |
| (4) | HYD SYS 2 ME/TVC ISLN V OP/CL ENA A | V58K1229X |
| (5) | HYD SYS 2 ME/TVC ISLN V OP/CL ENA B | V58K1232X |
| (6) | HYD SYS 2 ME/TVC ISLN V CL | V58K1235X |
| (7) | HYD SYS 3 ME/TVC ISLN V OP/CL ENA | V58K1332X |
| (8) | HYD SYS 3 ME/TVC ISLN V CL | V58K1335X |
| (9) | HYD SYS 1 ME/TVC ISLN V OP | V58K1134X |
| (10) | HYD SYS 2 ME/TVC ISLN V OP | V58K1234X |
| (11) | HYD SYS 3 ME/TVC ISLN V OP | V58K1334X |
| (12) | MPS TVC ISO VLV CLOSE TIMER | (INTERNAL) |

Step 6. This step terminates the close commands to the hydraulic system MPS TVC isolation valves.

Monitor the following signal:

| | | |
|-----|-----------------------------|------------|
| (a) | MPS TVC ISO VLV CLOSE TIMER | (INTERNAL) |
|-----|-----------------------------|------------|

If less than 5 seconds have elapsed since (a) started, return to Step 1.

If 5 or more seconds have elapsed since (a) started, on first pass, set (1) through (8) false and proceed to Step 7. On subsequent passes, return to Step 1.

| | | |
|-----|-------------------------------------|-----------|
| (1) | HYD SYS 1 ME/TVC ISLN V OP/CL ENA A | V58K1129X |
| (2) | HYD SYS 1 ME/TVC ISLN V OP/CL ENA B | V58K1132X |
| (3) | HYD SYS 1 ME/TVC ISLN V CL | V58K1135X |
| (4) | HYD SYS 2 ME/TVC ISLN V OP/CL ENA A | V58K1229X |
| (5) | HYD SYS 2 ME/TVC ISLN V OP/CL ENA B | V58K1232X |
| (6) | HYD SYS 2 ME/TVC ISLN V CL | V58K1235X |
| (7) | HYD SYS 3 ME/TVC ISLN V OP/CL ENA B | V58K1332X |
| (8) | HYD SYS 3 ME/TVC ISLN V CL | V58K1335X |

Step 7. This step provides a flag for priority rate limiting if all three MPS TVC isolation valves are not closed after being commanded closed.

Monitor the following signals:

| | | |
|-----|---------------------------------------|------------|
| (a) | HYD SYS 1 ME/TVC ISLN V OP IND | V58X1136X |
| (b) | HYD SYS 2 ME/TVC ISLN V OP IND | V58X1236X |
| (c) | HYD SYS 3 ME/TVC ISLN V OP IND | V58X1336X |
| (d) | FA1 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2845X |
| (e) | FA2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (f) | FA3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (g) | MPS TVC ISO VLV OPEN COUNTER | (INTERNAL) |

If (a) or (d) is true, increment (g) by 1 and proceed to monitor (b) and (e). Otherwise proceed to monitor (b) and (e).

If (b) or (e) is true, increment (g) by 1 and proceed to monitor (c) and (f). Otherwise proceed to monitor (c) and (f).

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If (c) or (f) is true, increment (g) by 1 and proceed to monitor (g). Otherwise proceed to monitor (g).

If (g) < 1, then set (1) and (2) false and proceed to Step 1. Otherwise set (1) true, set (2) false, and return to Step 1.

- | | | |
|-----|----------------------------|------------|
| (1) | PRL TVC ISO VLV OPEN FLAG | V90X5522X |
| (2) | SSME REPOSITION START FLAG | (INTERNAL) |

Step 8. This step opens the hydraulic system 1 isolation valve for extension of the landing gear in MM 603 and MM 305.

Monitor the following signals:

- | | | |
|-----|--|-----------|
| (a) | MAJOR MODE 603 FLAG | V93X0013X |
| (b) | MAJOR MODE 305 FLAG | V90X8162X |
| (c) | GROUND REL VELOCITY MAGNITUDE IN M50 SYS | V95L0151C |

If (a) or (b) is true, and (c) is \leq 800 fps, on first pass, set (1) true, start (2), and return to Step 1. On subsequent passes, proceed to Step 9. Otherwise, return to Step 1.

- | | | |
|-----|---------------------------------|------------|
| (1) | HYDR SYS 1 LDG GR ISLN VLV OPEN | V58K0195X |
| (2) | LND GEAR ISO VLV OP CMD TIMER | (INTERNAL) |

Step 9. This step terminates the hydraulic system 1 landing gear isolation valve open command.

Monitor the following signal:

- | | | |
|-----|-------------------------------|------------|
| (a) | LND GEAR ISO VLV OP CMD TIMER | (INTERNAL) |
|-----|-------------------------------|------------|

If less than 5 seconds have elapsed since (a) started, proceed to Step 10.

If 5 or more seconds have elapsed since (a) started, set (1) false, and proceed to Step 10.

- | | | |
|-----|---------------------------------|-----------|
| (1) | HYDR SYS 1 LDG GR ISLN VLV OPEN | V58K0195X |
|-----|---------------------------------|-----------|

Step 10. This step opens the hydraulic system brake isolation valves.

Monitor the following signal:

- | | | |
|-----|-------------------------|-----------|
| (a) | BRAKE ISO VLV OPEN FLAG | V96X0060X |
|-----|-------------------------|-----------|

If (a) is true, on first pass, set (1), (2), and (3) true, start (4) and return to Step 1. On subsequent passes, proceed to Step 11. Otherwise, return to Step 1.

- | | | |
|-----|-------------------------------|------------|
| (1) | HYD SYS 1 BRAKE ISLN VLV OPEN | V58K0197X |
| (2) | HYD SYS 2 BRAKE ISLN VLV OPEN | V58K0295X |
| (3) | HYD SYS 3 BRAKE ISLN VLV OPEN | V58K0395X |
| (4) | BRAKE ISO VLV OP CMD TIMER | (INTERNAL) |

Step 11. This step terminates the hydraulic system brake isolation valves open commands.

Monitor the following signal:

(a) BRAKE ISO VLV OP CMD TIMER (INTERNAL)

If less than 5 seconds have elapsed since (a) started, return to Step 1.

If 5 or more seconds have elapsed since (a) started, terminate (1), (2), and (3), and return to Step 1.

| | | |
|-----|-------------------------------|-----------|
| (1) | HYD SYS 1 BRAKE ISLN VLV OPEN | V58K0197X |
| (2) | HYD SYS 2 BRAKE ISLN VLV OPEN | V58K0295X |
| (3) | HYD SYS 3 BRAKE ISLN VLV OPEN | V58K0395X |

LANDING GEAR VALVE CONTROL INITIATION

| <u>NOMENCLATURE</u> | <u>INITIAL VALUE</u> | <u>UNITS</u> |
|---------------------------------|----------------------|--------------|
| SSME REPOSITION START FLAG | OFF | |
| MPS TVC VLV OPEN TIMER | 0.0 | SEC |
| MPS TVC ISO VLV CLOSE TIMER | 0.0 | SEC |
| MPS TVC ISO VLV OPEN COUNTER | 0 | |
| LND GEAR ISO VLV OP CMD TIMER | 0.0 | SEC |
| BRAKE ISO VLV OP CMD TIMER | 0.0 | SEC |
| SSME REPOSITION STOP FLAG | OFF | |
| DRAG CHUTE GIMBAL POSITION FLAG | OFF | |
| PRL TVC ISO VLV OPEN FLAG | OFF | |
| HYD MPS TVC SYS UNAVAIL CTR | 0 | |
| HYD SYS CTR | 0 | |
| HYD SYS 1 AVAIL | TRUE | |
| HYD SYS 2 AVAIL | TRUE | |
| HYD SYS 3 AVAIL | TRUE | |

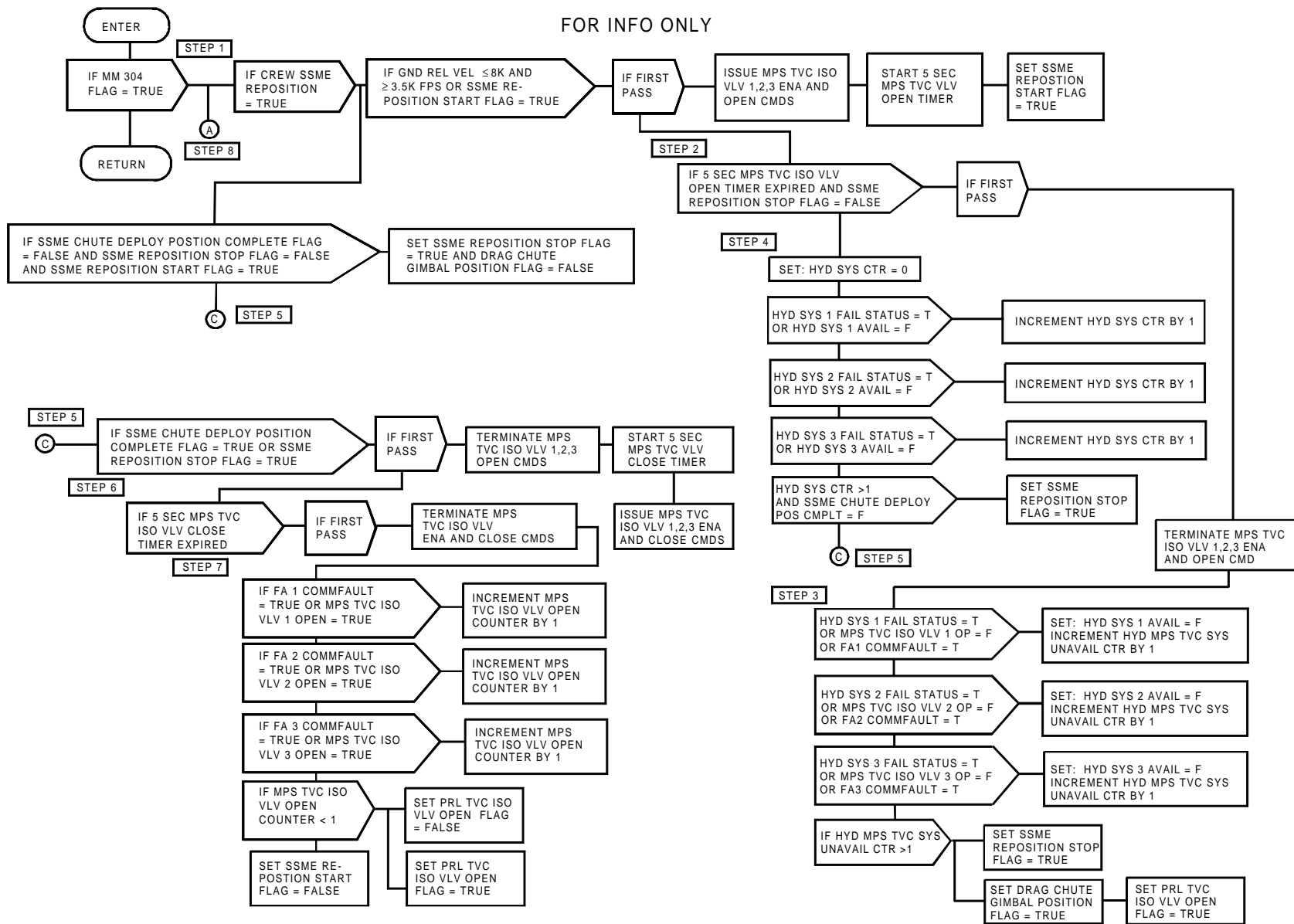


FIGURE 4.215.(1) Hydraulic Systems Landing Gear Isolation Valve Control Logic (Sheet 1 of 2)

FOR INFO ONLY

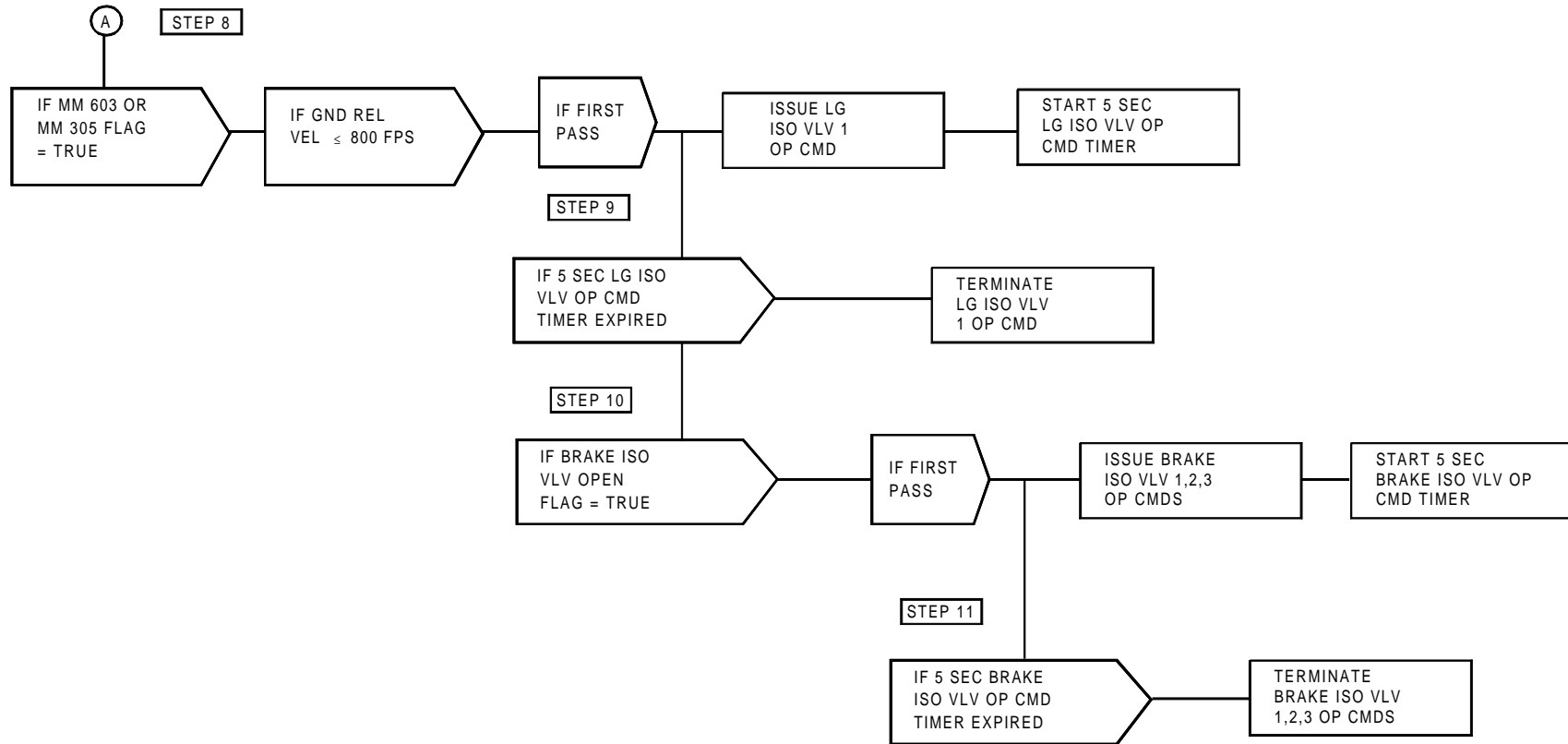


FIGURE 4.215.(2) Hydraulic Systems Landing Gear Isolation Valve Control Logic (Sheet 2 of 2)

TABLE 4.5.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR HYDRAULIC SYSTEM LNDG GEAR ISOLATION VLV CNTL SEQ
(G4.215)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------|------------|------------------------------------|-----------------|-------|-----------|------------------|---------|-------------|
| BRK_VLV_OP | V96X0060X | BRAKE ISO VLV OPEN FLAG | LANDING SOP | | BD | | 90102D | |
| 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 | * |
| MM_CODE_304/MM_304 | V90X8161X | MAJOR MODE 304 FLAG | MSC | | | | 92355B | |
| MM_CODE_305/MM_305 | V90X8162X | MAJOR MODE 305 FLAG | MSC | | | | 92355B | |
| MM_CODE_603/MM_603 | V90X8122X | MAJOR MODE 603 FLAG | MSC | | | | 92355B | |
| REL_VEL_MAG | V95L0151CA | GND REL VEL MAGNITUDE IN M50 SYS | RTLS UPP | FT/S | SPL | | 93017G | * |
| REL_VEL_MAG/V | V95L0151CC | GND REL VEL MAGNITUDE IN M50 SYS | ENT UPP | FT/S | SPL | | 93017G | * |
| REL_VEL_MAG/V | V95L0151CD | GND REL VEL MAGNITUDE IN M50 SYS | TAEM UPP | FT/S | SPL | | 93017G | * |
| SSME_REPOS | V93X5480X | CREW SSME REPOSITION | OVERRIDE DISP | | BD | | 89991E | |
| SSME_REPOS_CMPLT | V95X1624X | SSME CHUTE DEPLOY POSITION CMPLT | MPS TVC CMD SOP | | BD | | 89991E | |
| | V58X1136X | HYD SYS1 ME/TVC ISLN V OP IND | HDWR | | | | 93017G | * |
| | V58X1236X | HYD SYS2 ME/TVC ISLN V OP IND | HDWR | | | | 93017G | * |
| | V58X1336X | HYD SYS3 ME/TVC ISLN V OP IND | HDWR | | | | 93017G | * |
| | V91X2845X | FA1 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 89991E | |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |

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

TABLE 4.5.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM HYDRAULIC SYSTEM LNDG GEAR ISOLATION VLV CNTL SEQ
(G4.215)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------------|-----------|------------------------------------|-----------------|-------|--------------|------------------|---------|-------------|
| PRL_TVC_ISOL_VLV_OP | V90X5522X | PRL TVC ISO VLV OPEN FLAG | AEROJET DAP | | | | 89991E | |
| SSME_GMBL_POS | V90X5521X | DRAG CHUTE GIMBAL POSITION FLAG | MPS TVC CMD SOP | | | | 89991E | |
| SSME_REPOS_STOP | V95X1623X | SSME REPOSITION STOP FLAG | GAX | | | | 89991E | |
| | V58K0195X | HYDR SYS 1 LDG GR ISLN VLV OPEN | HYDR SYS 1 | | BD | | | |
| | V58K0197X | HYDR SYS 1 BRAKE ISLN VLV OPEN | HYDR SYS 1 | | BD | | 90102D | |
| | V58K0295X | HYDR SYS 2 BRAKE ISLN VLV OPEN | HYDR SYS 2 | | BD | | 90102D | |
| | V58K0395X | HYDR SYS 3 BRAKE ISLN VLV OPEN | HYDR SYS 3 | | BD | | 90102D | |
| | V58K1129X | HYD SYS1 ME/TVC ISLN V OP/CL ENA A | HYDR SYS 1 | | | | 89991E | |
| | V58K1132X | HYD SYS1 ME/TVC ISLN V OP/CL ENA B | HYDR SYS 1 | | | | 89991E | |
| | V58K1134X | HYD SYS1 ME/TVC ISLN V OP | HYDR SYS 1 | | | | 89991E | |
| | V58K1135X | HYD SYS1 ME/TVC ISLN V CL | HYDR SYS 1 | | | | 89991E | |
| | V58K1229X | HYD SYS2 ME/TVC ISLN V OP/CL ENA A | HYDR SYS 2 | | | | 89991E | |
| | V58K1232X | HYD SYS2 ME/TVC ISLN V OP/CL ENA B | HYDR SYS 2 | | | | 89991E | |
| | V58K1234X | HYD SYS2 ME/TVC ISLN V OP | HYDR SYS 2 | | | | 89991E | |
| | V58K1235X | HYD SYS2 ME/TVC ISLN V CL | HYDR SYS 2 | | | | 89991E | |
| | V58K1332X | HYD SYS3 ME/TVC ISLN V OP/CL ENA | HYDR SYS 3 | | | | 89991E | |
| | V58K1334X | HYD SYS3 ME/TVC ISLN V OP | HYDR SYS 3 | | | | 89991E | |
| | V58K1335X | HYD SYS3 ME/TVC ISLN V CL | HYDR SYS 3 | | | | 89991E | |

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 4.5.1.4-3. HYDRAULIC SYSTEM LNDG GEAR ISOLATION VLV CNTL SEQ (G4.215) 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 4.5.1.4-4. HYDRAULIC SYSTEM LNDG GEAR ISOLATION VLV CNTL SEQ (G4.215) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD 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.

TABLE 4.5.1.4-5. HYDRAULIC SYSTEM LNDG GEAR ISOLATION VLV CNTL SEQ (G4.215) 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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4.6 REACTION CONTROL SYSTEM (RCS)

4.6.1 RCS/RCS Crossfeed and Reconfiguration (4.185)

4.6.1.1 Introduction

The RCS propellant crossfeed sequence is used during ascent/entry for contingencies where the crossfeed sequence enables propellants from one aft pod to feed the thrusters of both aft pods. The sequence is manually initiated by the crew positioning the RCS master crossfeed switch to the desired crossfeed configuration or automatically initiated by the RCS helium regulator failure protection sequence when an aft RCS helium regulator is failed closed and there is no OMS/RCS interconnect configured. The sequence is also initiated automatically by the abort OMS/RCS interconnect sequence at the completion of OMS/RCS reconnect sequencing if a crossfeed is being commanded either by the RCS master crossfeed switch or by the RCS helium regulator failure protection sequence.

The RCS propellant crossfeed reconfiguration sequence is used during ascent/entry to reconfigure the RCS propellant feed to normal after an RCS crossfeed sequence has been employed. The sequence is manually initiated by the crew positioning the master RCS crossfeed switch to OFF (center) position from one of the two crossfeed positions. RCS helium isolation valve control is a manual operation. During ascent and entry, jet firings will be limited whenever on auto crossfeed occurs except for RTLS ET separation.

On orbit, both the RCS propellant crossfeed and the RCS propellant crossfeed reconfiguration are performed manually by the crew. The crossfeed switch is monitored by SW RM to limit the number of RCS jets fired during crossfeed operation. The RCS jets are inhibited by the crew during system configuration in orbit.

4.6.1.2 Overview

The RCS crossfeed sequence initiation is dependent upon the master RCS crossfeed switch being placed in the desired crossfeed position, or upon the RCS helium regulator failure protection sequence selecting the desired crossfeed configuration automatically if the switch is in the OFF position. The RCS control switches should be in the GPC position.

The OMS crossfeed valves are commanded closed in the crossfeed portion of the sequence to prevent undesirable propellant transfer between OMS and RCS. If an OMS/RCS interconnect is in effect or being configured, the RCS/RCS crossfeed sequence will be reinitialized in order to accept future commands.

Left to Right Crossfeed. This sequence configures the aft RCS to feed the left pod propellants to both the left and right pod thrusters by performing the following functions:

- (a) Close the OMS left and right crossfeed valves, clear the OMS XFD B valve masks
- (b) Open the RCS left and right crossfeed valves
- (c) Open the left RCS tank isolation valves
- (d) Close the right RCS tank isolation valves

Right to Left Crossfeed. This sequence configures the aft RCS to feed the right pod propellants to both the left and right pod thrusters by performing the following functions:

- (a) Close the OMS left and right crossfeed valves, clear the OMS XFD B valve masks
- (b) Open the RCS left and right crossfeed valves
- (c) Open the right RCS tank isolation valves
- (d) Close the left RCS tank isolation valves

RCS Reconfiguration Sequence. This sequence initiation is dependent upon the master RCS crossfeed switch being in the OFF (center) position after being in one of the two crossfeed positions. All the RCS switches involved in this sequence should be in the GPC position.

The sequence reconfigures the left pod propellants to the left pod thrusters and the right pod propellants to the right pod thrusters after a crossfeed sequence has been terminated.

4.6.1.3 Detail Requirements

During ascent and entry, the scheduling and descheduling of this sequence are performed by moding, sequence, and control (MSC) based on a change in the master RCS crossfeed switch position or upon the RCS helium regulator failure protection sequence selecting the desired crossfeed configuration automatically and sequence completion flags.

Step 1. This step prevents the RCS crossfeed sequencer from running while an OMS/RCS interconnect is in effect or being configured.

The following signals are monitored:

- | | | |
|-----|-------------------------------|-----------|
| (a) | OMS/RCS INTERCONNECT COMMAND | V90X8312X |
| (b) | OMS/RCS INTERCONNECT COMPLETE | V90X8282X |

If (a) or (b) is true, then enable first pass indicators for subsequence A, B, and C and set (1) below true and (2) and (3) below false and return to Step 1.

If (a) and (b) are false, then proceed to Step 2.

- | | | |
|-----|---------------------------------|------------|
| (1) | RCS XFD RECONFIG SEQ COMPL FL | V90X1539X |
| (2) | RCS CROSSFEED SEQ COMPLETE FLAG | V90X1540X |
| (3) | POST SEQ CMD TERM FLAG | (INTERNAL) |

Step 2. This step determines whether the master RCS crossfeed switch or the automatic signals from the RCS helium regulator failure protection sequence are in control of selecting which crossfeed sequence is to be performed.

The following signals are monitored:

- | | | |
|-----|------------------------------------|-----------|
| (a) | SEL RCS MASTER CROSSFEED FROM LEFT | V90X7501X |
| (b) | SEL RCS MASTER CROSSFEED FROM RT | V90X7502X |

If (a) or (b) is true, set (1) and (2) below false and proceed to Step 3.

If (a) and (b) are false proceed to Step 3.

- | | | |
|-----|---------------------|-----------|
| (1) | FEED FROM LEFT RCS | V93X5199X |
| (2) | FEED FROM RIGHT RCS | V93X5200X |

Step 3. This step initiates and controls the left to right RCS crossfeed.

The following signals are monitored:

- | | | |
|-----|------------------------------------|-----------|
| (a) | SEL RCS MASTER CROSSFEED FROM LEFT | V90X7501X |
| (b) | FEED FROM LEFT RCS | V93X5199X |

If (a) and (b) are false, proceed to Step 4.

If (a) or (b) is true and it is not first pass, proceed to Subsequence A.

If (a) or (b) is true and it is first pass, enable all first-pass indicators for Subsequences B and C, set (1) and (2) false, and proceed to Subsequence A.

- | | | |
|-----|---------------------------------|-----------|
| (1) | RCS CROSSFEED SEQ COMPLETE FLAG | V90X1540X |
| (2) | RCS XFD RECONFIG SEQ COMPL FLAG | V90X1539X |

Step 4. This step initiates and controls the right to left RCS crossfeed.

The following signals are monitored:

- | | | |
|-----|----------------------------------|-----------|
| (a) | SEL RCS MASTER CROSSFEED FROM RT | V90X7502X |
| (b) | FEED FROM RIGHT RCS | V93X5200X |

If (a) and (b) are false, proceed to Step 5.

If (a) or (b) is true and it is not first pass, proceed to Subsequence C.

If (a) or (b) is true and it is first pass, enable all first-pass indicators for Subsequences A and B, set (1) and (2) false, and proceed to Subsequence C.

- | | | |
|-----|---------------------------------|-----------|
| (1) | RCS CROSSFEED SEQ COMPLETE FLAG | V90X1540X |
| (2) | RCS XFD RECONFIG SEQ COMPL FL | V90X1539X |

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Step 5. This step initiates and controls the reconfiguration to normal RCS propellant feed.

The following signals are monitored:

- | | | |
|-----|------------------------------------|-----------|
| (a) | SEL RCS MASTER CROSSFEED FROM LEFT | V90X7501X |
| (b) | SEL RCS MASTER CROSSFEED FROM RT | V90X7502X |
| (c) | FEED FROM LEFT RCS | V93X5199X |
| (d) | FEED FROM RIGHT RCS | V93X5200X |

If (a) or (b) or (c) or (d) is true, return to Step 1.

If (a) and (b) and (c) and (d) are all false, and if not first pass, proceed to Subsequence B.

If (a) and (b) and (c) and (d) are all false and it is first pass, enable first-pass indicators for Subsequences A and C, set (1) and (2) false, and proceed to Subsequence B.

- | | | |
|-----|---------------------------------|-----------|
| (1) | RCS CROSSFEED SEQ COMPLETE FLAG | V90X1540X |
| (2) | RCS XFD RECONFIG SEQ COMPL FL | V90X1539X |

Subsequence A

Subsequence A is the left to right RCS crossfeed sequence and is manually initiated when the crew places the master RCS crossfeed switch in the FEED FROM LEFT position or automatically initiated when the RCS helium regulator failure protection sequence selects a FEED FROM LEFT RCS due to a right RCS helium regulator being failed closed.

Step A1. This step controls the removal or termination of all required MDM outputs in preparation for subsequent use in the sequence or provides a return if the sequence has been completed.

The following signals are monitored:

- | | | |
|-----|---------------------------------|------------|
| (a) | RCS CROSSFEED SEQ COMPLETE FLAG | V90X1540X |
| (b) | POST SEQ CMD TERM FLAG | (INTERNAL) |

If (a) is true and (b) is true, proceed to Subsequence E.

If (a) is true and (b) is false, return to Step 1.

If (a) is false and it is first pass, proceed to Subsequence E.

If (a) is false and it is not first pass, proceed to Step A3.

Step A2. Deleted.

Step A3. This step is used to command the OMS left and right crossfeed valves closed to prevent propellant flow between the RCS and OMS and to clear the OMS XFD B masks.

Issue (1) through (12) and set (13) through (16) to false then return to Step 1 until at least 1.5 seconds have elapsed, and proceed to Step A4.

| | |
|--------------------------------------|-----------|
| (1) OMS L POD XFD VLVS A CMD 1 CL | V43K4283X |
| (2) OMS L POD OX XFD VLV A CMD 2 CL | V43K4285X |
| (3) OMS L POD XFD VLVS B CMD 1 CL | V43K4287X |
| (4) OMS L POD OX XFD VLV B CMD 2 CL | V43K4289X |
| (5) OMS L POD FU XFD VLV A CMD 2 CL | V43K4385X |
| (6) OMS L POD FU XFD VLV B CMD 2 CL | V43K4389X |
| (7) OMS R POD XFD VLVS A CMD 1 CL | V43K5283X |
| (8) OMS R POD OX XFD VLV A CMD 2 CL | V43K5285X |
| (9) OMS R POD XFD VLVS B CMD 1 CL | V43K5287X |
| (10) OMS R POD OX XFD VLV B CMD 2 CL | V43K5289X |
| (11) OMS R POD FU XFD VLV A CMD 2 CL | V43K5385X |
| (12) OMS R POD FU XFD VLV B CMD 2 CL | V43K5389X |
| (13) OMS-L POD OX XFD B MASK | V99X0016X |
| (14) OMS-L POD FU XFD B MASK | V99X0017X |
| (15) OMS-R POD OX XFD B MASK | V99X0018X |
| (16) OMS-R POD FU XFD B MASK | V99X0019X |

Step A4. This step is used to command the RCS left and right crossfeed valves open.

Issue the following commands, return to Step 1 until at least 1.5 seconds have elapsed, then continue to Step A5.

| | |
|-----------------------------------|-----------|
| RCS L AFT XFD VLV-1/2 GPC OP A | V42K2402X |
| RCS L AFT OX XFD V-1/2 GPC OP B | V42K2403X |
| RCS L AFT FU XFD V-1/2 GPC OP B | V42K2404X |
| RCS L AFT XFD VLV-3/4/5 GPC OP A | V42K2408X |
| RCS L AFT OX XFD V-3/4/5 GPC OP B | V42K2409X |
| RCS L AFT FU XFD V-3/4/5 GPC OP B | V42K2410X |
| RCS R AFT XFD VLV-1/2 GPC OP A | V42K3402X |
| RCS R AFT OX XFD V-1/2 GPC OP B | V42K3403X |
| RCS R AFT FU XFD V-1/2 GPC OP B | V42K3404X |
| RCS R AFT XFD VLV-3/4/5 GPC OP A | V42K3408X |
| RCS R AFT OX XFD V-3/4/5 GPC OP B | V42K3409X |
| RCS R AFT FU XFD V-3/4/5 GPC OP B | V42K3410X |

Step A5. This step is used to command the left RCS propellant tank isolation valves open.

Issue the following commands, return to Step 1 until at least 1.5 seconds have elapsed, then proceed to Step A6.

| | |
|--------------------------------------|-----------|
| RCS L AFT TK ISLN V-1/2 GPC OP A | V42K2342X |
| RCS L AFT OX TK ISLN V-1/2 GPC OP B | V42K2343X |
| RCS L AFT FU TK ISLN V-1/2 GPC OP B | V42K2344X |
| RCS L AFT OX TK ISLN V-3/4/5A GPC OP | V42K2346X |

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| | |
|--------------------------------------|-----------|
| RCS L AFT FU TK ISLN V-3/4/5A GPC OP | V42K2347A |
| RCS L AFT OX TK ISLN V-3/4/5B GPC OP | V42K2349X |
| RCS L AFT FU TK ISLN V-3/4/5B GPC OP | V42K2350X |

Step A6. This step is used to command the right tank isolation valves closed for left to right crossfeed.

Issue the following commands and return to Step 1 until at least 1.5 seconds have elapsed; then set (1) and (2) below true and return to Step 1.

| | |
|--------------------------------------|-----------|
| RCS R AFT TK ISLN V-1/2 GPC CL A | V42K3353X |
| RCS R AFT OX TK ISLN V-1/2 GPC CL B | V42K3354X |
| RCS R AFT FU TK ISLN V-1/2 GPC CL B | V42K3355X |
| RCS R AFT OX TK ISLN V-3/4/5A GPC CL | V42K3357X |
| RCS R AFT FU TK ISLN V-3/4/5A GPC CL | V42K3358X |
| RCS R AFT OX TK ISLN V-3/4/5B GPC CL | V42K3360X |
| RCS R AFT FU TK ISLN V-3/4/5B GPC CL | V42K3361X |

| | |
|--|------------|
| (1) RCS CROSSFEED SEQUENCE COMPLETE FLAG | V90X1540X |
| (2) POST SEQ CMD TERM FLAG | (INTERNAL) |

Subsequence B

During ascent and entry, Subsequence B is the reconfiguration sequence and is manually initiated when the crew places the master RCS crossfeed switch in the OFF position after it has been in one of the two crossfeed positions.

Step B1. This step controls the removal or termination of all required MDM outputs in preparation for subsequent use in the sequence.

The following signals are monitored:

| | |
|-----------------------------------|------------|
| (a) RCS XFD RECONFIG SEQ COMPL FL | V90X1539X |
| (b) POST SEQ CMD TERM FLAG | (INTERNAL) |

If (a) is true and (b) is true, proceed to Subsequence E.

If (a) is true and (b) is false, return to Step 1.

If (a) is false and it is first pass, proceed to Subsequence E.

If (a) is false and it is not first pass, proceed to Step B2.

Step B2. This step is used to command the RCS left and right propellant tank isolation valves open.

Issue the following commands, return to Step 1 until at least 1.5 seconds have elapsed, then proceed to Step B3.

| | |
|--------------------------------------|-----------|
| RCS L AFT TK ISLN V 1/2 GPC OP A | V42K2342X |
| RCS L AFT OX TK ISLN V 1/2 GPC OP B | V42K2343X |
| RCS L AFT FU TK ISLN V 1/2 GPC OP B | V42K2344X |
| RCS L AFT OX TK ISLN V 3/4/5A GPC OP | V42K2346X |
| RCS L AFT FU TK ISLN V 3/4/5A GPC OP | V42K2347X |
| RCS L AFT OX TK ISLN V 3/4/5B GPC OP | V42K2349X |
| RCS L AFT FU TK ISLN V 3/4/5B GPC OP | V42K2350X |
| RCS R AFT TK ISLN V 1/2 GPC OP A | V42K3342X |
| RCS R AFT OX TK ISLN V 1/2 GPC OP B | V42K3343X |
| RCS R AFT FU TK ISLN V 1/2 GPC OP B | V42K3344X |
| RCS R AFT OX TK ISLN V 3/4/5A GPC OP | V42K3346X |
| RCS R AFT FU TK ISLN V 3/4/5A GPC OP | V42K3347X |
| RCS R AFT OX TK ISLN V 3/4/5B GPC OP | V42K3349X |
| RCS R AFT FU TK ISLN V 3/4/5B GPC OP | V42K3350X |

Step B3. This step is used to command the RCS left and right crossfeed valves closed.

Issue the following commands and return to Step 1 until at least 1.5 seconds have elapsed; then set (1) and (2) below true and return to Step 1.

| | |
|-----------------------------------|------------|
| RCS L AFT XFD V 1/2 GPC CL A | V42K2416X |
| RCS L AFT OX XFD V 1/2 GPC CL B | V42K2418X |
| RCS L AFT FU XFD V 1/2 GPC CL B | V42K2422X |
| RCS L AFT XFD V 3/4/5 GPC CL A | V42K2428X |
| RCS L AFT OX XFD V 3/4/5 GPC CL B | V42K2430X |
| RCS L AFT FU XFD V 3/4/5 GPC CL B | V42K2434X |
| RCS R AFT XFD V 1/2 GPC CL A | V42K3416X |
| RCS R AFT OX XFD V 1/2 GPC CL B | V42K3418X |
| RCS R AFT FU XFD V 1/2 GPC CL B | V42K3422X |
| RCS R AFT OX XFD V 3/4/5 GPC CL B | V42K3430X |
| RCS R AFT FU XFD V 3/4/5 GPC CL B | V42K3434X |
| RCS R AFT XFD V 3/4/5 GPC CL A | V42K3428X |
| (1) POST SEQ CMD TERM FLAG | (INTERNAL) |
| (2) RCS XFD RECONFIG SEQ COMPL FL | V90X1539X |

Subsequence C

Subsequence C is the right to left RCS crossfeed sequence and is manually initiated when the crew places the master RCS crossfeed switch in the FEED FROM RIGHT position or automatically initiated when the RCS helium regulator protection sequence selects a FEED FROM RIGHT RCS due to a left RCS helium regulator being failed closed.

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Step C1. This step controls the removal or termination of all required MDM outputs in preparation for subsequent use in the sequence or provides a return if the sequence has been completed.

The following signals are monitored:

- | | | |
|-----|---------------------------------|------------|
| (a) | RCS CROSSFEED SEQ COMPLETE FLAG | V90X1540X |
| (b) | POST SEQ CMD TERM FLAG | (INTERNAL) |

If (a) is true and (b) is true, proceed to Subsequence E.

If (a) is true and (b) is false, return to Step 1.

If (a) is false and it is first pass, proceed to Subsequence E.

If (a) is false and it is not first pass, proceed to Step C3.

Step C2. Deleted.

Step C3. This step is used to command the OMS left and right crossfeed valves closed to prevent propellant flow between the RCS and OMS and to clear the OMS XFD B masks.

Issue (1) through (12) and set (13) through (16) to false then return to Step 1 until at least 1.5 seconds have elapsed, and proceed to Step C4.

- | | | |
|------|---------------------------------|-----------|
| (1) | OMS L POD XFD VLVS A CMD 1 CL | V43K4283X |
| (2) | OMS L POD OX XFD VLV A CMD 2 CL | V43K4285X |
| (3) | OMS L POD XFD VLVS B CMD 1 CL | V43K4287X |
| (4) | OMS L POD OX XFD VLV B CMD 2 CL | V43K4289X |
| (5) | OMS L POD FU XFD VLV B CMD 2 CL | V43K4385X |
| (6) | OMS L POD FU XFD VLV B CMD 2 CL | V43K4389X |
| (7) | OMS R POD XFD VLVS A CMD 1 CL | V43K5283X |
| (8) | OMS R POD OX XFD VLV A CMD 2 CL | V43K5285X |
| (9) | OMS R POD XFD VLVS B CMD 1 CL | V43K5287X |
| (10) | OMS R POD OX XFD VLV B CMD 2 CL | V43K5289X |
| (11) | OMS R POD FU XFD VLV A CMD 2 CL | V43K5385X |
| (12) | OMS R POD FU XFD VLV B CMD 2 CL | V43K5389X |
| (13) | OMS-L POD OX XFD B MASK | V99X0016X |
| (14) | OMS-L POD FU XFD B MASK | V99X0017X |
| (15) | OMS-R POD OX XFD B MASK | V99X0018X |
| (16) | OMS-R POD FU XFD B MASK | V99X0019X |

Step C4. This step is used to command the RCS left and right crossfeed valves open.

Issue the following commands and return to Step 1 until at least 1.5 seconds have elapsed; then continue to Step C5.

| | |
|-----------------------------------|-----------|
| RCS L AFT XFD VLV-1/2 GPC OP A | V42K2402X |
| RCS L AFT OX XFD V-1/2 GPC OP B | V42K2403X |
| RCS L AFT FU XFD V-1/2 GPC OP B | V42K2404X |
| RCS L AFT XFD VLV-3/4/5 GPC OP A | V42K2408X |
| RCS L AFT OX XFD V-3/4/5 GPC OP B | V42K2409X |
| RCS L AFT FU XFD V-3/4/5 GPC OP B | V42K2410X |
| RCS R AFT XFD VLV-1/2 GPC OP A | V42K3402X |
| RCS R AFT OX XFD V-1/2 GPC OP B | V42K3403X |
| RCS R AFT FU XFD V-1/2 GPC OP B | V42K3404X |
| RCS R AFT XFD VLV-3/4/5 GPC OP A | V42K3408X |
| RCS R AFT OX XFD V-3/4/5 GPC OP B | V42K3409X |
| RCS R AFT FU XFD V-3/4/5 GPC OP B | V42K3410X |

Step C5. This step is used to command the right RCS propellant tank isolation valves open.

Issue the following commands, return to Step 1 until at least 1.5 seconds have elapsed, then proceed to Step C6.

| | |
|--------------------------------------|-----------|
| RCS R AFT TK ISLN V-1/2 GPC OP A | V42K3342X |
| RCS R AFT OX TK ISLN V-1/2 GPC OP B | V42K3343X |
| RCS R AFT FU TK ISLN V-1/2 GPC OP B | V42K3344X |
| RCS R AFT OX TK ISLN V-3/4/5A GPC OP | V42K3346X |
| RCS R AFT FU TK ISLN V-3/4/5A GPC OP | V42K3347X |
| RCS R AFT OX TK ISLN V-3/4/5B GPC OP | V42K3349X |
| RCS R AFT FU TK ISLN V-3/4/5B GPC OP | V42K3350X |

Step C6. This step is used to command the left tank isolation valves closed for right to left crossfeed.

Issue the following commands and return to Step 1 until at least 1.5 seconds have elapsed; then set (1) and (2) below true and return to Step 1.

| | |
|--------------------------------------|------------|
| RCS L AFT TK ISLN V-1/2 GPC CL A | V42K2353X |
| RCS L AFT OX TK ISLN V-1/2 GPC CL B | V42K2354X |
| RCS L AFT FU TK ISLN V-1/2 GPC CL B | V42K2355X |
| RCS L AFT OX TK ISLN V-3/4/5A GPC CL | V42K2357X |
| RCS L AFT FU TK ISLN V-3/4/5A GPC CL | V42K2358X |
| RCS L AFT OX TK ISLN V-3/4/5B GPC CL | V42K2360X |
| RCS L AFT FU TK ISLN V-3/4/5B GPC CL | V42K2361X |
| (1) RCS CROSSFEED SEQ COMPLETE FLAG | V90X1540X |
| (2) POST SEQ CMD TERM FLAG | (INTERNAL) |

Subsequence D

Deleted.

Subsequence E

Step E1. This subsequence is used to establish a known configuration of the valve commands at the start of each crossfeed or reconfiguration sequence. Terminate the following commands:

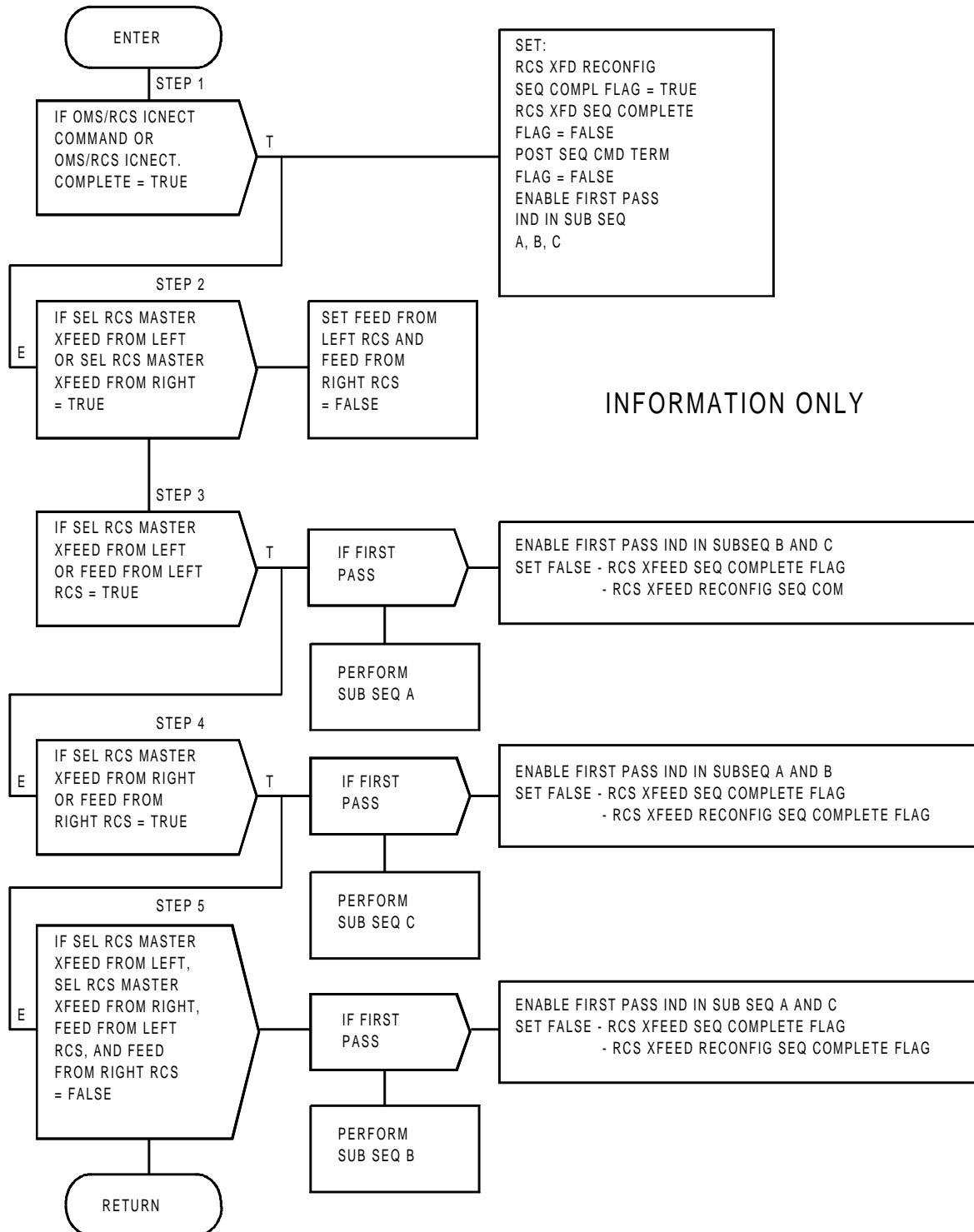
| | |
|--------------------------------------|-----------|
| RCS-L AFT TK ISLN V-1/2 GPC OP A | V42K2342X |
| RCS-L AFT OX TK ISLN V-1/2 GPC OP B | V42K2343X |
| RCS-L AFT FU TK ISLN V-1/2 GPC OP B | V42K2344X |
| RCS-L AFT OX TK ISLN V-3/4/5A GPC OP | V42K2346X |
| RCS-L AFT FU TK ISLN V-3/4/5A GPC OP | V42K2347X |
| RCS-L AFT OX TK ISLN V-3/4/5B GPC OP | V42K2349X |
| RCS-L AFT FU TK ISLN V-3/4/5B GPC OP | V42K2350X |
| RCS-L AFT TK ISLN V-1/2 GPC CL A | V42K2353X |
| RCS-L AFT OX TK ISLN V-1/2 GPC CL B | V42K2354X |
| RCS-L AFT FU TK ISLN V-1/2 GPC CL B | V42K2355X |
| RCS-L AFT OX TK ISLN V-3/4/5A GPC CL | V42K2357X |
| RCS-L AFT FU TK ISLN V-3/4/5A GPC CL | V42K2358X |
| RCS-L AFT OX TK ISLN V-3/4/5B GPC CL | V42K2360X |
| RCS-L AFT FU TK ISLN V-3/4/5B GPC CL | V42K2361X |
| RCS-L AFT XFD VLV-1/2 GPC OP A | V42K2402X |
| RCS-L AFT OX XFD V-1/2 GPC OP B | V42K2403X |
| RCS-L AFT FU XFD V-1/2 GPC OP B | V42K2404X |
| RCS-AFT XFD VLV-3/4/5 GPC OP A | V42K2408X |
| RCS-L AFT OX XFD V-3/4/5 GPC OP B | V42K2409X |
| RCS-L AFT FU XFD V-3/4/5 GPC OP B | V42K2410X |
| RCS-L AFT XFD V-1/2 GPC CL A | V42K2416X |
| RCS-L AFT OX XFD V-1/2 GPC CL B | V42K2418X |
| RCS-L AFT FU XFD V-1/2 GPC CL B | V42K2422X |
| RCS-L AFT XFD V-3/4/5 GPC CL A | V42K2428X |
| RCS-L AFT OX XFD V-3/4/5 GPC CL B | V42K2430X |
| RCS-L AFT FU XFD V-3/4/5 GPC CL B | V42K2434X |
| RCS-R AFT TK ISLN V-1/2 GPC OP A | V42K3342X |
| RCS-R AFT OX TK ISLN V-1/2 GPC OP B | V42K3343X |
| RCS-R AFT FU TK ISLN V-1/2 GPC OP B | V42K3344X |
| RCS-R AFT OX TK ISLN V-3/4/5A GPC OP | V42K3346X |
| RCS-R AFT FU TK ISLN V-3/4/5A GPC OP | V42K3347X |
| RCS-R AFT OX TK ISLN V-3/4/5B GPC OP | V42K3349X |
| RCS-R AFT FU TK ISLN V-3/4/5B GPC OP | V42K3350X |
| RCS-R AFT TK ISLN V-1/2 GPC CL A | V42K3353X |
| RCS-R AFT OX TK ISLN V-1/2 GPC CL B | V42K3354X |
| RCS-R AFT FU TK ISLN V-1/2 GPC CL B | V42K3355X |
| RCS-R AFT OX TK ISLN V-3/4/5A GPC CL | V42K3357X |
| RCS-R AFT FU TK ISLN V-3/4/5A GPC CL | V42K3358X |
| RCS-R AFT OX TK ISLN V-3/4/5B GPC CL | V42K3360X |
| RCS-R AFT FU TK ISLN V-3/4/5B GPC CL | V42K3361X |
| RCS-R AFT XFD VLV-1/2 GPC OP A | V42K3402X |
| RCS-R AFT OX XFD V-1/2 GPC OP B | V42K3403X |
| RCS-R AFT FU XFD V-1/2 GPC OP B | V42K3404X |
| RCS-R AFT XFD VLV-3/4/5 GPC OP A | V42K3408X |
| RCS-R AFT OX XFD V-3/4/5 GPC OP B | V42K3409X |

| | |
|------------------------------------|-----------|
| RCS-R AFT FU XFD V-3/4/5 GPC OP B | V42K3410X |
| RCS-R AFT XFD V-1/2 GPC CL A | V42K3416X |
| RCS-R AFT OX XFD V-1/2 GPC CL B | V42K3418X |
| RCS-R AFT FU XFD V-1/2 GPC CL B | V42K3422X |
| RCS-R AFT XFD V-3/4/5 GPC CL A | V42K3428X |
| RCS-R AFT OX XFD V-3/4/5 GPC CL B | V42K3430X |
| RCS-R AFT FU XFD V-3/4/5 GPC CL B | V42K3434X |
| OMS-L POD XFD VLVS A CMD 1 OP | V43K4282X |
| OMS-L POD XFD VLVS A CMD 1 CL | V43K4283X |
| OMS-L POD OXDZR XFD VLV A CMD 2 OP | V43K4284X |
| OMS-L POD OXDZR XFD VLV A CMD 2 CL | V43K4285X |
| OMS-L POD XFD VLVS B CMD 1 OP | V43K4286X |
| OMS-L POD XFD VLVS B CMD 1 CL | V43K4287X |
| OMS-L POD OXDZR XFD VLV B CMD 2 OP | V43K4288X |
| OMS-L POD OXDZR XFD VLV B CMD 2 CL | V43K4289X |
| OMS-L POD FUEL XFD VLV A CMD 2 OP | V43K4384X |
| OMS-L POD FUEL XFD VLV A CMD 2 CL | V43K4385X |
| OMS-L POD FUEL XFD VLV B CMD 2 OP | V43K4388X |
| OMS-L POD FUEL XFD VLV B CMD 2 CL | V43K4389X |
| OMS-R POD XFD VLVS A CMD 1 OP | V43K5282X |
| OMS-R POD XFD VLVS A CMD 1 CL | V43K5283X |
| OMS-R POD OXDZR XFD VLV A CMD 2 OP | V43K5284X |
| OMS-R POD OXDZR XFD VLV A CMD 2 CL | V43K5285X |
| OMS-R POD XFD VLVS B CMD 1 OP | V43K5286X |
| OMS-R POD XFD VLVS B CMD 1 CL | V43K5287X |
| OMS-R POD OXDZR XFD VLV B CMD 2 OP | V43K5288X |
| OMS-R POD OXDZR XFD VLV B CMD 2 CL | V43K5289X |
| OMS-R POD FUEL XFD VLV A CMD 2 OP | V43K5384X |
| OMS-R POD FUEL XFD VLV A CMD 2 CL | V43K5385X |
| OMS-R POD FUEL XFD VLV B CMD 2 OP | V43K5388X |
| OMS-R POD FUEL XFD VLV B CMD 2 CL | V43K5389X |

When all commands above have been terminated, the following signal is set false, and the sequence returns to Step 1.

(1) POST SEQ CMD TERM FLAG

(INTERNAL)



INFORMATION ONLY

FIGURE 4.185.(1) RCS/RCS XFEED (Sheet 1 of 5)

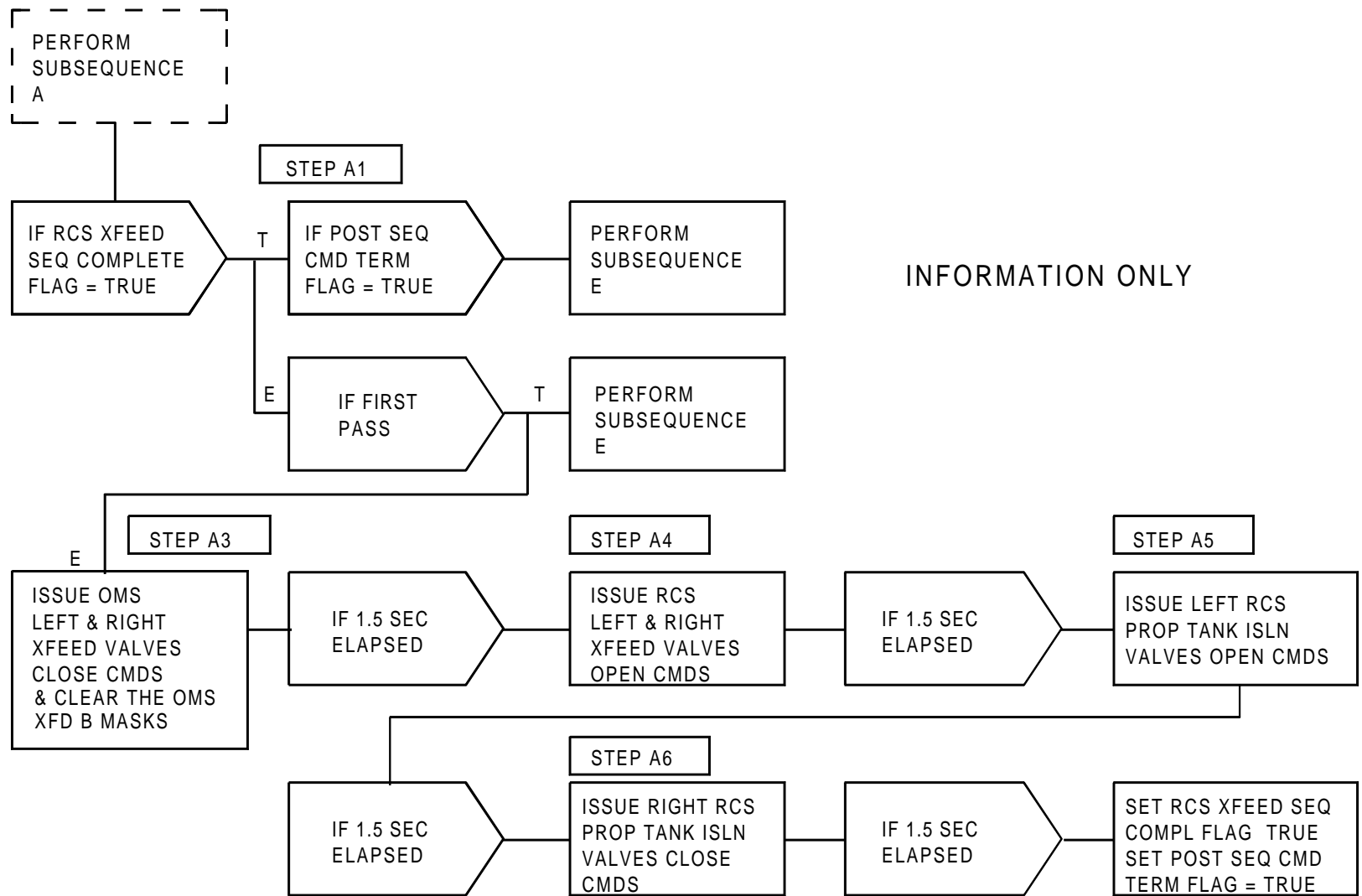


FIGURE 4.185.(2) RCS/RCS XFEED (Sheet 2 of 5)

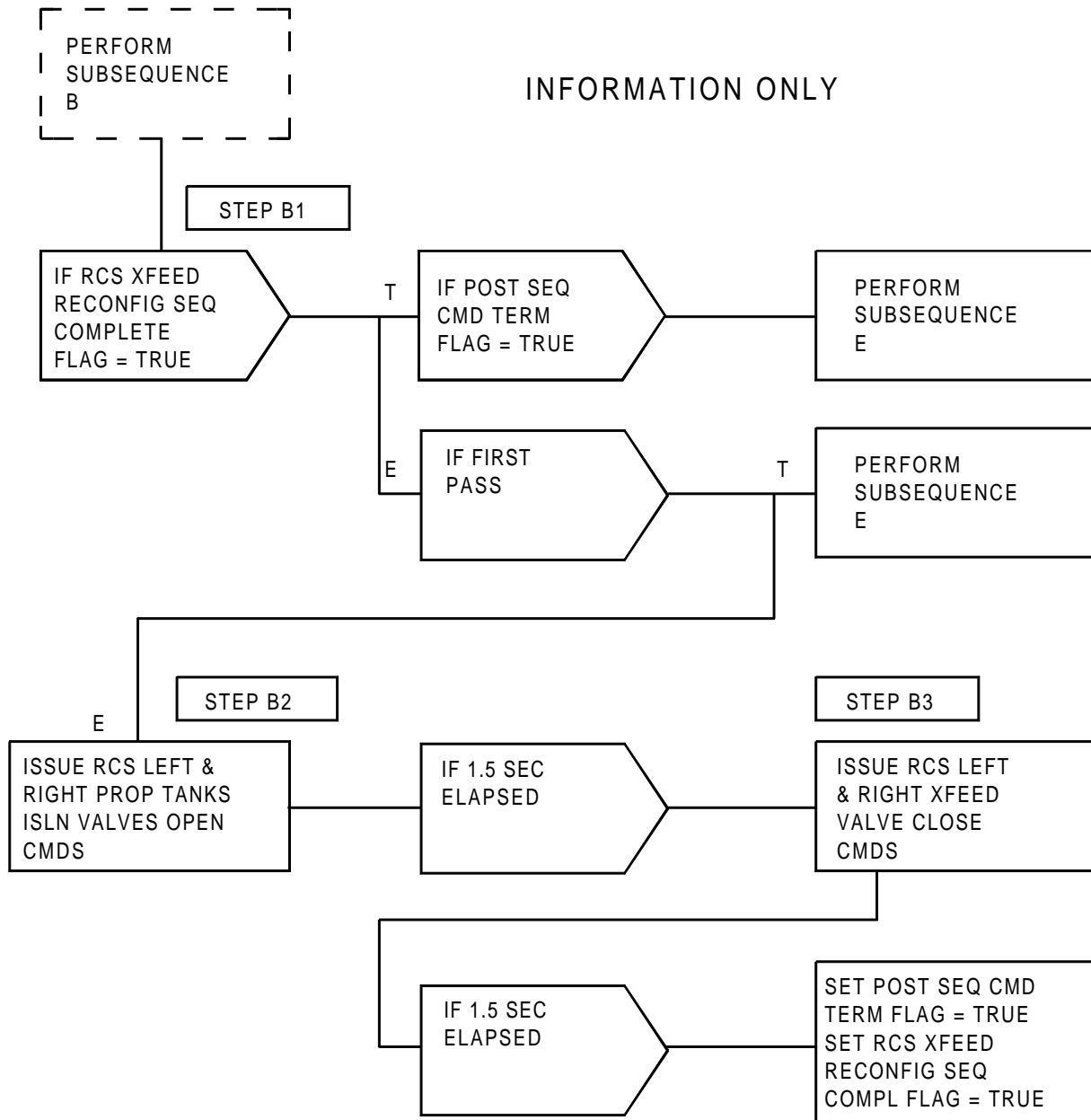


FIGURE 4.185.(3) RCS/RCS XFEED (Sheet 3 of 5)

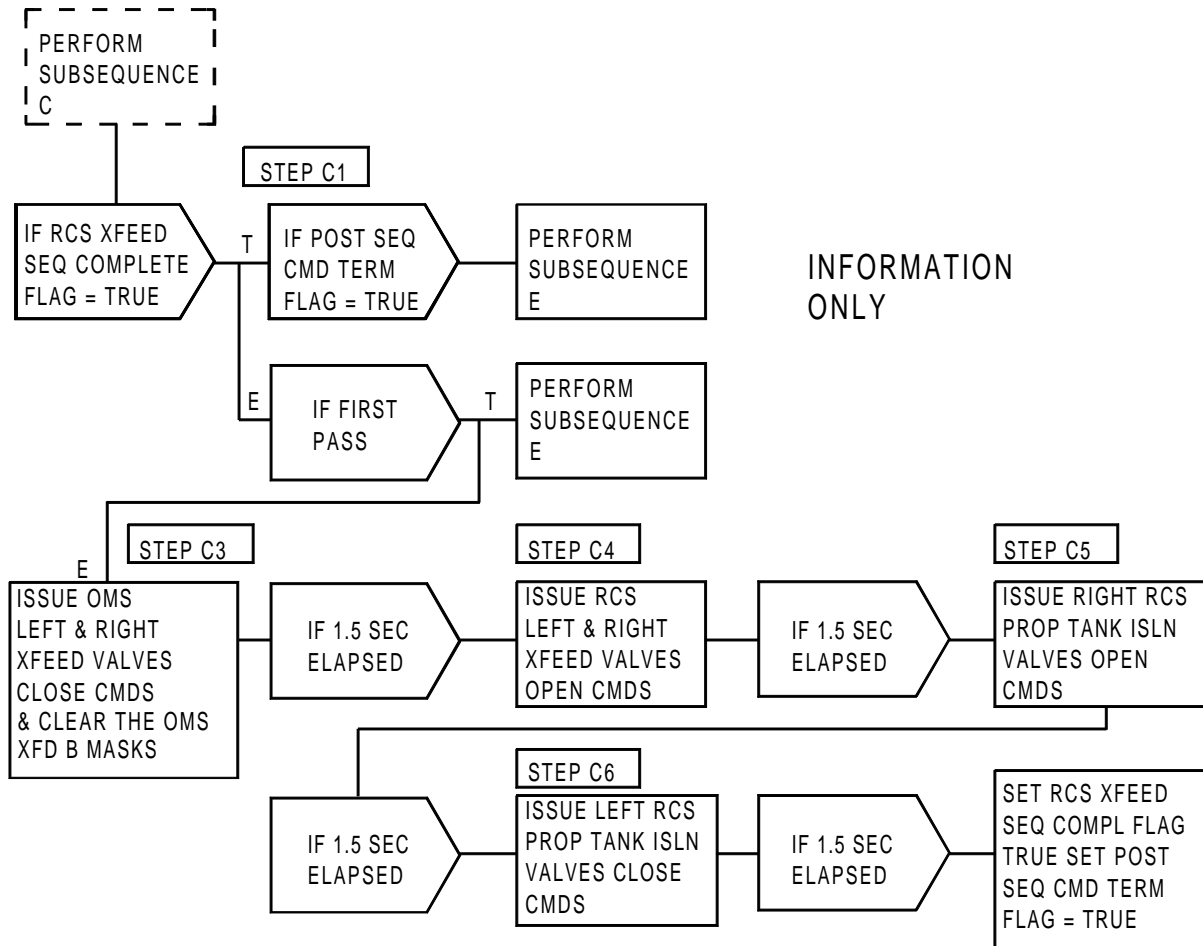


FIGURE 4.185.(4) RCS/RCS XFEED (Sheet 4 of 5)

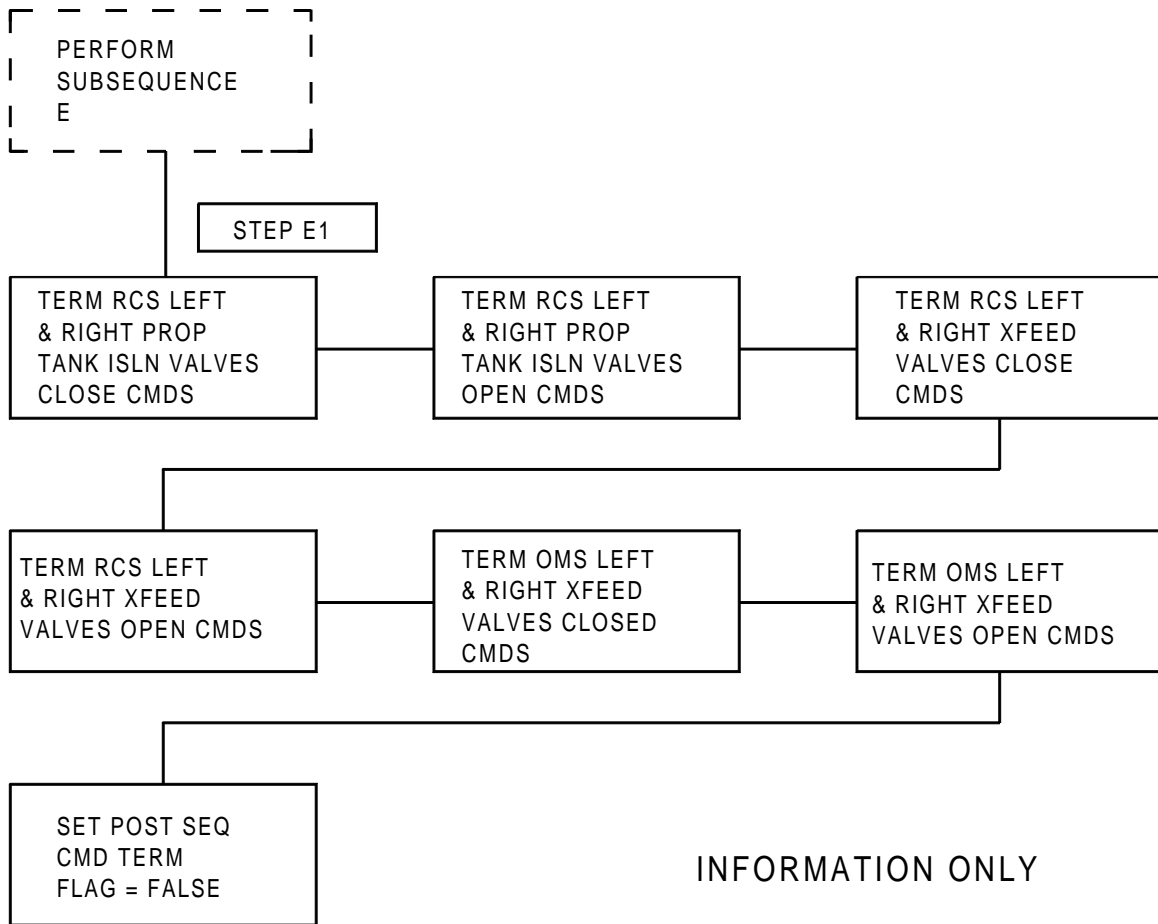


FIGURE 4.185.(5) RCS/RCS XFEED (Sheet 5 of 5)

TABLE 4.6.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR RCS/RCS CROSSFEED FUNCTION (G4.185)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|------------------|-------|-----------|---------|---------|-------|
| | V90X7501X | SEL RCS MASTER CROSSFEED FROM LEFT | GN&C SW RM | | BD | | 93017G | * |
| | V90X7502X | SEL RCS MASTER CROSSFEED FROM RT | GN&C SW RM | | BD | | 93017G | * |
| | V90X8282X | OMS TO RCS INTERCONNECT COMP FLAG | ABT OMS/RCS CONN | | BD | | 93017G | * |
| | V90X8312X | OMS TO RCS INTERCONNECT CMD | ABT CNTL SEQ | | BD | | 93017G | * |
| | V93X5199XA | FEED FROM LEFT RCS | RCS REG SEQ | | BD | | 93017G | * |
| | V93X5200XA | FEED FROM RIGHT RCS | RCS REG SEQ | | BD | | 93017G | * |

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

TABLE 4.6.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM RCS/RCS CROSSFEED FUNCTION (G4.185)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-------------------------|------------|------------------------------------|---|-------|--------------|------------------|---------|-------------|
| CROSSFEED_OPEN | V90X1540X | RCS CROSSFEED SEQ COMPLETE FLAG | AEROJET DAP GRTLS DAP MSC TRANS DAP | | | | | |
| OMS_L_POD_FU_XFD_B_MASK | V99X0017XA | OMS-L POD FU XFD B MASK | ABT OMS/RCS CONN | | BD | | 93093A | |
| OMS_L_POD_OX_XFD_B_MASK | V99X0016XA | OMS-L POD OX XFD B MASK | ABT OMS/RCS CONN | | BD | | 93093A | |
| OMS_R_POD_FU_XFD_B_MASK | V99X0019XA | OMS-R POD FU XFD B MASK | ABT OMS/RCS CONN | | BD | | 93093A | |
| OMS_R_POD_OX_XFD_B_MASK | V99X0018XA | OMS-R POD OX XFD B MASK | ABT OMS/RCS CONN | | BD | | 93093A | |
| RECONFIG_CMPL | V90X1539X | RCS XFD RECONFIG SEQ COMPLETE FLAG | AEROJET DAP GRTLS DAP MSC TLM TRANS DAP | | | | 89599C | |
| | V42K2342XC | RCS-L AFT TK ISLN V-1/2 GPC OP A | MCA A3 | | | | | |
| | V42K2343XC | RCS-L AFT OX TK ISLN V1/2 GPC OP B | MCA A3 | | | | | |
| | V42K2344XC | RCS-L AFT FU TK ISLN V1/2 GPC OP B | MCA A3 | | | | | |
| | V42K2346XC | RCS-L AFT OX TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| | V42K2347XC | RCS-L AFT FU TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| | V42K2349XC | RCS-L AFT OX TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| | V42K2350XC | RCS-L AFT FU TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| | V42K2353XC | RCS-L AFT TK ISLN V-1/2 GPC CL A | MCA A3 | | | | | |
| | V42K2354XC | RCS-L AFT OX TK ISLN V1/2 GPC CL B | MCA A3 | | | | | |
| | V42K2355XC | RCS-L AFT FU TK ISLN V1/2 GPC CL B | MCA A3 | | | | | |
| | V42K2357XC | RCS-L AFT OX TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| | V42K2358XC | RCS-L AFT FU TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | 89598A |
| | V42K2360XC | RCS-L AFT OX TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| | V42K2361XC | RCS-L AFT FU TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| | V42K2402XA | RCS-L AFT XFD VLV 1/2 GPC OP A | MCA A3 | | | | | |
| | V42K2403XA | RCS-L AFT OX XFD VLV-1/2 GPC OP B | MCA A3 | | | | | |
| | V42K2404XA | RCS-L AFT FU XFD VLV 1/2 GPC OP B | MCA A3 | | | | | |
| | V42K2408XA | RCS-L AFT XFD VLV 3/4/5 GPC OP A | MCA A2 | | | | | |
| | V42K2409XA | RCS-L AFT OX XFD V-3/4/5 GPC OP B | MCA A2 | | | | | |
| | V42K2410XA | RCS-L AFT FU XFD V-3/4/5 GPC OP B | MCA A2 | | | | | |
| | V42K2416XA | RCS-L AFT XFD VLV-1/2 GPC CL A | MCA A3 | | | | | |
| | V42K2418XA | RCS-L AFT OX XFD VLV-1/2 GPC CL B | MCA A3 | | | | | |
| | V42K2422XA | RCS-L AFT FU XFD VLV-1/2 GPC CL B | MCA A3 | | | | | |
| | V42K2428XA | RCS-L AFT XFD V-3/4/5 GPC CL A | MCA A2 | | | | | |
| | V42K2430XA | RCS-L AFT OX XFD V-3/4/5 GPC CL B | MCA A2 | | | | | |
| | V42K2434XA | RCS-L AFT FU XFD V-3/4/5 GPC CL B | MCA A2 | | | | | |
| | V42K3342XC | RCS-R AFT TK ISLN V-1/2 GPC OP A | MCA A3 | | | | | |
| | V42K3343XC | RCS-R AFT OX TK ISLN V-1/2 GPC OPB | MCA A3 | | | | | |
| | V42K3344XC | RCS-R AFT FU TK ISLN V-1/2 GPC OPB | MCA A3 | | | | | |
| | V42K3346XC | RCS-R AFT OX TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| | V42K3347XC | RCS-R AFT FU TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| | V42K3349XC | RCS-R AFT OX TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| | V42K3350XC | RCS-R AFT FU TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |

TABLE 4.6.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM RCS/RCS CROSSFEED FUNCTION (G4.185)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|-------------|-------|-----------|---------|---------|-------|
| | V42K3353XC | RCS-R AFT TK ISLN V-1/2 GPC CL A | MCA A3 | | | | | |
| | V42K3354XC | RCS-R AFT OX TK ISLN V-1/2 GPC CLB | MCA A3 | | | | | |
| | V42K3355XC | RCS-R AFT FU TK ISLN V-1/2 GPC CLB | MCA A3 | | | | | |
| | V42K3357XC | RCS-R AFT OX TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| | V42K3358XC | RCS-R AFT FU TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| | V42K3360XC | RCS-R AFT OX TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| | V42K3361XC | RCS-R AFT FU TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| | V42K3402XA | RCS R AFT XFD VLV-1/2 GPC OPEN A | MCA A3 | | | | | |
| | V42K3403XA | RCS R AFT OX XFD V-1/2 GPC OPEN B | MCA A3 | | | | | |
| | V42K3404XA | RCS R AFT FU XFD V-1/2 GPC OPEN B | MCA A3 | | | | | |
| | V42K3408XA | RCS R AFT XFD VLV-3/4/5 GPC OPEN A | MCA A1 | | | | | |
| | V42K3409XA | RCS R AFT OX XFD V-3/4/5 GPC OP B | MCA A1 | | | | | |
| | V42K3410XA | RCS R AFT FU XFD V-3/4/5 GPC OP B | MCA A1 | | | | | |
| | V42K3416XA | RCS R AFT XFD VLV-1/2 GPC CLOSE A | MCA A3 | | | | | |
| | V42K3418XA | RCS R AFT OX XFD V-1/2 GPC CLOSE B | MCA A3 | | | | | |
| | V42K3422XA | RCS R AFT FU XFD V-1/2 GPC CLOSE B | MCA A3 | | | | | |
| | V42K3428XA | RCS R AFT XFD VLV-3/4/5 GPC CL A | MCA A1 | | | | | |
| | V42K3430XA | RCS-R AFT OX XFD V-3/4/5 GPC CL B | MCA A1 | | | | | |
| | V42K3434XA | RCS-R AFT FU XFD V-3/4/5 GPC CL B | MCA A1 | | | | | |
| | V43K4282XA | OMS-L POD XFD VLVS A CMD 1 OP | MCA A1 | | | | | |
| | V43K4283XA | OMS-L POD XFD VLVS A CMD 1 CL | MCA A1 | | | | | |
| | V43K4284XA | OMS-L POD OXDZR XFD VLV A CMD 2 OP | MCA A1 | | | | | |
| | V43K4285XA | OMS-L POD OXDZR XFD VLV A CMD 2 CL | MCA A1 | | | | | |
| | V43K4286XA | OMS-L POD XFD VLVS B CMD 1 OP | MCA A2 | | | | | |
| | V43K4287XA | OMS-L POD XFD VLVS B CMD 1 CL | MCA A2 | | | | | |
| | V43K4288XA | OMS-L POD OXDZR XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K4289XA | OMS-L POD OXDZR XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V43K4384XA | OMS-L POD FUEL XFD VLV A CMD 2 OP | MCA A1 | | | | | |
| | V43K4385XA | OMS-L POD FUEL XFD VLV A CMD 2 CL | MCA A1 | | | | | |
| | V43K4388XA | OMS-L POD FUEL XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K4389XA | OMS-L POD FUEL XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V43K5282XA | OMS-R POD XFD VLVS A CMD 1 OP | MCA A3 | | | | | |
| | V43K5283XA | OMS-R POD XFD VLVS A CMD 1 CL | MCA A3 | | | | | |
| | V43K5284XA | OMS-R POD OXDZR XFD VLV A CMD 2 OP | MCA A3 | | | | | |
| | V43K5285XA | OMS-R POD OXDZR XFD VLV A CMD 2 CL | MCA A3 | | | | | |
| | V43K5286XA | OMS-R POD XFD VLVS B CMD 1 OP | MCA A2 | | | | | |
| | V43K5287XA | OMS-R POD XFD VLVS B CMD 1 CL | MCA A2 | | | | | |
| | V43K5288XA | OMS-R POD OXDZR XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K5289XA | OMS-R POD OXDZR XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V43K5384XA | OMS-R POD FUEL XFD VLV A CMD 2 OP | MCA A3 | | | | | |
| | V43K5385XA | OMS-R POD FUEL XFD VLV A CMD 2 CL | MCA A3 | | | | | |
| | V43K5388XA | OMS-R POD FUEL XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K5389XA | OMS-R POD FUEL XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V90M2904PE | CGRB_STATUS_2\$(24:) | DL FMT 21/1 | | | | 93017G | * |
| | | | DL FMT 23/1 | | | | | |

TABLE 4.6.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM RCS/RCS CROSSFEED FUNCTION (G4.185)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|---------------------|-------------|-------|-----------|------------------|---------|-------------|
| | V93X5199XB | FEED FROM LEFT RCS | DL FMT 21/1 | | BD | | 93017G | * |
| | | | DL FMT 23/1 | | | | | |
| | V93X5200XB | FEED FROM RIGHT RCS | DL FMT 21/1 | | BD | | 93017G | * |
| | | | 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**

TABLE 4.6.1.4-3. RCS/RCS CROSSFEED FUNCTION (G4.185) 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 4.6.1.4-4. RCS/RCS CROSSFEED FUNCTION (G4.185) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD 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.

TABLE 4.6.1.4-5. RCS/RCS CROSSFEED FUNCTION (G4.185) 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.

4.6.3 RCS Quantity Monitor (4.102)

4.6.3.1 Introduction

The RCS quantity monitor sequence uses the GPC to calculate the percent of usable fuel and oxidizer remaining in each RCS module: forward, aft left, and aft right. The sequence also uses the calculated quantities to determine and output the lowest quantity of oxidizer or fuel for each RCS module, determine if the difference between each pair of tanks exceeds a preset tolerance to leakage detection, and provide automatic closure of the high-pressure helium isolation valves on orbit when the C&W high limit on tank outlet pressure is exceeded. The initial helium weight and the total usable propellant weight K-loads are to be uplinked prior to launch in OPS 9 or after transition into OPS 2 and will be based on propellant load data obtained prior to launch in OPS 9. These K-loads must be protected across OPS transitions between prelaunch, ascent, on orbit and entry.

4.6.3.2 Overview

RCS quantities are computed based on the PVT method, which requires that pressure and temperature measurements be combined with a unique set of constants to calculate the percent remaining in each of the six propellant tanks. Transducer failures or commfaults are accounted for by substitution of alternate measurements. If an alternate measurement cannot be selected, a crew quantity alert is provided and the calculation of quantity remaining is suspended for the particular tank involved. If the condition (transducer failure or commfault) is removed or corrected, the associated alert(s) is reset.

For each tank pair, a separate output of lowest quantity of fuel or oxidizer is also provided.

Leak detection, based on a comparison between fuel and oxidizer, will result in a C&W alert when a preset tolerance is exceeded. Sequential leaks are provided for by reset of the fuel or oxidizer level and the leak alert indicators at the time of failure detection.

For each tank, based on a C&W alert of excessive outlet pressure, the helium isolation valves are commanded closed. Should the tank outlet pressure return within limits, the close commands are removed.

4.6.3.3 Detailed Requirements

Step 1. This step performs a test to isolate transducer failure for each measurement listed in Table 4.6.3-1. The following test shall be performed.

$$\text{Lower Limit} < \text{MSID} < \text{Upper Limit}$$

Any measurement outside of the range shall be considered a failed transducer. Proceed to Step 2.

Step 2. This step selects the value, in the order listed below, to be used in the calculation of oxidizer and fuel quantities. Using Tables 4.6.3-2, 4.6.3-3, 4.6.3-4 commfaults*, and the results of Step 1, select the appropriate values from below for use in Step 3.

*Tenth character, an asterisk, in the MSID for commfaults and certain hardware parameters identifies measurements that are channelized on two flight critical MDM's.

The parameter used in the computation is the MSID listed in the table or its substitute. If no entry is available the appropriate flag, 1 through 3, shall be set true; otherwise, set flags 1 through 3 false. If there is no entry for any parameter in a group, the computation in Step 3 shall not be performed and the last previous value for the propellant shall be output.

TS (1) = V42T1100C OR SUBSTITUTE
PS1 (1) = V42P1110C OR SUBSTITUTE
PS2 (1) = V42P1112C OR SUBSTITUTE
PF1 (1) = V42P1115C OR SUBSTITUTE
PF2 (1) = V42P1210C OR SUBSTITUTE
TF (1) = V42T1200C OR SUBSTITUTE
TS (2) = V42T1104C OR SUBSTITUTE
PS1 (2) = V42P1113C OR SUBSTITUTE
PS2 (2) = V42P1114C OR SUBSTITUTE
PF1 (2) = V42P1116C OR SUBSTITUTE
PF2 (2) = V42P1310C OR SUBSTITUTE
TF (2) = V42T1300C OR SUBSTITUTE
TS (3) = V42T2100C OR SUBSTITUTE
PS1 (3) = V42P2110C OR SUBSTITUTE
PS2 (3) = V42P2112C* OR SUBSTITUTE
PF1 (3) = V42P2115C OR SUBSTITUTE
PF2 (3) = V42P2210C* OR SUBSTITUTE
TF (3) = V42T2200C OR SUBSTITUTE
TS (4) = V42T2104C* OR SUBSTITUTE
PS1 (4) = V42P2113C OR SUBSTITUTE
PS2 (4) = V42P2114C* OR SUBSTITUTE
PF1 (4) = V42P2116C OR SUBSTITUTE
PF2 (4) = V42P2310C* OR SUBSTITUTE
TF (4) = V42T2300C* OR SUBSTITUTE
TS (5) = V42T3100C OR SUBSTITUTE
PS1 (5) = V42P3110C OR SUBSTITUTE
PS2 (5) = V42P3112C* OR SUBSTITUTE
PF1 (5) = V42P3115C OR SUBSTITUTE
PF2 (5) = V42P3210C* OR SUBSTITUTE
TF (5) = V42T3200C OR SUBSTITUTE
TS (6) = V42T3104C* OR SUBSTITUTE
PS1 (6) = V42P3113C OR SUBSTITUTE
PS2 (6) = V42P3114C* OR SUBSTITUTE
PF1 (6) = V42P3116C OR SUBSTITUTE
PF2 (6) = V42P3310C* OR SUBSTITUTE
TF (6) = V42T3300C* OR SUBSTITUTE

where

- (1) = FWD OX
- (2) = FWD FU
- (3) = AFT LEFT OX
- (4) = AFT LEFT FU
- (5) = AFT RIGHT OX
- (6) = AFT RIGHT FU

| | | |
|-----|--------------------------|-----------|
| (1) | RCS-FWD QUANTITY ALERT | V90X2392X |
| (2) | RCS-L AFT QUANTITY ALERT | V90X2393X |
| (3) | RCS-R AFT QUANTITY ALERT | V90X2394X |

Step 3. This step calculates the OX and FU quantities, using the parameters from Step 2.

$$RWFD = \frac{RHOF[VP - VTP - VHU] - WTP}{WFDA} \quad (100)$$

where

- RWFD = Usable propellant quantity remaining in percent
- RHOF = Propellant density
- VP = Volume of the propellant system
- VTP = Volume of trapped line propellant
- VHU = Propellant tank ullage volume
- WTP = Weight of residual tank propellant plus gaging system accuracy
(6 K-loads, Table 4.6.3-6)
- WFDA = Weight of total usable propellant (6 K-loads, Table 4.6.3-6)

The terms of the algorithm must be selected for each quantity calculated; that is, six sets of parameters and/or constants are used in calculating the six propellant quantities. For constants, see Table 4.6.3-5. The terms RHOF and VHU are variables and must be computed for each quantity calculation using the following:

$$RHOF_{(FU)} = E_1 - (E_2)(T_f) + (E_3)(PF)$$

$$RHOF_{(OX)} = (C_1) - (C_2)(T_f) + (C_3)(PF)$$

$$VHU = \frac{G [WHI - WHS](T_f)R}{PF - PFV}$$

where

$E_1, E_2,$ and E_3 = Fuel density coefficients

T_f = Propellant tank temperature = °F + H

PF = Propellant tank pressure = $\frac{(PF_1 + PF_2)}{2}$

$C_1, C_2,$ and C_3 = Oxidizer density coefficients

G = Helium weight coefficient

WHI = Initial helium weight in system (6 K-loads, Table 4.6.3-6)

WHS = Weight of helium in helium supply

R = Helium gas constant

PFV = Propellant vapor pressure

$$WHS = \frac{(PS) (VHS)}{ZS(R) T_S}$$

where

PS = Helium bottle pressure = $\frac{(PS_1 + PS_2)}{2}$

VHS = Helium supply system volume

ZS = Helium compressibility factor

T_S = Helium bottle temperature = °F + H

R = Helium gas constant

VHS = $VHAM [1 + (PS) (A)]^3 + VHLI$

where

VHAM = Volume of helium bottle at 0 psig and 70°F

A = Helium system volume coefficient

VHLI = Volume of helium lines

$$ZS = 1 + B_1 (PS) (T_S)^{-B_2}$$

where

B_1 and B_2 = Helium compressibility coefficients

$$PFV_{OX} = e^{+ \left[D_1 - \left(\frac{D_2}{T_f} \right) + (D_3) (T_f) \right]}$$

$PFV_{FU} = F$ at 70°F

where

D_1 , D_2 , and D_3 = Oxidizer vapor pressure coefficients

F = Fuel vapor pressure

The six calculated RCS quantities below are output to the dedicated cockpit meter, 5 PCM counts/1 percent, with quantities exceeding 99 percent limited to 99 percent.

| | |
|-------------------------|-----------|
| RCS-FWD OX QUANTITY | V72Q1370C |
| RCS-FWD FUEL QUANTITY | V72Q1371C |
| RCS-L AFT OX QUANTITY | V72Q1374C |
| RCS-L AFT FUEL QUANTITY | V72Q1375C |
| RCS-R AFT OX QUANTITY | V72Q1378C |
| RCS-R AFT FUEL QUANTITY | V72Q1379C |

The six calculated quantities are also output to the CRT displays as the following signals in percent remaining:

| | |
|--|-----------|
| RCS-FWD OX QUANTITY REMAINING DISP | V90Q2360C |
| RCS-FWD FUEL QUANTITY REMAINING DISP | V90Q2361C |
| RCS-L AFT OX QUANTITY REMAINING DISP | V90Q2362C |
| RCS-L AFT FUEL QUANTITY REMAINING DISP | V90Q2363C |
| RCS-R AFT OX QUANTITY REMAINING DISP | V90Q2364C |
| RCS-R AFT FUEL QUANTITY REMAINING DISP | V90Q2365C |

Proceed to Step 4.

Step 4. This step is used to compare the calculated quantity of fuel and oxidizer in each RCS module and output the lowest quantity, oxidizer or fuel, to the dedicated meter.

Compare the quantities computed in Step 3 to determine the lowest remaining between each pair of fuel/oxidizer tanks, forward, aft left, and aft right. Output the following as lowest value for each pair in volts, scaled for quantity remaining:

| | |
|--------------------------------|-----------|
| RCS FWD PROP QUANTITY LOWEST | V72Q1372C |
| RCS-L AFT PROP QUANTITY LOWEST | V72Q1376C |
| RCS-R AFT PROP QUANTITY LOWEST | V72Q1380C |

Proceed to Step 5.

Step 5. This step performs a comparison of oxidizer versus fuel for each location, forward, aft left, and aft right, to determine if utilization is balanced within the threshold level for leak detection.

Each pair of quantities, fuel and oxidizer, in each module shall be compared to each other and the quantity difference compared to the preset leakage limits in the following algorithm.*

* OX-BIAS = 0 and FU-BIAS = 0 at initialization.

$$\Delta RWL = RWFD (OX) + OX-BIAS - [RWFD (FU) + FU-BIAS]$$

If $|\Delta RWIL| - |\Delta RWL| \geq 0$, no leak, proceed to Step 6.

If $|\Delta RWIL| - |\Delta RWL| < 0$, leak alert then

If $\Delta RWL > 0$, set fuel leak alert (forward, left, or right) and set $FU-BIAS = FU-BIAS + \Delta RWL$

or if $\Delta RWL < 0$ set oxidizer leak alert forward, left, or right, and set $OX-BIAS = OX - BIAS + |\Delta RWL|$

where

RWFD = Propellant quantity remaining (FU, OX)

$\pm \Delta RWL$ = Difference in propellant quantities

$\Delta RWIL$ = RCS leak detection indicator limit (PCT) V97U9807C (Table 4.6.3-6)

If any of the propellant leak alert is true, issue the corresponding following outputs to generate CRT message lines, a Class 2 alert light and tone, and status indicators:

| | | |
|------|-----------------------------------|-----------|
| (1) | RCS-FWD OX LEAKAGE ALERT | V90X2356X |
| (2) | RCS-FWD OX LEAKAGE ALERT DISP | V90X2379X |
| (3) | RCS-FWD FUEL LEAKAGE ALERT | V90X2355X |
| (4) | RCS-FWD FUEL LEAKAGE ALERT DISP | V90X2378X |
| (5) | RCS-L AFT OX LEAKAGE ALERT | V90X2352X |
| (6) | RCS-L AFT OX LEAKAGE ALERT DISP | V90X2375X |
| (7) | RCS-L AFT FUEL LEAKAGE ALERT | V90X2351X |
| (8) | RCS-L AFT FUEL LEAKAGE ALERT DISP | V90X2374X |
| (9) | RCS-R AFT OX LEAKAGE ALERT | V90X2354X |
| (10) | RCS-R AFT OX LEAKAGE ALERT DISP | V90X2377X |
| (11) | RCS-R AFT FUEL LEAKAGE ALERT | V90X2353X |
| (12) | RCS-R AFT FUEL LEAKAGE ALERT DISP | V90X2376X |

Proceed to Step 6.

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Step 6. This step is used to provide automatic closure of the high–pressure helium isolation valve when the C&W high limit on tank outlet pressure is exceeded.

If (g) is true, monitor (a) through (f) below; otherwise return to Step 1.

The following signals are monitored:

| | | |
|-----|-----------------------------------|-----------|
| (a) | RCS FWD TK PRESS OX HI/LO/IO STAT | V94J4342C |
| (b) | RCS FWD TK PRESS FU HI/LO/IO STAT | V94J4343C |
| (c) | RCS L TK PRESS OX HI/LO/IO STATUS | V94J4346C |
| (d) | RCS L TK PRESS FU HI/LO/IO STATUS | V94J4347C |
| (e) | RCS R TK PRESS OX HI/LO/IO STATUS | V94J4350C |
| (f) | RCS R TK PRESS FU HI/LO/IO STATUS | V94J4351C |
| (g) | OPS 2 IND | V90X8633X |

For each lettered signal (a) through (f) above indicating an excess outlet pressure, HI, both of the corresponding lettered commands below will be issued.

For each pair of lettered signals (a) through (f) above (both propellants of the same location—fwd, L, and R) not indicating an excess outlet pressure, HI, both pairs of the corresponding lettered commands (a) through (f) below are terminated.

| | | |
|-----|-----------------------------------|-----------|
| (a) | RCS FWD HE PRESS VLV A GPC CL A | V42K1154X |
| (b) | RCS FWD HE PRESS VLV A GPC CL A | V42K1154X |
| (c) | RCS L AFT HE PRESS VLV A GPC CL A | V42K2154X |
| (d) | RCS L AFT HE PRESS VLV A GPC CL A | V42K2154X |
| (e) | RCS R AFT HE PRESS VLV A GPC CL A | V42K3154K |
| (f) | RCS R AFT HE PRESS VLV A GPC CL A | V42K3154K |
| (a) | RCS FWD HE PRESS VLV B GPC CL A | V42K1156X |
| (b) | RCS FWD HE PRESS VLV B GPC CL A | V42K1156X |
| (c) | RCS L AFT HE PRESS VLV B GPC CL A | V42K2156X |
| (d) | RCS L AFT HE PRESS VLV B GPC CL A | V42K2156X |
| (e) | RCS R AFT HE PRESS VLV B GPC CL A | V42K3156X |
| (f) | RCS R AFT HE PRESS VLV B GPC CL A | V42K3156X |

Then return to Step 1.

| Table 4.6.3-1.RCS Propellant Transducer Limits | | | | | |
|--|-------|-------|------------|-------|-------|
| FWD RCS | | | | | |
| LIMITS | | | | | |
| OXID | UPPER | LOWER | FUEL | UPPER | LOWER |
| V42T1100C | 150 | -70 | V42T1104C | 150 | -70 |
| V42P1110C | 3960 | 400 | V42P1113C | 3960 | 400 |
| V42P1112C | 3960 | 400 | V42P1114C | 3960 | 400 |
| V42P1115C | 380 | 150 | V42P1116C | 380 | 150 |
| V42T1200C | 150 | 30 | V42T1300C | 150 | 30 |
| V42P1210C | 380 | 150 | V42P1310C | 380 | 150 |
| LEFT RCS | | | | | |
| LIMITS | | | | | |
| OXID | UPPER | LOWER | FUEL | UPPER | LOWER |
| V42T2100C | 150 | -70 | V42T2104C* | 150 | -70 |
| V42P2110C | 3960 | 400 | V42P2113C | 3960 | 400 |
| V42P2112C* | 3960 | 400 | V42P2114C* | 3960 | 400 |
| V42P2115C | 380 | 150 | V42P2116C | 380 | 150 |
| V42T2200C | 150 | 30 | V42T2300C* | 150 | 30 |
| V42P2210C* | 380 | 150 | V42P2310C* | 380 | 150 |
| RIGHT RCS | | | | | |
| LIMITS | | | | | |
| OXID | UPPER | LOWER | FUEL | UPPER | LOWER |
| V42T3100C | 150 | -70 | V42T3104C* | 150 | -70 |
| V42P3110C | 3960 | 400 | V42P3113C | 3960 | 400 |
| V42P3112C* | 3960 | 400 | V42P3114C* | 3960 | 400 |
| V42P3115C | 380 | 150 | V42P3116C | 380 | 150 |
| V42T3200C | 150 | 30 | V42T3300C* | 150 | 30 |
| V42P3210C* | 380 | 150 | V42P3310C* | 380 | 150 |

| Table 4.6.3-2. Forward RCS Propellant Quantity Primary/Substitute Parameters | | |
|--|-----|-----------------|
| FWD | | |
| PRIMARY MSID | MDM | SUBSTITUTE MSID |
| V42T1100C | 3 | V42T1104C* |
| V42P1110C | 3 | V42P1112C* |
| V42P1112C | 1 | V42P1110C |
| V42P1115C | 1 | V42P1210C* |
| V42P1210C | 3 | V42P1115C |
| V42T1200C | 1 | V42T1300C* |
| V42T1104C | 1 | V42T1100C |
| V42P1113C | 1 | V42P1114C* |
| V42P1114C | 3 | V42P1113C |
| V42P1116C | 3 | V42P1310C* |
| V42P1310C | 1 | V42P1116C |
| V42T1300C | 3 | V42T1200C |

| Table 4.6.3-3. Aft Left RCS Propellant Quantity Primary/Substitute Parameters | | |
|---|-----|-----------------|
| AFT LEFT | | |
| PRIMARY MSID | MDM | SUBSTITUTE MSID |
| V42T2100C | 1 | V42T2104C* |
| V42P2110C | 1 | V42P2112C* |
| V42P2112C* | 3 | V42P2110C |
| V42P2115C | 1 | V42P2210C* |
| V42P2210C* | 3 | V42P2115C |
| V42T2200C | 1 | V42T2300C* |
| V42T2104C* | 3 | V42T2100C |
| V42P2113C | 1 | V42P2114C* |
| V42P2114C* | 3 | V42P2113C |
| V42P2116C | 1 | V42P2310C* |
| V42P2310C* | 3 | V42P2116C |
| V42T2300C* | 3 | V42T2200C |

| Table 4.6.3-4. Aft Right RCS Propellant Quantity Primary/Substitute Parameters | | |
|--|-----|-----------------|
| AFT Right | | |
| PRIMARY MSID | MDM | SUBSTITUTE MSID |
| V42T3100C | 2 | V42T3104C* |
| V42P3110C | 2 | V42P3112C* |
| V42P3112C* | 4 | V42P3110C |
| V42P3115C | 2 | V42P3210C* |
| V42P3210C* | 4 | V42P3115C |
| V42T3200C | 2 | V42T3300C* |
| V42T3104C* | 4 | V42T3100C |
| V42P3113C | 2 | V42P3114C* |
| V42P3114C* | 4 | V42P3113C |
| V42P3116C | 2 | V42P3310C* |
| V42P3310C* | 4 | V42P3116C |
| V42T3300C* | 4 | V42T3200C |

| Table 4.6.3-5.RCS Propellant Quantity Constants | | |
|---|---------------------------|------------------|
| Title | Value | Units |
| RCS-FWD TRAPPED OX LINE VOL (VTP)* | 725.9 | in. ³ |
| RCS-FWD TRAPPED FU LINE VOL (VTP)* | 677.5 | in. ³ |
| FUEL DENSITY COEFFICIENT (E1) | 4.1538 x 10 ⁻² | – |
| FUEL DENSITY COEFFICIENT (E2) | 1.8697 x 10 ⁻⁵ | – |
| FUEL DENSITY COEFFICIENT (E3) | 1.4583 x 10 ⁻⁷ | – |
| FUEL VAPOR PRESSURE (F) | 0.8 | psia |
| HELIUM WEIGHT COEFFICIENT (G) | 1.008 | – |
| HELIUM GAS CONSTANT (R) | 4635 | in.-lb/lb-°R |
| RANKIN TEMP CONVERSION COEFF (H) | 459.7 | – |
| HELIUM SYSTEM COEFFICIENT (A) | 1.4972 x 10 ⁻⁶ | – |
| HELIUM COMPRESSIBILITY COEFFICIENT (B1) | 9.7544 x 10 ⁻³ | – |
| HELIUM COMPRESSIBILITY COEFFICIENT (B2) | 0.897 | – |
| RCS-L AFT TRAPPED OX LINE VOL (VTP) | 1.1326 x 10 ³ | in. ³ |
| RCS-L AFT TRAPPED FU LINE VOL (VTP) | 1.2230 x 10 ³ | in. ³ |
| RCS-R AFT TRAPPED OX LINE VOL (VTP) | 1.1326 x 10 ³ | in. ³ |
| RCS-R AFT TRAPPED FU LINE VOL (VTP) | 1.2230 x 10 ³ | in. ³ |
| RCS-FWD HE BOTTLE VOLUME (VHAM) | 3.043 x 10 ³ | in. ³ |
| RCS-L AFT HE BOTTLE VOLUME (VHAM) | 3.043 x 10 ³ | in. ³ |
| RCS-R AFT HE BOTTLE VOLUME (VHAM) | 3.043 x 10 ³ | in. ³ |
| RCS-FWD OX HE LINE VOLUME (VHLI) | 13.7 | in. ³ |
| RCS-FWD FU HE LINE VOLUME (VHLI) | 13.7 | in. ³ |
| RCS-L AFT OX HE LINE VOLUME (VHLI) | 23.6 | in. ³ |
| RCS-L AFT FU HE LINE VOLUME (VHLI) | 20.7 | in. ³ |
| RCS-R AFT OX HE LINE VOLUME (VHLI) | 23.6 | in. ³ |
| RCS-R AFT FU HE LINE VOLUME (VHLI) | 20.7 | in. ³ |
| RCS-FWD OX SYSTEM VOLUME (VP)* | 3.1892 x 10 ⁴ | in. ³ |
| RCS-FWD FU SYSTEM VOLUME (VP)* | 3.18436 x 10 ⁴ | in. ³ |
| RCS-L AFT OX SYSTEM VOLUME (VP) | 3.23156 x 10 ⁴ | in. ³ |
| RCS-L AFT FU SYSTEM VOLUME (VP) | 3.23886 x 10 ⁴ | in. ³ |
| RCS-R AFT OX SYSTEM VOLUME (VP) | 3.23156 x 10 ⁴ | in. ³ |
| RCS-R AFT FU SYSTEM VOLUME (VP) | 3.23886 x 10 ⁴ | in. ³ |
| OXIDIZER DENSITY COEFFICIENT (C ₁) | 7.6027 x 10 ⁻² | – |
| OXIDIZER DENSITY COEFFICIENT (C ₂) | 4.5162 x 10 ⁻⁵ | – |
| OXIDIZER DENSITY COEFFICIENT (C ₃) | 4.1667 x 10 ⁻⁷ | – |

| Table 4.6.3-5.RCS Propellant Quantity Constants | | |
|--|-------------------------|-------|
| Title | Value | Units |
| OXID VAPOR PRESS COEFFICIENT (D ₁) | 12.082 | – |
| OXID VAPOR PRESS COEFFICIENT (D ₂) | 6111.0 | – |
| OXID VAPOR PRESS COEFFICIENT (D ₃) | 4.03 x 10 ⁻³ | – |
| <p>* The additional 6.73 in³ (0.46 in D X 40.5 in length) of line volume resulting from the addition of the Forward Interconnect System (FICS) propellant lines to the closed volume of the Forward RCS Subsystem are not included in these constants. This inconsistency will not affect the calculation of the quantity of Forward RCS propellant. The additional delta volume is added into the Forward VP and VTP constants, and in the RWFD quantity calculations the VTP constant is subtracted from the VP constant resulting in a delta minus delta or zero result.</p> <p>Note: The propellant weight K-Loads WTP and WFDA account for propellant weight internal to the propellant tanks, and does not account for any propellant weight outside the confines of the propellant tanks. Thus there is no delta weight to be accounted for as a function of the installation of the FICS lines.</p> | | |

| Table 4.6.3-6.RCS Propellant Quantity K-Loads | | |
|---|-------|-----------------------------|
| MSID | Title | Nomenclature |
| V99U7584C | WTP | RCS FWD FU TK RESIDUAL WT |
| V99U7583C | WTP | RCS FWD OX TK RESIDUAL WT |
| V99U7586C | WTP | RCS L AFT FU TK RESIDUAL WT |
| V99U7585C | WTP | RCS L AFT OX TK RESIDUAL WT |
| V99U7588C | WTP | RCS R AFT FU TK RESIDUAL WT |
| V99U7587C | WTP | RCS R AFT OX TK RESIDUAL WT |
| V97U9817C | WFDA | RCS FWD 100 PCT USABLE FU |
| V97U9816C | WFDA | RCS FWD 100 PCT USABLE OX |
| V97U9819C | WFDA | RCS L AFT 100 PCT USABLE FU |
| V97U9818C | WFDA | RCS L AFT 100 PCT USABLE OX |
| V97U9821C | WFDA | RCS R AFT 100 PCT USABLE FU |
| V97U9820C | WFDA | RCS R AFT 100 PCT USABLE OX |
| V97U9811C | WHI | RCS FWD FU TOTAL HE WT |
| V97U9810C | WHI | RCS FWD OX TOTAL HE WT |
| V97U9813C | WHI | RCS L AFT FU TOTAL HE WT |
| V97U9812C | WHI | RCS L AFT OX TOTAL HE WT |
| V97U9815C | WHI | RCS R AFT FU TOTAL HE WT |
| V97U9814C | WHI | RCS R AFT OX TOTAL HE WT |
| V97U9807C | ΔRWIL | RCS LEAK DET IND LMT |

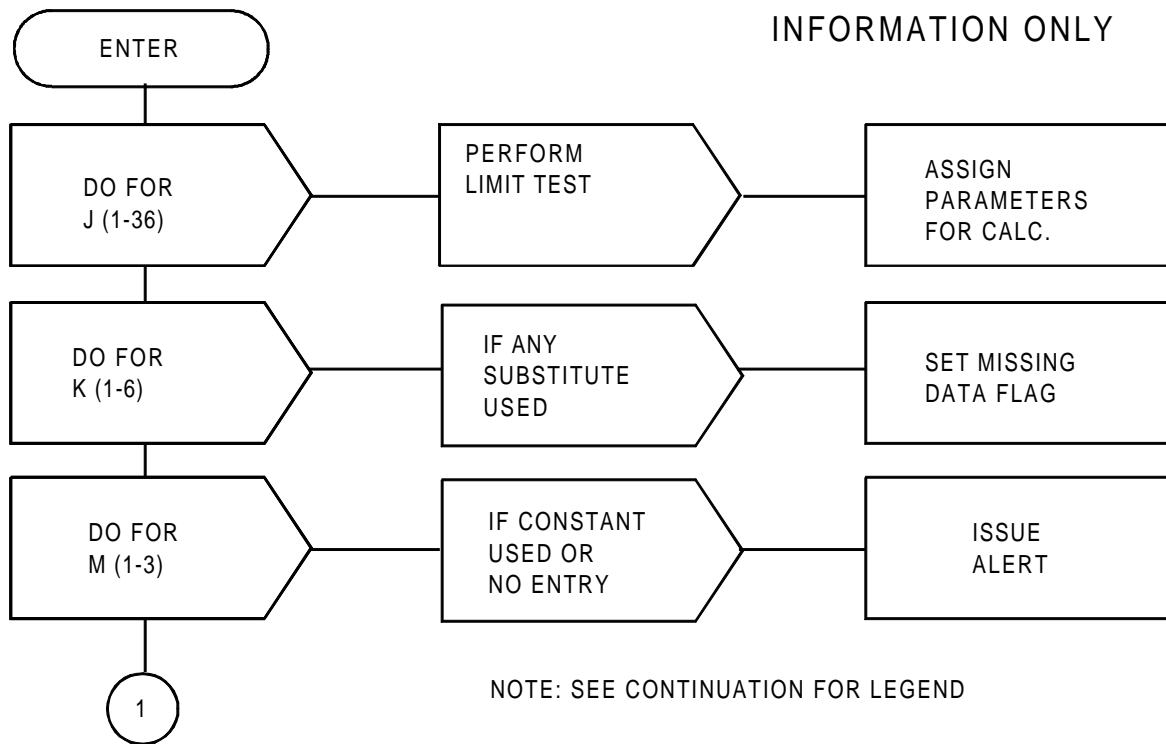


FIGURE 4.102.(1) RCS Qty Mon (Sheet 1 of 2)

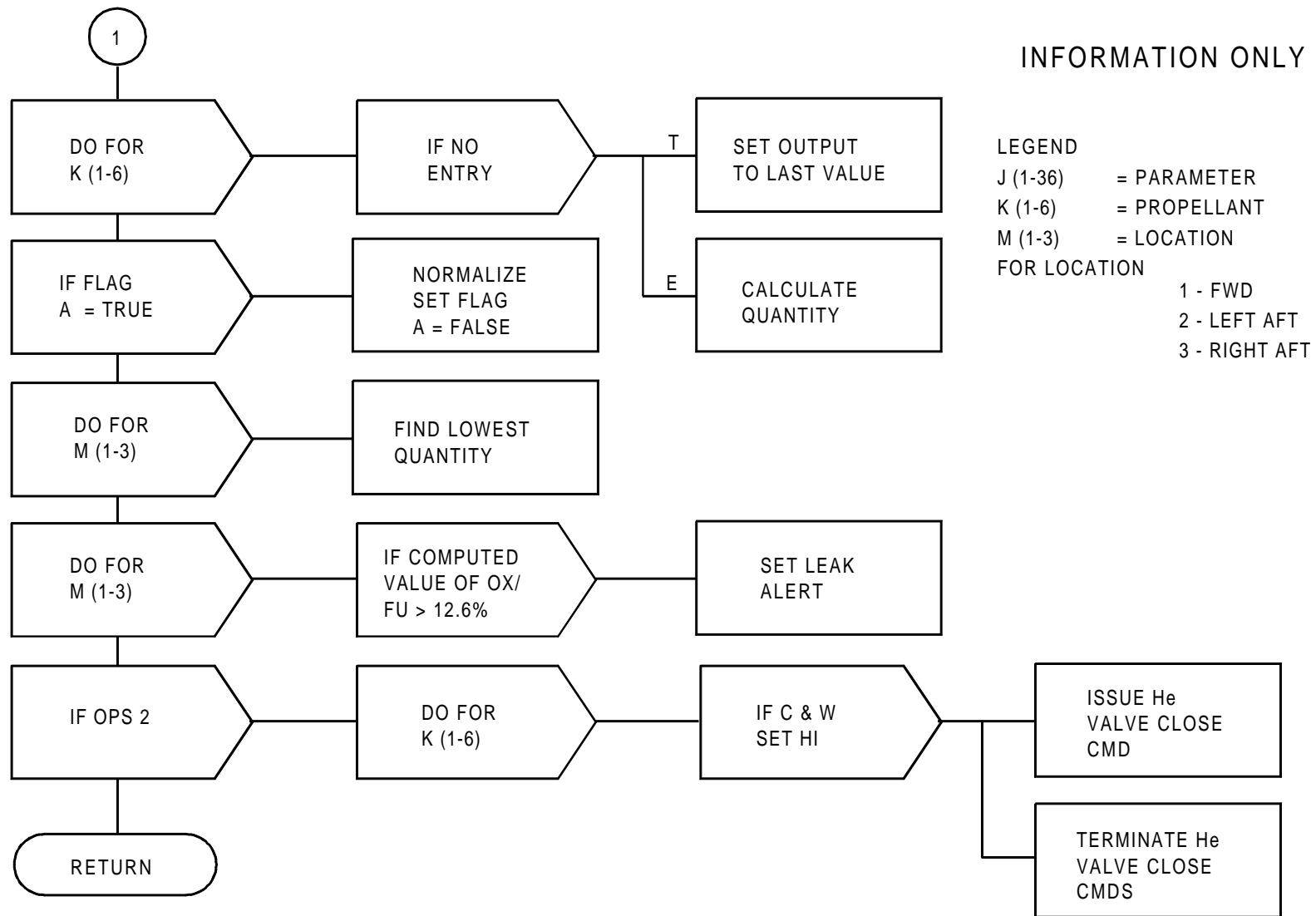


FIGURE 4.102.(2) RCS Qty Mon (Sheet 2 of 2)

TABLE 4.6.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR REACTION CONTROL SYSTEM QUANTITY MONITOR (G4.102)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------------|------------|--------------------------------|---------|-------|-----------|------------------|---------|-------------|
| OPS_2_INDICATOR | V90X8633X | OPS 2 IND | MSC | | | | 90837G | |
| | V42P1110C | RCS FWD HE OX TANK PRESS-1 | DSC F2 | PSIA | AMU | | 93017G | * |
| | V42P1112C | RCS FWD HE OX TANK PRESS-2 | DSC F4 | PSIA | AMU | | 93017G | * |
| | V42P1112C* | RCS FWD HE OX TANK PRESS-2 | DSC F4 | PSIA | AMU | | 89595A | |
| | V42P1113C | RCS FWD HE FU TANK PRESS-1 | DSC F4 | PSIA | AMU | | 93017G | * |
| | V42P1114C | RCS FWD HE FU TANK PRESS-2 | DSC F2 | PSIA | AMU | | 93017G | * |
| | V42P1114C* | RCS FWD HE FU TANK PRESS-2 | DSC F2 | PSIA | AMU | | 89595A | |
| | V42P1115C | RCS FWD OX TANK ULLAGE PRESS | DSC F4 | PSIA | AMU | | 93017G | * |
| | V42P1116C | RCS FWD FU TANK ULLAGE PRESS | DSC F2 | PSIA | AMU | | 93017G | * |
| | V42P1210C | RCS FWD OX TANK OUT PRESS | DSC F2 | PSIA | AMU | | 93017G | * |
| | V42P1210C* | RCS FWD OX TANK OUT PRESS | DSC F2 | PSIA | AMU | | 89595A | |
| | V42P1310C | RCS FWD FU TANK OUT PRESS | DSC F4 | PSIA | AMU | | 93017G | * |
| | V42P1310C* | RCS FWD FU TANK OUT PRESS | DSC F4 | PSIA | AMU | | 89595A | |
| | V42P2110C | RCS L AFT HE OX TANK PRESS-1 | DSC OL1 | PSIA | AMU | | 93017G | * |
| | V42P2112C | RCS L AFT HE OX TANK PRESS-2 | DSC OL2 | PSIA | AMU | | 93017G | * |
| | V42P2112C* | RCS L AFT HE OX TANK PRESS-2 | DSC OL2 | PSIA | AMU | | 89464G | |
| | V42P2113C | RCS L AFT HE FU TANK PRESS-1 | DSC OL1 | PSIA | AMU | | 93017G | * |
| | V42P2114C | RCS L AFT HE FU TANK PRESS-2 | DSC OL1 | PSIA | AMU | | 93017G | * |
| | V42P2114C* | RCS L AFT HE FU TANK PRESS-2 | DSC OL1 | PSIA | AMU | | 89464G | |
| | V42P2115C | RCS L AFT OX TANK ULLAGE PRESS | DSC OL1 | PSIA | AMU | | 93017G | * |
| | V42P2116C | RCS L AFT FU TANK ULLAGE PRESS | DSC OL2 | PSIA | AMU | | 93017G | * |
| | V42P2210C | RCS L AFT OX TANK OUT PRESS | DSC OL1 | PSIA | AMU | | 93017G | * |
| | V42P2210C* | RCS L AFT OX TANK OUT PRESS | DSC OL1 | PSIA | AMU | | 89464G | |
| | V42P2310C | RCS L AFT FU TANK OUT PRESS | DSC OL2 | PSIA | AMU | | 93017G | * |
| | V42P2310C* | RCS L AFT FU TANK OUT PRESS | DSC OL2 | PSIA | AMU | | 89464G | |
| | V42P3110C | RCS R AFT HE OX TANK PRESS-1 | DSC OR1 | PSIA | AMU | | 93017G | * |
| | V42P3112C | RCS R AFT HE OX TANK PRESS-2 | DSC OR2 | PSIA | AMU | | 93017G | * |
| | V42P3112C* | RCS R AFT HE OX TANK PRESS-2 | DSC OR2 | PSIA | AMU | | 89464G | |
| | V42P3113C | RCS R AFT HE FU TANK PRESS-1 | DSC OR2 | PSIA | AMU | | 93017G | * |
| | V42P3114C | RCS R AFT HE FU TANK PRESS-2 | DSC OR1 | PSIA | AMU | | 93017G | * |
| | V42P3114C* | RCS R AFT HE FU TANK PRESS-2 | DSC OR1 | PSIA | AMU | | 89464G | |
| | V42P3115C | RCS R AFT OX TANK ULLAGE PRESS | DSC OR1 | PSIA | AMU | | 93017G | * |
| | V42P3116C | RCS R AFT FU TANK ULLAGE PRESS | DSC OR2 | PSIA | AMU | | 93017G | * |
| | V42P3210C | RCS R AFT OX TANK OUT PRESS | DSC OR1 | PSIA | AMU | | 93017G | * |
| | V42P3210C* | RCS R AFT OX TANK OUT PRESS | DSC OR1 | PSIA | AMU | | 89464G | |
| | V42P3310C | RCS R AFT FU TANK OUT PRESS | DSC OR2 | PSIA | AMU | | 93017G | * |
| | V42P3310C* | RCS R AFT FU TANK OUT PRESS | DSC OR2 | PSIA | AMU | | 89464G | |
| | V42T1100C | RCS FWD HE OX TANK TEMP-1 | DSC F2 | DEGF | AMU | | 93017G | * |
| | V42T1104C | RCS FWD HE FU TANK TEMP-1 | DSC F4 | DEGF | AMU | | 93017G | * |
| | V42T1104C* | RCS FWD HE FU TANK TEMP-1 | DSC F4 | DEGF | AMU | | 89648A | |
| | V42T1200C | RCS FWD OX TANK TEMP-1 | DSC F4 | DEGF | AMU | | 93017G | * |
| | V42T1300C | RCS FWD FU TANK TEMP-1 | DSC F2 | DEGF | AMU | | 93017G | * |
| | V42T1300C* | RCS FWD FU TANK TEMP-1 | DSC F2 | DEGF | AMU | | | |
| | V42T2100C | RCS L AFT HE OX TANK TEMP-1 | DSC OL1 | DEGF | AMU | | 93017G | * |
| | V42T2104C | RCS L AFT HE FU TANK TEMP-1 | DSC OL2 | DEGF | AMU | | 93017G | * |
| | V42T2104C* | RCS L AFT HE FU TANK TEMP-1 | DSC OL2 | DEGF | AMU | | 89648A | |

TABLE 4.6.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR REACTION CONTROL SYSTEM QUANTITY MONITOR (G4.102)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|---------|-------|-----------|---------|---------|-------|
| | V42T2200C | RCS L AFT OX TANK TEMP-1 | DSC OL2 | DEGF | AMU | | 93017G | * |
| | V42T2300C | RCS L AFT FU TANK TEMP-1 | DSC OL1 | DEGF | AMU | | 93017G | * |
| | V42T2300C* | RCS L AFT FU TANK TEMP-1 | DSC OL1 | DEGF | AMU | | 89595A | |
| | V42T3100C | RCS R AFT HE OX TANK TEMP-1 | DSC OR1 | DEGF | AMU | | 93017G | * |
| | V42T3104C | RCS R AFT HE FU TANK TEMP-1 | DSC OR2 | DEGF | AMU | | 93017G | * |
| | V42T3104C* | RCS R AFT HE FU TANK TEMP-1 | DSC OR2 | DEGF | AMU | | 89648A | |
| | V42T3200C | RCS R AFT OX TANK TEMP-1 | DSC OR2 | DEGF | AMU | | 93017G | * |
| | V42T3300C | RCS R AFT FU TANK TEMP-1 | DSC OR1 | DEGF | AMU | | 93017G | * |
| | V42T3300C* | RCS R AFT FU TANK TEMP-1 | DSC OR1 | DEGF | AMU | | | |
| | V91X2283X | FF1 INPUT PROM SEG 1,2 STATUS(MFE) | FCOS | | BD | | | |
| | V91X2284X | FF2 INPUT PROM SEG 1,2 STATUS(MFE) | FCOS | | BD | | | |
| | V91X2285X | FF3 INPUT PROM SEG 1,2 STATUS(MFE) | FCOS | | BD | | | |
| | V91X2287X | FF4 INPUT PROM SEG 1,2 STATUS(MFE) | FCOS | | BD | | | |
| | V91X2841X | FA1 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2842X | FA2 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2843X | FA3 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2844X | FA4 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V94J4342C | RCS FWD TK PRESS OX HI/LO/IO STAT | GAX | | VAR | | | |
| | V94J4343C | RCS FWD TK PRESS FU HI/LO/IO STAT | GAX | | VAR | | | |
| | V94J4346C | RCS L TK PRESS OX HI/LO/IO STATUS | GAX | | VAR | | | |
| | V94J4347C | RCS L TK PRESS FU HI/LO/IO STATUS | GAX | | VAR | | | |
| | V94J4350C | RCS R TK PRESS OX HI/LO/IO STATUS | GAX | | VAR | | | |
| | V94J4351C | RCS R TK PRESS FU HI/LO/IO STATUS | GAX | | VAR | | | |

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

TABLE 4.6.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM REACTION CONTROL SYSTEM QUANTITY MONITOR (G4.102)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------------|---|-------|-----------|---------|---------|-------|
| RWFD(1) | V72Q1370C | RCS-FWD OX QUANTITY | D&C PNL DL FMT 21/1 DL FMT 22/A DL FMT 23/A DL FMT 32/A | PCT | AMU | | 93017G | * |
| RWFD(1) | V90Q2360C | RCS FWD OX QUANTITY REMAINING DISP | GNC SYS SUMM2 DISP RM RCS DIP | PCT | VAR | | 92354 | |
| RWFD(2) | V72Q1371C | RCS-FWD FU QUANTITY | D&C PNL DL FMT 21/1 DL FMT 22/A DL FMT 23/A DL FMT 32/A | PCT | AMU | | 93017G | * |
| RWFD(2) | V90Q2361C | RCS FWD FU QUANTITY REMAINING DISP | GNC SYS SUMM2 DISP RM RCS DIP | PCT | VAR | | 92354 | |
| RWFD(3) | V72Q1374C | RCS-L AFT OX QUANTITY | D&C PNL DL FMT 21/1 DL FMT 22/A DL FMT 23/A DL FMT 32/A | PCT | AMU | | 93017G | * |
| RWFD(3) | V90Q2362C | RCS-L AFT OX QTY REMAINING DISP | GNC SYS SUMM2 DISP RM RCS DIP | PCT | VAR | | 92354 | |
| RWFD(4) | V72Q1375C | RCS-L AFT FU QUANTITY | D&C PNL DL FMT 21/1 DL FMT 22/A DL FMT 23/A DL FMT 32/A | PCT | AMU | | 93017G | * |
| RWFD(4) | V90Q2363C | RCS-L AFT FUEL QTY REMAINING DISP | GNC SYS SUMM2 DISP RM RCS DIP | PCT | VAR | | 92354 | |
| RWFD(5) | V90Q2364C | RCS-R AFT OX QTY REMAINING DISP | GNC SYS SUMM2 DISP RM RCS DIP | PCT | VAR | | 92354 | |
| RWFD(6) | V90Q2365C | RCS-R AFT FUEL QTY REMAINING DISP | GNC SYS SUMM2 DISP RM RCS DIP | PCT | VAR | | 92354 | |
| WRFD(5) | V72Q1378C | RCS-R AFT OX QUANTITY | D&C PNL DL FMT 21/1 DL FMT 22/A DL FMT 23/A DL FMT 32/A | PCT | AMU | | 93017G | * |
| WRFD(7) | V72Q1379C | RCS-R AFT FU QUANTITY | D&C PNL DL FMT 21/1 DL FMT 22/A DL FMT 23/A DL FMT 32/A | PCT | AMU | | 93017G | * |
| | V42K1154X | RCS-FWD HE PRESS VLV-A GPC CL A | LCA F1 | | BD | | | |
| | V42K1156X | RCS-FWD HE PRESS VLV-B GPC CL A | LCA F2 | | BD | | | |
| | V42K2154X | RCS-L AFT HE PRESS VLV-A GPC CL A | LCA A1 | | BD | | | |
| | V42K2156X | RCS-L AFT HE PRESS VLV-B GPC CL A | LCA A3 | | BD | | | |

TABLE 4.6.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM REACTION CONTROL SYSTEM QUANTITY MONITOR (G4.102)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------------|-------------------|-------|-----------|------------------|---------|-------------|
| | V42K3154X | RCS-R AFT HE PRESS VLV-A GPC CL A | LCA A1 | | BD | | | |
| | V42K3156X | RCS-R AFT HE PRESS VLV-B GPC CL A | LCA A2 | | BD | | | |
| | V72Q1372C | RCS-FWD LOWEST PROPELLANT QUANTITY | D&C PNL | PCT | AMU | | | |
| | V72Q1376C | RCS-L AFT LOWEST PROPELLANT QTY | D&C PNL | PCT | AMU | | | |
| | V72Q1380C | RCS-R AFT LOWEST PROPELLANT QTY | D&C PNL | PCT | AMU | | | |
| | V90X2351X | RCS L AFT FU LEAKAGE ALERT | GAX | | | | | |
| | V90X2352X | RCS L AFT OX LEAKAGE ALERT | GAX | | | | | |
| | V90X2353X | RCS R AFT FU LEAKAGE ALERT | GAX | | | | | |
| | V90X2354X | RCS R AFT OX LEAKAGE ALERT | GAX | | | | | |
| | V90X2355X | RCS FWD FU LEAKAGE ALERT | GAX | | | | | |
| | V90X2356X | RCS FWD OX LEAKAGE ALERT | GAX | | | | | |
| | V90X2374X | RCS L FU LEAKAGE ALERT DISP | GAX RM RCS DIP | | | | | |
| | V90X2375X | RCS L OX LEAKAGE ALERT DISP | GAX RM RCS DIP | | | | | |
| | V90X2376X | RCS R FU LEAKAGE ALERT DISP | GAX RM RCS DIP | | | | | |
| | V90X2377X | RCS R OX LEAKAGE ALERT DISP | GAX RM RCS DIP | | | | | |
| | V90X2378X | RCS FWD FU LEAKAGE ALERT DISP | GAX RM RCS DIP | | | | | |
| | V90X2379X | RCS FWD OX LEAKAGE ALERT DISP | GAX RM RCS DIP | | | | | |
| | V90X2392X | RCS-FWD QUANTITY ALERT | GAX RM RCS DIP | | | | | |
| | V90X2393X | RCS-L QUANTITY ALERT | GAX RM RCS DIP | | | | | |
| | V90X2394X | RCS-R QUANTITY ALERT | GAX RM RCS DIP | | | | | |

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 4.6.3.4-3. REACTION CONTROL SYSTEM QUANTITY MONITOR (G4.102) 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 4.6.3.4-4. REACTION CONTROL SYSTEM QUANTITY MONITOR (G4.102) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--|-----------|----|-------------|-----------|----|--------|---|---------|---------|-------------|
| RCS_FWD_100_PCT_USABLE_FU RCS-FWD 100 PCT USABLE FU-(WFDA) | V97U9817C | 00 | +8.50 | E+02 LBS | F | S | C | G4.102 | 90540B | |
| RCS_FWD_100_PCT_USABLE_OX RCS-FWD 100 PCT USABLE OX-(WFDA) | V97U9816C | 00 | +1.350 | E+03 LBS | F | S | C | G4.102 | 90540B | |
| RCS_FWD_FU_TK_RESIDUAL_WT | V99U7584C | 00 | +1.18 | E+02 LBS | F | S | C | G4.102 | 90540B | |
| RCS_FWD_FU_TOTAL_HE_WT RCS-FWD FU TOTAL HE WT-(WHI) | V97U9811C | 00 | +4.244 | E+00 LBS | F | S | C | G4.102 | 90540B | |
| RCS_FWD_OX_TK_RESIDUAL_WT | V99U7583C | 00 | +1.89 | E+02 LBS | F | S | C | G4.102 | 90540B | |
| RCS_FWD_OX_TOTAL_HE_WT RCS-FWD OX TOTAL HE WT-(WHI) | V97U9810C | 00 | +4.334 | E+00 LBS | F | S | C | G4.102 | 90540B | |
| RCS_LEAK_DET_IND_LMT RCS - LEAK DET IND LIM | V97U9807C | 00 | +9.5 | E+00 PCT | F | S | C | G4.102 | 90540B | |
| RCS_L_AFT_100_PCT_USABLE_FU RCS-L AFT 100 PCT USABLE FU(WFDA) | V97U9819C | 00 | +8.50 | E+02 LBS | F | S | C | G4.102 | 90540B | |
| RCS_L_AFT_100_PCT_USABLE_OX RCS-L AFT 100 PCT USABLE OX(WFDA) | V97U9818C | 00 | +1.350 | E+03 LBS | F | S | C | G4.102 | 90540B | |
| RCS_L_AFT_FU_TK_RESIDUAL_WT | V99U7586C | 00 | +6.7 | E+01 LBS | F | S | C | G4.102 | 90540B | |
| RCS_L_AFT_FU_TOTAL_HE_WT RCS-L AFT FU TOTAL HE WT-(WHI) | V97U9813C | 00 | +4.251 | E+00 LBS | F | S | C | G4.102 | 90540B | |
| RCS_L_AFT_OX_TK_RESIDUAL_WT | V99U7585C | 00 | +1.08 | E+02 LBS | F | S | C | G4.102 | 90540B | |
| RCS_L_AFT_OX_TOTAL_HE_WT RCS L AFT OX TOTAL HE WT (WHI) | V97U9812C | 00 | +4.349 | E+00 LBS | F | S | C | G4.102 | 90540B | |
| RCS_R_AFT_100_PCT_USABLE_FU RCS-R AFT 100 PCT USABLE FU(WFDA) | V97U9821C | 00 | +8.50 | E+02 LBS | F | S | C | G4.102 | 90540B | |
| RCS_R_AFT_100_PCT_USABLE_OX RCS-R AFT 100 PCT USABLE OX(WFDA) | V97U9820C | 00 | +1.350 | E+03 LBS | F | S | C | G4.102 | 90540B | |
| RCS_R_AFT_FU_TK_RESIDUAL_WT | V99U7588C | 00 | +6.7 | E+01 LBS | F | S | C | G4.102 | 90540B | |
| RCS_R_AFT_FU_TOTAL_HE_WT RCS-R AFT FU TOTAL HE WT-(WHI) | V97U9815C | 00 | +4.251 | E+00 LBS | F | S | C | G4.102 | 90540B | |
| RCS_R_AFT_OX_TK_RESIDUAL_WT | V99U7587C | 00 | +1.08 | E+02 LBS | F | S | C | G4.102 | 90540B | |
| RCS_R_AFT_OX_TOTAL_HE_WT RCS-R AFT OX TOTAL HE WT-(WHI) | V97U9814C | 00 | +4.349 | E+00 LBS | F | S | C | G4.102 | 90540B | |

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

TABLE 4.6.3.4-5. REACTION CONTROL SYSTEM QUANTITY MONITOR (G4.102) CONSTANTS

| FSSR NAME DESCRIPTION | MSID | MC | CONSTANT VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|---|-----------|----|----------------|---------------------------|----|--------|---|---------|---------|-------------|
| FUEL_DENSITY_COEFFICIENT_E1 FUEL DENSITY COEFFICIENT (E1) | V97U6159C | 00 | +4.1538 | E-02 ND | F | D | C | G4.102 | 90374C | |
| FUEL_DENSITY_COEFFICIENT_E2 FUEL DENSITY COEFFICIENT (E2) | V97U6160C | 00 | +1.8697 | E-05 ND | F | D | C | G4.102 | 90904C | |
| FUEL_DENSITY_COEFFICIENT_E3 FUEL DENSITY COEFFICIENT (E3) | V97U6161C | 00 | +1.4583 | E-07 ND | F | D | C | G4.102 | 90374C | |
| FUEL_VAPOR_PRESSURE_F FUEL VAPOR PRESSURE (F) | V97U6162C | 00 | +8.0 | E-01 PSIA | F | D | C | G4.102 | 90374C | |
| HELIUM_GAS_CONSTANT_R HELIUM GAS CONSTANT (R) | V97U6165C | 00 | +4.635 | E+03 PSIA*IN**3/LBM*DEG R | F | D | C | G4.102 | 90374C | |
| HELIUM_SYSTEM_COEFFICIENT_A HELIUM SYSTEM VOLUME COEFFICIENT (A) | V97U6166C | 00 | +1.4972 | E-06 ND | F | D | C | G4.102 | 90374C | |
| HELIUM_WEIGHT_COEFFICIENT_G HELIUM WEIGHT COEFFICIENT (G) | V97U6167C | 00 | +1.008 | E+00 ND | F | D | C | G4.102 | 90374C | |
| HE_COMPRESSIBILITY_COEF_B1 HELIUM COMPRESSIBILITY COEFFICIENT (B1) | V97U6163C | 00 | +9.7544 | E-03 ND | F | D | C | G4.102 | 90774 | |
| HE_COMPRESSIBILITY_COEF_B2 HELIUM COMPRESSIBILITY COEFFICIENT (B2) | V97U6164C | 00 | +8.97 | E-01 ND | F | D | C | G4.102 | 90774 | |
| OXIDIZER_DENSITY_COEFFICIENT_C1 OXIDIZER DENSITY COEFFICIENT (C1) | V97U6171C | 00 | +7.6027 | E-02 ND | F | D | C | G4.102 | 90374C | |
| OXIDIZER_DENSITY_COEFFICIENT_C2 OXIDIZER DENSITY COEFFICIENT (C2) | V97U6172C | 00 | +4.5162 | E-05 ND | F | D | C | G4.102 | 90374C | |
| OXIDIZER_DENSITY_COEFFICIENT_C3 OXIDIZER DENSITY COEFFICIENT (C3) | V97U6173C | 00 | +4.1667 | E-07 ND | F | D | C | G4.102 | 90374C | |
| OXID_VAPOR_PRESS_COEFFICIENT_D1 OXID VAPOR PRESS COEFFICIENT (D1) | V97U6168C | 00 | +1.2082 | E+01 ND | F | D | C | G4.102 | 90374C | |
| OXID_VAPOR_PRESS_COEFFICIENT_D2 OXID VAPOR PRESS COEFFICIENT (D2) | V97U6169C | 00 | +6.1110 | E+03 ND | F | D | C | G4.102 | 90374C | |
| OXID_VAPOR_PRESS_COEFFICIENT_D3 OXID VAPOR PRESS COEFFICIENT (D3) | V97U6170C | 00 | +4.03 | E+03 ND | F | D | C | G4.102 | 90374C | |
| RANKIN_TEMP_CONVERSION_COEFF_H RANKIN TEMP CONVERSION COEFF (H) | V97U6174C | 00 | +4.597 | E+02 ND | F | D | C | G4.102 | 90374C | |
| RCS_FWD_FU_HE_LINE_VOLUME_VHLI RCS-FWD FU HE LINE VOLUME (VHLI) | V97U6175C | 00 | +1.37 | E+01 IN**3 | F | D | C | G4.102 | 90374C | |
| RCS_FWD_FU_SYSTEM_VOLUME_VP RCS-FWD FU SYSTEM VOLUME (VP) | V97U6176C | 00 | +3.18436 | E+04 IN**3 | F | D | C | G4.102 | 90374C | |
| RCS_FWD_HE_BOTTLE_VOLUME_VHAM RCS-FWD HE BOTTLE VOLUME (VHAM) | V97U6177C | 00 | +3.043 | E+03 IN**3 | F | D | C | G4.102 | 90374C | |
| RCS_FWD_OX_HE_LINE_VOLUME_VHLI RCS-FWD OX HE LINE VOLUME (VHLI) | V97U6178C | 00 | +1.37 | E+01 IN**3 | F | D | C | G4.102 | 90374C | |
| RCS_FWD_OX_SYSTEM_VOLUME_VP RCS-FWD OX SYSTEM VOLUME (VP) | V97U6179C | 00 | +3.1892 | E+04 IN**3 | F | D | C | G4.102 | 90374C | |
| RCS_FWD_TRAPPED_FU_LINE_VOL_VTP RCS-FWD TRAPPED FU LINE VOL (VTP) | V97U6180C | 00 | +6.775 | E+02 IN**3 | F | D | C | G4.102 | 90374C | |

TABLE 4.6.3.4-5. REACTION CONTROL SYSTEM QUANTITY MONITOR (G4.102) CONSTANTS

| FSSR NAME DESCRIPTION | MSID | MC | CONSTANT VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|---|-----------|----|----------------|-----------|-------|--------|---|----------|---------|-------------|
| RCS_FWD_TRAPPED_OX_LINE_VOL_VTP RCS-FWD TRAPPED OX LINE VOL (VTP) | V97U6181C | 00 | +7.259 | E+02 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_L_AFT_FU_HE_LINE_VOLUME_VHLI RCS-L AFT FU HE LINE VOLUME (VHLI) | V97U6182C | 00 | +2.07 | E+01 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_L_AFT_FU_SYSTEM_VOLUME_VP RCS-L AFT FU SYSTEM VOLUME (VP) | V97U6183C | 00 | +3.23886 | E+04 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_L_AFT_HE_VOLUME_VHAM RCS-L AFT HE BOTTLE VOLUME (VHAM) | V97U6184C | 00 | +3.043 | E+03 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_L_AFT_OX_HE_LINE_VOLUME_VHLI RCS-L AFT OX HE LINE VOLUME (VHLI) | V97U6185C | 00 | +2.36 | E+01 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_L_AFT_OX_SYSTEM_VOLUME_VP RCS-L AFT OX SYSTEM VOLUME (VP) | V97U6186C | 00 | +3.23156 | E+04 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_L_AFT_TRAPPED_FU_LN_VOL_VTP RCS-L AFT TRAPPED FU LINE VOL (VTP) | V97U6187C | 00 | +1.2230 | E+03 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_L_AFT_TRAPPED_OX_LN_VOL_VTP RCS-L AFT TRAPPED OX LINE VOL (VTP) | V97U6188C | 00 | +1.1326 | E+03 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_R_AFT_FU_HE_LINE_VOLUME_VHLI RCS-R AFT FU HE LINE VOLUME (VHLI) | V97U6189C | 00 | +2.07 | E+01 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_R_AFT_FU_SYSTEM_VOLUME_VP RCS-R AFT FU SYSTEM VOLUME (VP) | V97U6190C | 00 | +3.23886 | E+04 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_R_AFT_HE_BOTTLE_VOLUME_VHAM RCS-R AFT HE BOTTLE VOLUME (VHAM) | V97U6191C | 00 | +3.043 | E+03 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_R_AFT_OX_HE_LINE_VOLUME_VHLI RCS-R AFT OX HE LINE VOLUME (VHLI) | V97U6192C | 00 | +2.36 | E+01 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_R_AFT_OX_SYSTEM_VOLUME_VP RCS-R AFT OX SYSTEM VOLUME (VP) | V97U6193C | 00 | +3.23156 | E+04 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_R_AFT_TRAPPED_FU_LN_VOL_VTP RCS-R AFT TRAPPED FU LINE VOL (VTP) | V97U6194C | 00 | +1.2230 | E+03 | IN**3 | F | D | C G4.102 | 90374C | |
| RCS_R_AFT_TRAPPED_OX_LN_VOL_VTP RCS-R AFT TRAPPED OX LINE VOL (VTP) | V97U6195C | 00 | +1.1326 | E+03 | IN**3 | F | D | C G4.102 | 90374C | |

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

4.6.4 RCS Helium Regulator Failure Protection Sequence (4.189)

4.6.4.1 Introduction

The RCS helium regulator failure protection sequence will be used during OPS 1, 3, and 6 to protect the aft left and right RCS systems against helium regulator failures. If a regulator failure occurs, then the RCS/RCS crossfeed and reconfiguration sequence will be called. This sequence will operate automatically and can be overridden by manual reconfiguration of the panel 07 or 08 switches controlling the appropriate valves. The sequence is initiated by the MECO CONFIRMED event.

The RCS helium regulator failure protection sequence will detect and respond to regulator closed failures. If a failure occurs, then the sequence will auto crossfeed, and the crew will be alerted to the reconfiguration.

This sequence is designed for OPS 1, 3, and 6 only. Redundancy is built into the sequence so that reconfiguration will not occur with a single instrumentation failure, yet, following an instrumentation failure, the sequence will still protect against regulator failures.

4.6.4.2 Overview

RCS regulator failures are determined based on a comparison of selected transducer pressure readings to a low limit. Transducer failures or commfaults will be accounted for by elimination of the faulted measurement. If no instrumentation failures exist, then the sequence will use two pressure readings to check against the failure limits. If one transducer in a single system fails, the sequence will use only one transducer in order to determine a regulator failure. If an unfaulted measurement cannot be selected, the sequence will not work, and no crew annunciation will be made. The sequence will continue to look for a good pressure (i.e., unfaulted) in order to perform the intended function. If a measurement starts to work or a commfault is cleared, the sequence will start to check the pressure reading against the low limit. All of the good pressures must be out of limit for a regulator failure to be declared.

If a failed close regulator is detected, the sequence will call the RCS/RCS crossfeed and reconfiguration sequence to provide propellant from the good pod.

4.6.4.3 Detail Requirements

During ascent and entry, this sequence shall run at 1.04 Hz. Prior to the first execution of this sequence, the parameters used by this sequence shall be initialized as defined in Table 4.6.4.4-4. The values of the parameters in Table 4.6.4.4-4 shall be preserved across all OPS transitions and OPS mode recalls with the exception of a transition into OPS 2, on which the parameters should be reinitialized per Table 4.6.4.4-4.

Step 1. This step initializes the current RCS pod counter so that both aft RCS pods (aft left and aft right) will be processed by the sequence.

Set (1) below to zero and proceed to Step 2.

(1) CURRENT POD

(INTERNAL)

Step 2. On each pass of the sequence, both aft RCS pods (aft left and aft right) are processed in a loop. This step defines which pod is being processed on the current pass of the loop.

Increment (a) below by one and proceed to monitor (a) below:

(a) CURRENT POD (INTERNAL)

If (a) is equal to 1, then proceed to Step 3 for the aft left RCS pod.

If (a) is equal to 2, then proceed to step 3 for the aft right RCS pod.

If (a) is greater than 2, i.e., both pods have been processed, then return to Step 1.

Step 3. This step initializes the current propellant type counter so that both propellant types (oxidizer and fuel) will be processed by the sequence for the current RCS pod.

Set (1) below to zero and proceed to Step 4.

(1) CURRENT PROPELLANT TYPE (INTERNAL)

Step 4. On each pass of the sequence for each RCS pod, both propellants (oxidizer and fuel) are processed in a loop. This step defines which propellant is being processed on the current pass of the loop.

Increment (a) below by one and proceed to monitor (a) below:

(a) CURRENT PROPELLANT TYPE (INTERNAL)

If (a) is equal to 1, then proceed to Subsequence A for the oxidizer leg.

If (a) is equal to 2, then proceed to Subsequence A for the fuel leg.

If (a) is greater than 2, i.e., both oxidizer and fuel legs have been processed, then return to Step 2.

Subsequence A

Subsequence A monitors the RCS pressures used by this sequence for commfaults and transducer failures, determines how many pressures are available for use by the sequence for the current RCS pod and propellant type, and performs regulator failure criteria limit checking on the good pressures available for use by the sequence.

All transducers are checked for commfaults and are checked against the transducer failure criteria (off-scale values) in Table 4.6.4.4-3. A dedicated signal conditioner (DSC) failure will look like a transducer failure because the reading will go to the low state (zero), which is below the offscale low failure limit.

This subsequence will monitor the tank pressure and the tank outlet pressure sequentially for the current RCS pod and propellant type. If a pressure is determined to be good, the subsequence compares the pressure against a low limit to determine if the regulator is failed closed. If the instrumentation is failed, then the regulator failure criteria limit check is bypassed and the pressure will not be used. A regulator can be considered failed closed only if all the good pressures available for use by the sequence for the current RCS pod and propellant type are at or below the low limit. A noise filter is included in the subsequence to

preclude a data hit from declaring a regulator failure. If the low limit test is failed for two consecutive passes, the appropriate action is taken to respond to the failed close regulator.

Step A1. This step initializes the number of pressures out of limits and the number of good pressures to zero before transducer checks are performed for the current RCS pod and propellant type. It also initializes the current pressure indicator so that the tank pressure will be the first pressure checked.

Set (a), (b), and (c) below to zero and then proceed to Step A2.

- | | | |
|-----|----------------------------------|------------|
| (a) | NUMBER OF PRESSURES OUT OF LIMIT | (INTERNAL) |
| (b) | NUMBER OF GOOD PRESSURES | (INTERNAL) |
| (c) | CURRENT PRESSURE | (INTERNAL) |

Step A2. On each pass of the subsequence, both tank pressure transducers (tank pressure and tank outlet pressure) for the current RCS pod and propellant type are processed in a loop. This step defines which pressure transducer is being processed on the current pass of the loop.

Increment (a) below by one and proceed to monitor (a) below:

- | | | |
|-----|------------------|------------|
| (a) | CURRENT PRESSURE | (INTERNAL) |
|-----|------------------|------------|

If (a) is equal to 1, then proceed to Step A3 to check the tank pressure.

If (a) is equal to 2, then proceed to Step A4 to check the tank outlet pressure.

If (a) is greater than 2, i.e., both pressures have been checked, then proceed to Step A7.

Step A3. This step selects the tank pressure and commfault signals for the current RCS pod and propellant type to be used to determine whether the tank pressure can be used by the sequence.

The following signals are monitored:

- | | | |
|-----|--------------------------------------|------------|
| (a) | CURRENT POD | (INTERNAL) |
| (b) | CURRENT PROPELLANT TYPE | (INTERNAL) |
| (c) | LRCS OX TK P | V42P2115C |
| (d) | LRCS FU TK P | V42P2116C |
| (e) | RRCS OX TK P | V42P3115C |
| (f) | RRCS FU TK P | V42P3116C |
| (g) | FA1 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2841X |
| (h) | FA2 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2842X |

If (a) is equal to 1 and (b) is equal to 1, i.e., left RCS oxidizer is now being processed, then set (1) below to (c), set (2) below to (g), and proceed to Step A5.

If (a) is equal to 1 and (b) is equal to 2, i.e., left RCS fuel is being processed, then set (1) below to (d), set (2) below to (g), and proceed to Step A5.

If (a) is equal to 2 and (b) is equal to 1, i.e., right RCS oxidizer is being processed, then set (1) below to (e), set (2) below to (h) and proceed to Step A5.

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If (a) is equal to 2 and (b) is equal to 2, i.e., right RCS fuel is being processed, then set (1) below to (f), set (2) below to (h), and proceed to Step A5.

- | | |
|---------------------------------|------------|
| (1) SELECTED PRESSURE | (INTERNAL) |
| (2) SELECTED PRESSURE COMMFAULT | (INTERNAL) |

Step A4. This step selects the tank outlet pressure and commfault signals for the current RCS pod and propellant type to be used to determine whether the tank outlet pressure can be used by the sequence.

The following signals are monitored:

- | | |
|--|------------|
| (a) CURRENT POD | (INTERNAL) |
| (b) CURRENT PROPELLANT TYPE | (INTERNAL) |
| (c) LRCS OX TK OUT P* | V42P2210C* |
| (d) LRCS FU TK OUT P* | V42P2310C* |
| (e) RRCS OX TK OUT P* | V42P3210C* |
| (f) RRCS FU TK OUT P* | V42P3310C* |
| (g) FA3 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2843X |
| (h) FA4 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2844X |

If (a) is equal to 1 and (b) is equal to 1, i.e., left RCS oxidizer is being processed, then set (1) below to (c), set (2) below to (g), and proceed to Step A5.

If (a) is equal to 1 and (b) is equal to 2, i.e., left RCS fuel is being processed, then set (1) below to (d), set (2) below to (g), and proceed to Step A5.

If (a) is equal to 2 and (b) is equal to 1, i.e., right RCS oxidizer is being processed, then set (1) below to (e), set (2) below to (h), and proceed to Step A5.

If (a) is equal to 2 and (b) is equal to 2, i.e., right RCS fuel is being processed, then set (1) below to (f), set (2) below to (h), and proceed to Step A5.

- | | |
|---------------------------------|------------|
| (1) SELECTED PRESSURE | (INTERNAL) |
| (2) SELECTED PRESSURE COMMFAULT | (INTERNAL) |

Step A5. This step performs transducer and commfault checks on the selected pressure to determine whether the pressure can be used by the sequence. If the selected pressure is commfaulted or off scale high or off scale low, it will not be used. Otherwise, it will be used by the sequence.

The following signals are monitored:

- | | |
|---------------------------------|------------|
| (a) SELECTED PRESSURE COMMFAULT | (INTERNAL) |
| (b) SELECTED PRESSURE | (INTERNAL) |

If (a) is true or (b) is greater than or equal to (1) below or (b) is less than or equal to (2) below, i.e., the selected pressure is bad, then return to Step A2.

If (a) is false and (b) is less than (1) below and (b) is greater than (2) below, i.e., the selected pressure is good, then increment (3) below by one and proceed to Step A6.

- | | | |
|-----|--------------------------|------------|
| (1) | OFF_SCALE_HIGH_LIMIT | V99U9860C |
| (2) | OFF_SCALE_LOW_LIMIT | V99U9859C |
| (3) | NUMBER OF GOOD PRESSURES | (INTERNAL) |

Step A6. This step performs the low-limit test on the selected pressure to determine whether the pressure is at or below the low limit. If the selected pressure is at or below the low limit, the number of pressures out of limit is incremented by one.

The following signals are monitored:

- | | | |
|-----|--------------------------|------------|
| (a) | SELECTED PRESSURE | (INTERNAL) |
| (b) | RCS_TANK_LOW_PRESS_LIMIT | V99U9862C |

If (a) is less than or equal to (b), i.e., the selected pressure is equal to or below the low limit, then increment (1) below by one and return to Step A2.

If (a) is greater than (b), i.e., the selected pressure is above the low limit, then return to Step A2.

- | | | |
|-----|----------------------------------|------------|
| (1) | NUMBER OF PRESSURES OUT OF LIMIT | (INTERNAL) |
|-----|----------------------------------|------------|

Step A7. This step determines whether or not a regulator may be failed closed based on the number of pressures out of limit. If all of the pressures available for use by the sequence are at or below the low limit, then the regulator may be failed closed and noise filtering must be performed to determine if a real failure exists.

The following signals are monitored:

- | | | |
|-----|----------------------------------|------------|
| (a) | NUMBER OF GOOD PRESSURES | (INTERNAL) |
| (b) | NUMBER OF PRESSURES OUT OF LIMIT | (INTERNAL) |

If (a) is equal to zero, i.e., there are no good pressures available, then return to Step 4.

If (a) is not equal to zero and (a) is equal to (b), i.e., each good pressure is at or below the low limit, then proceed to Step A9 to perform noise filtering.

If (a) is not equal to zero and (a) is not equal to (b), i.e., at least one good pressure is above the low limit, then proceed to Step A8.

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Step A8. This step reinitializes the failed–close first pass flag and the low noise filter count for the current RCS pod and propellant type, since the low–limit test has been passed without detecting a failed close regulator. It also resets the RCS low–pressure alert for the current RCS pod and propellant type to allow for annunciation of subsequent regulator–closed failures.

The following signals are monitored:

- (a) CURRENT POD (INTERNAL)
- (b) CURRENT PROPELLANT TYPE (INTERNAL)

If (a) is equal to 1 and (b) is equal to 1, i.e., left RCS oxidizer is being processed, then set (1) below true and (5) below false, set (9) below to zero, and return to Step 4.

If (a) is equal to 1 and (b) is equal to 2, i.e., left RCS fuel is being processed, then set (2) below true and (6) below false, set (10) below to zero, and return to Step 4.

If (a) is equal to 2 and (b) is equal to 1, i.e., right RCS oxidizer is being processed, then set (3) below true and (7) below false, set (11) below to zero, and return to Step 4.

If (a) is equal to 2 and (b) is equal to 2, i.e., right RCS fuel is being processed, then set (4) below true and (8) below false, set (12) below to zero, and return to Step 4.

- (1) LRCS OX FIRST PASS FAILED CLOSE FLAG (INTERNAL)
- (2) LRCS FU FIRST PASS FAILED CLOSE FLAG (INTERNAL)
- (3) RRCS OX FIRST PASS FAILED CLOSE FLAG (INTERNAL)
- (4) RRCS FU FIRST PASS FAILED CLOSE FLAG (INTERNAL)
- (5) LRCS OX LOW PRESS ALERT V90X5794X
- (6) LRCS FU LOW PRESS ALERT V90X5795X
- (7) RRCS OX LOW PRESS ALERT V90X5797X
- (8) RRCS FU LOW PRESS ALERT V90X5798X
- (9) LRCS OX LOW NOISE FILTER COUNT (INTERNAL)
- (10) LRCS FU LOW NOISE FILTER COUNT (INTERNAL)
- (11) RRCS OX LOW NOISE FILTER COUNT (INTERNAL)
- (12) RRCS FU LOW NOISE FILTER COUNT (INTERNAL)

Step A9. This step performs noise filtering for the low–limit test for the current RCS pod and propellant by incrementing the appropriate noise filter counter and then monitoring it. If the pressure has met or exceeded the low limit for two consecutive passes of the sequence, the regulator is considered failed closed and action is taken to perform an auto–crossfeed from the other RCS pod and to annunciate an alarm to the crew.

The following signals are monitored:

- (a) CURRENT POD (INTERNAL)
- (b) CURRENT PROPELLANT TYPE (INTERNAL)

If (a) is equal to 1 and (b) is equal to 1, i.e., the left RCS oxidizer pressure has met or exceeded the low limit for at least one pass, then increment (c) below by one and proceed to monitor (c) below.

If (a) is equal to 1 and (b) is equal to 2, i.e., the left RCS fuel pressure has met or exceeded the low limit for at least one pass, then increment (d) below by one and proceed to monitor (d) below.

If (a) is equal to 2 and (b) is equal to 1, i.e., the right RCS oxidizer pressure has met or exceeded the low limit for at least one pass, then increment (e) below by one and proceed to monitor (e) below.

If (a) is equal to 2 and (b) is equal to 2, i.e., the right RCS fuel pressure has met or exceeded the low limit for at least one pass, then increment (f) below by one and proceed to monitor (f) below.

- | | | |
|-----|--------------------------------|------------|
| (c) | LRCS OX LOW NOISE FILTER COUNT | (INTERNAL) |
| (d) | LRCS FU LOW NOISE FILTER COUNT | (INTERNAL) |
| (e) | RRCS OX LOW NOISE FILTER COUNT | (INTERNAL) |
| (f) | RRCS FU LOW NOISE FILTER COUNT | (INTERNAL) |

If (a) is equal to 1, (b) is equal to 1, and (c) is greater than or equal to 2, i.e., the left RCS oxidizer pressure has met or exceeded the low limit for two consecutive passes, then proceed to Subsequence B to react to the failed close regulator. If (c) is less than 2, then return to Step 4.

If (a) is equal to 1, (b) is equal to 2, and (d) is greater than or equal to 2, i.e., the left RCS fuel pressure has met or exceeded the low limit for two consecutive passes, then proceed to Subsequence B to react to the failed close regulator. If (d) is less than 2, then return to Step 4.

If (a) is equal to 2, (b) is equal to 1, and (e) is greater than or equal to 2, i.e., the right RCS oxidizer pressure has met or exceeded the low limit for two consecutive passes, then proceed to Subsequence B to react to the failed close regulator. If (e) is less than 2, then return to Step 4.

If (a) is equal to 2, (b) is equal to 2, and (f) is greater than or equal to 2, i.e., the right RCS fuel pressure has met or exceeded the low limit for two consecutive passes, then proceed to Subsequence B to react to the failed close regulator. If (f) is less than 2, then return to Step 4.

Subsequence B

Subsequence B will be executed if a regulator is discovered to be failed close. This subsequence monitors for the failed close first pass flag for the current RCS pod and propellant type and for the OMS/RCS interconnect command and the OMS/RCS complete flags. If the appropriate failed-close first pass flag is true and an OMS/RCS interconnect is not in effect or being configured, then this subsequence will initiate an automatic crossfeed to the remaining good aft RCS system and annunciate a crew alert. The subsequence also sets the failed close first pass flag for the current RCS pod and propellant type false.

Step B1. This step determines whether action needs to be taken for a regulator failed close. If this is the first pass through this subsequence for the current RCS pod and propellant type, then the appropriate action will be taken based on the current RCS pod.

The following signals are monitored:

- | | | |
|-----|--------------------------------------|------------|
| (a) | CURRENT POD | (INTERNAL) |
| (b) | CURRENT PROPELLANT TYPE | (INTERNAL) |
| (c) | LRCS OX FIRST PASS FAILED CLOSE FLAG | (INTERNAL) |
| (d) | LRCS FU FIRST PASS FAILED CLOSE FLAG | (INTERNAL) |
| (e) | RRCS OX FIRST PASS FAILED CLOSE FLAG | (INTERNAL) |
| (f) | RRCS FU FIRST PASS FAILED CLOSE FLAG | (INTERNAL) |

If (a) is equal to 1 and (b) is equal to 1, i.e., left RCS oxidizer is being processed, and (c) is true, i.e., it is first pass for a left RCS oxidizer regulator failed close, then proceed to Step B2. If (c) is false, i.e., it is not first pass for a left RCS oxidizer regulator failed close, then return to Step 4.

If (a) is equal to 1 and (b) is equal to 2, i.e., left RCS fuel is being processed, and (d) is true, i.e., it is first pass for a left RCS fuel regulator failed close, then proceed to Step B2. If (d) is false, i.e., it is not first pass for a left RCS fuel regulator failed close, then return to Step 4.

If (a) is equal to 2 and (b) is equal to 1, i.e., right RCS oxidizer is being processed, and (e) is true, i.e., it is first pass for a right RCS oxidizer regulator failed close, then proceed to Step B2. If (e) is false, i.e., it is not first pass for a right RCS oxidizer regulator failed close, then return to Step 4.

If (a) is equal to 2 and (b) is equal to 2, i.e., right RCS fuel is being processed, and (f) is true, i.e., it is first pass for a right RCS fuel regulator failed close, then proceed to Step B2. If (f) is false, i.e., it is not first pass for a right RCS fuel regulator failed close, then return to Step 4.

Step B2. This step initiates an automatic crossfeed to the remaining good aft RCS system after an aft RCS regulator–closed failure has been detected, provided there is no OMS/RCS interconnect in effect or being configured.

The following signals are monitored:

- | | | |
|-----|------------------------------------|------------|
| (a) | OMS/RCS INTERCONNECT COMMAND | V90X8312X |
| (b) | OMS/RCS INTERCONNECT COMPLETE FLAG | V90X8282X |
| (c) | CURRENT POD | (INTERNAL) |

If (a) or (b) is true, i.e., an OMS/RCS interconnect is in effect or is being configured, then proceed to Step B4.

If (a) and (b) are false, i.e., there is no OMS/RCS interconnect in effect or being configured, and (c) is equal to 1, i.e., the failure is in the left RCS pod, then set (1) below false and (2) below true to initiate an RCS/RCS crossfeed from the right RCS system and proceed to Step B3.

If (a) and (b) are false, i.e., there is no OMS/RCS interconnect in effect or being configured, and (c) is equal to 2, i.e., the failure is in the right RCS pod, then set (1) below true and (2) below false to initiate an RCS/RCS crossfeed from the left RCS system and proceed to Step B3.

- | | |
|-------------------------|-----------|
| (1) FEED FROM LEFT RCS | V93X5199X |
| (2) FEED FROM RIGHT RCS | V93X5200X |

Step B3. This step performs additional actions unique to an aft RCS regulator–closed failure. An alert is issued to the crew that the current RCS pod has been reconfigured.

Monitor the following signals:

- | | |
|-----------------------------|------------|
| (a) CURRENT POD | (INTERNAL) |
| (b) CURRENT PROPELLANT TYPE | (INTERNAL) |

If (a) is equal to 1 and (b) is equal to 1, i.e., left RCS oxidizer is being processed, then set (1) below true and proceed to Step B4.

If (a) is equal to 1 and (b) is equal to 2, i.e., left RCS fuel is being processed, then set (2) below true and proceed to Step B4.

If (a) is equal to 2 and (b) is equal to 1, i.e., right RCS oxidizer is being processed, then set (3) below true and proceed to Step B4.

If (a) is equal to 2 and (b) is equal to 2, i.e., right RCS fuel is being processed, then set (4) below true and proceed to Step B4.

- | | |
|-----------------------------|-----------|
| (1) LRCS OX LOW PRESS ALERT | V90X5794X |
| (2) LRCS FU LOW PRESS ALERT | V90X5795X |
| (3) RRCS OX LOW PRESS ALERT | V90X5797X |
| (4) RRCS FU LOW PRESS ALERT | V90X5798X |

Step B4. This step resets the failed–close first pass flag for the current RCS pod and propellant type and zeroes the noise filter counter for the current RCS pod and propellant type.

Monitor the following signals:

- | | |
|-----------------------------|------------|
| (a) CURRENT POD | (INTERNAL) |
| (b) CURRENT PROPELLANT TYPE | (INTERNAL) |

If (a) is equal to 1 and (b) is equal to 1, i.e., left RCS oxidizer is being processed, then set (1) below false, set (5) below to zero, and return to Step 4.

If (a) is equal to 1 and (b) is equal to 2, i.e., left RCS fuel is being processed, then set (2) below false, set (6) below to zero, and return to Step 4.

If (a) is equal to 2 and (b) is equal to 1, i.e., right RCS oxidizer is being processed, then set (3) below false, set (7) below to zero, and return to Step 4.

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If (a) is equal to 2 and (b) is equal to 2, i.e., right RCS fuel is being processed, then set (4) below false, set (8) below to zero, and return to Step 4.

- | | | |
|-----|--------------------------------------|------------|
| (1) | LRCS OX FIRST PASS FAILED CLOSE FLAG | (INTERNAL) |
| (2) | LRCS FU FIRST PASS FAILED CLOSE FLAG | (INTERNAL) |
| (3) | RRCS OX FIRST PASS FAILED CLOSE FLAG | (INTERNAL) |
| (4) | RRCS FU FIRST PASS FAILED CLOSE FLAG | (INTERNAL) |
| (5) | LRCS OX LOW NOISE FILTER COUNT | (INTERNAL) |
| (6) | LRCS FU LOW NOISE FILTER COUNT | (INTERNAL) |
| (7) | RRCS OX LOW NOISE FILTER COUNT | (INTERNAL) |
| (8) | RRCS FU LOW NOISE FILTER COUNT | (INTERNAL) |

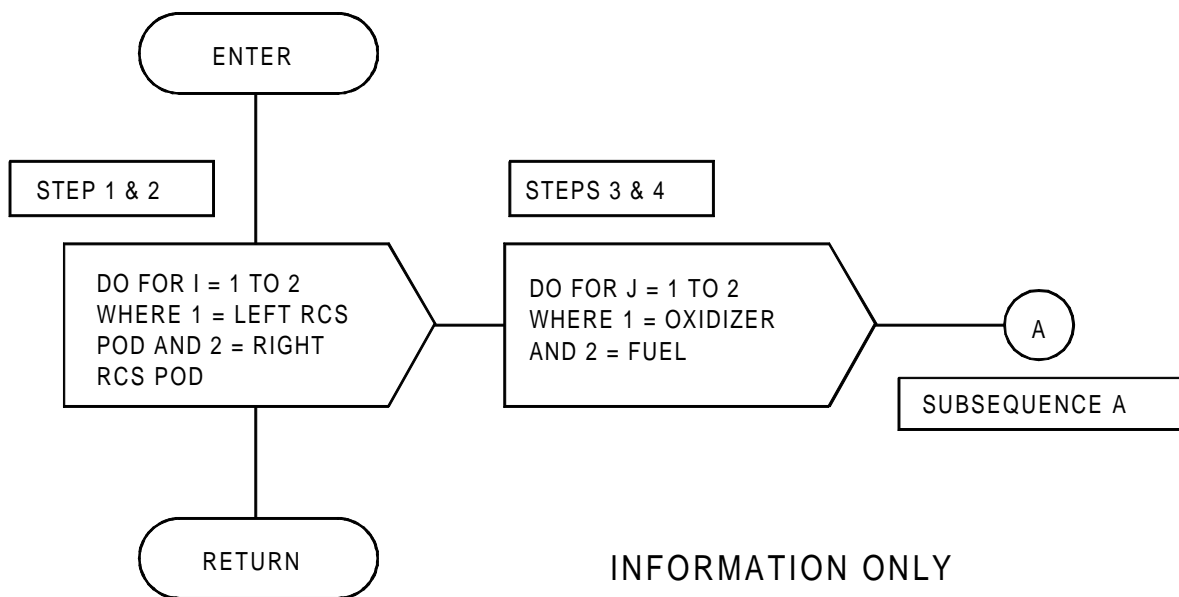


FIGURE 4.189.(1) RCS He Regulator Failure Protection Sequence (Sheet 1 of 3)

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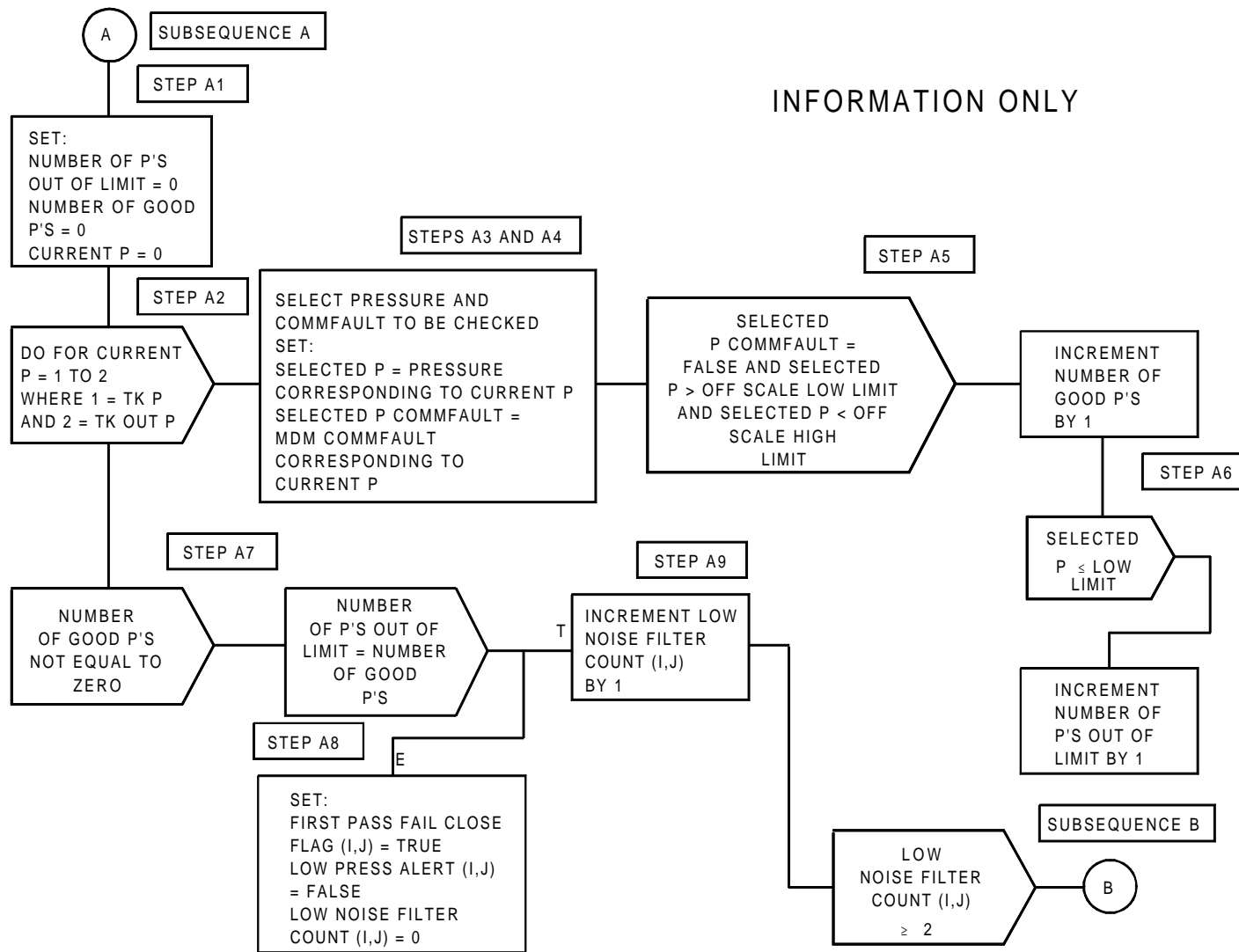


FIGURE 4.189.(2) RCS He Regulator Failure Protection Sequence (Sheet 2 of 3)

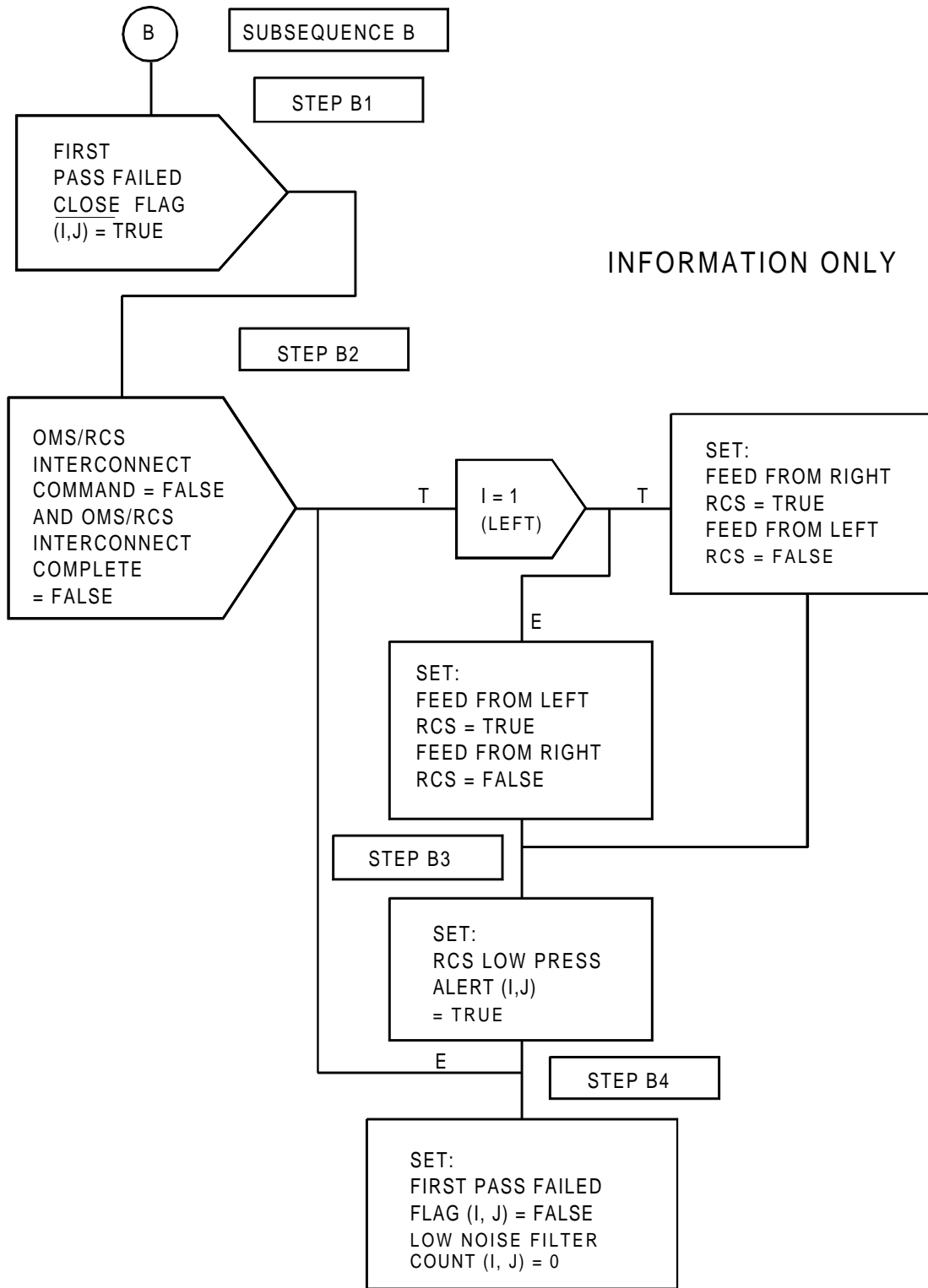


FIGURE 4.189.(3) RCS Helium Regulator Failure Protection Sequence (Sheet 3 of 3)

TABLE 4.6.4.4-1. INPUT FUNCTIONAL PARAMETERS FOR RCS REGULATOR FAILURE PROTECTION SEQUENCE (G4.189)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------------|------------|------------------------------------|------------------|-------|-----------|------------------|---------|-------------|
| RTLS_ABORT_DECLARED | V90X8637XA | RTLS ABORT DECLARED | MSC | | BD | | 93167A | * |
| | V42P2115C | RCS L AFT OX TANK ULLAGE PRESS | DSC OL1 | PSIA | AMU | | 93017G | * |
| | V42P2116C | RCS L AFT FU TANK ULLAGE PRESS | DSC OL2 | PSIA | AMU | | 93017G | * |
| | V42P2210C* | RCS L AFT OX TANK OUT PRESS | DSC OL1 | PSIA | AMU | | 89464G | |
| | V42P2310C* | RCS L AFT FU TANK OUT PRESS | DSC OL2 | PSIA | AMU | | 89464G | |
| | V42P3115C | RCS R AFT OX TANK ULLAGE PRESS | DSC OR1 | PSIA | AMU | | 93017G | * |
| | V42P3116C | RCS R AFT FU TANK ULLAGE PRESS | DSC OR2 | PSIA | AMU | | 93017G | * |
| | V42P3210C* | RCS R AFT OX TANK OUT PRESS | DSC OR1 | PSIA | AMU | | 89464G | |
| | V42P3310C* | RCS R AFT FU TANK OUT PRESS | DSC OR2 | PSIA | AMU | | 89464G | |
| | V90X8282X | OMS TO RCS INTERCONNECT COMP FLAG | ABT OMS/RCS CONN | | BD | | 93017G | * |
| | V90X8312X | OMS TO RCS INTERCONNECT CMD | ABT CNTL SEQ | | BD | | 93017G | * |
| | V91X2841X | FA1 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2842X | FA2 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2843X | FA3 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2844X | FA4 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |

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

TABLE 4.6.4.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM RCS REGULATOR FAILURE PROTECTION SEQUENCE (G4.189)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|-------------------------|--|-------|-----------|------------------|---------|-------------|
| | V90M2904PD | CGRB_STATUS_2\$(24:) | DL FMT 21/1 DL FMT 23/1 | | | | 93017G | * |
| | V90X5794X | LRCS OX LOW PRESS ALERT | GAX | | BD | | 79964F | |
| | V90X5795X | LRCS FU LOW PRESS ALERT | GAX | | BD | | 79964F | |
| | V90X5797X | RRCS OX LOW PRESS ALERT | GAX | | BD | | 79964F | |
| | V90X5798X | RRCS FU LOW PRESS ALERT | GAX | | BD | | 79964F | |
| | V93X5199XA | FEED FROM LEFT RCS | DL FMT 21/1 DL FMT 23/1 MSC RCS/RCS XFEED | | BD | | 93017G | * |
| | V93X5200XA | FEED FROM RIGHT RCS | DL FMT 21/1 DL FMT 23/1 MSC RCS/RCS XFEED | | BD | | 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 4.6.4.4-3. RCS REGULATOR FAILURE PROTECTION SEQUENCE (G4.189) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|--------------------------|-----------|-----------|----|----|---|---|---------|----|-----|---------|-------------|
| RCS_TANK_LOW_PRESS_LIMIT | V99U9862C | PSIA | F | S | D | P | G4.189 | 00 | REG | DC0617 | |

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

TABLE 4.6.4.4-4. RCS REGULATOR FAILURE PROTECTION SEQUENCE (G4.189) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--------------------------|-----------|----|-------------|-----------|----|--------|---|---------|---------|-------------|
| OFF_SCALE_HIGH_LIMIT | V99U9860C | 00 | +3.50 | E+02 PSIA | F | S | P | G4.189 | 89246A | |
| OFF_SCALE_LOW_LIMIT | V99U9859C | 00 | +1.50 | E+02 PSIA | F | S | P | G4.189 | 79964F | |

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

TABLE 4.6.4.4-5. RCS REGULATOR FAILURE PROTECTION SEQUENCE (G4.189) 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.

4.7.2 Orbit OMS/RCS Conn (4.212)

4.7.2.1 Introduction

For missions requiring RCS propellant in excess of the available volume in the RCS tanks, a manual capability is available with an automatic OMS tank repressurization function, which is initiated when left or right OMS tank feed is selected for aft RCS jet usage.

4.7.2.2 Overview

After the crew has manually configured the system valves for the required propellant transfer from the OMS propellant tanks to either or both the Aft RCS jet manifolds, a single or dual keyboard entry on SPEC 23 (RM RCS Display) is used to start the automatic OMS tank repressurization and the OMS/RCS quantity gauging sequences. The first operation performed after receipt of the SPEC 23 keyboard entry(s) is the establishment of a known MDM condition via termination of required valve commands. This allows return of all switches to a known GPC condition and the initiation of aft RCS jet cycle counting in support of OMS/RCS gauging.

OMS ullage pressure is maintained by periodic cycling of helium isolation and vapor isolation valves based on pressure unless inhibited by crew item entry on SPEC 23. The inhibit allows the MCC to terminate the auto repressurization of the OMS tanks to protect against helium system failures. This MCC capability may also be used to ascertain the OMS propellant tank quantity measurement in support of OMS propellant tank leak analysis.

If during the termination of an auto OMS propellant tank repressurization cycle any of the helium or vapor isolation valves fail to close when commanded, OMS Helium Valve Miscompare signals are generated resulting in a crew Class 3 alert and tone. The Miscompare signals are reset during each pass. Setting of the Miscompare to a false state will remove the crew alert in subsequent passes if the cause of the miscompare is removed.

When no longer required, as determined by activation of Item 7 of the RM RCS Display, this sequence and the OMS/RCS gauging is terminated.

4.7.2.3 Detailed Requirements

Step 1. This step initiates and controls the OMS tank repressurization functions and resets the OMS HE Valve Miscompare Signal.

During each pass the following signals are reset:

| | |
|--------------------------------|-----------|
| LT OMS HE/VAPOR ISO VLV MISCOM | V90X8274X |
| RT OMS HE/VAPOR ISO VLV MISCOM | V90X8275X |

The following signals are monitored:

| | |
|----------------------------------|------------|
| (a) LOMS TO AFT RCS PRESS ENA | V93X5100X |
| (b) ROMS TO AFT RCS PRESS ENA | V93X5101X |
| (c) INTERCONNECT INITIATION FLAG | (INTERNAL) |
| (d) PRE-SEQ CMD TERM FLAG | (INTERNAL) |

If (c) is true, then set (1) true, and (c) false, and proceed to Subsequence B. Then proceed to monitor (a) and (b). Otherwise, proceed to monitor (d).

If (d) is false, then proceed to Step 2. Then proceed to monitor (a) and (b). Otherwise, proceed to monitor (a) and (b).

If (a) and (b) are false, then set (c) true, set (10) false, terminate (2) through (9), and return to Step 1. Otherwise, return to Step 1.

| | | |
|------|-------------------------------|------------|
| (1) | PRE-SEQ CMD TERM FLAG | (INTERNAL) |
| (2) | OMS L POD HE ISLN VLV A OP | V43K4180X |
| (3) | OMS L POD HE ISLN VLV B OP | V43K4181X |
| (4) | OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| (5) | OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| (6) | OMS R POD HE ISLN VLV A OP | V43K5180X |
| (7) | OMS R POD HE ISLN VLV B OP | V43K5181X |
| (8) | OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| (9) | OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |
| (10) | REPRESS ACTIVE FLAG | (INTERNAL) |

Step 2. This step monitors for commfault status. The following signals are monitored:

| | | |
|-----|---------------------------------------|------------|
| (a) | FA 1 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2841X |
| (b) | FA 2 INPUT PROM SEG 1, 2 STATUS (MFE) | V91X2842X |
| (c) | REPRESS ACTIVE FLAG | (INTERNAL) |
| (d) | PRESS_TIME_DELAY | V97U9823C |

If (a) and (b) are both false, proceed to Step A1.

If (a) or (b) is true and (c) is true, then return to Step 1 until (d) has expired. Then, terminate the commands listed below, set (c) above false, and return to Step 1.

If (a) or (b) is true and (c) is false, then return to Step 1.

| | | |
|-----|-------------------------------|-----------|
| (1) | OMS L POD HE ISLN VLV A OP | V43K4180X |
| (2) | OMS L POD HE ISLN VLV B OP | V43K4181X |
| (3) | OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| (4) | OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| (5) | OMS R POD HE ISLN VLV A OP | V43K5180X |
| (6) | OMS R POD HE ISLN VLV B OP | V43K5181X |
| (7) | OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| (8) | OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |

Subsequence A

Step A1. This step issues the commands necessary for the performance and inhibiting of the LT/RT OMS tank automatic repressurization.

The following signals are monitored:

| | | |
|-----|-----------------------------------|------------|
| (a) | REPRESS ACTIVE FLAG | (INTERNAL) |
| (b) | OMS PRESS ENA INHIBIT | V93X5116X |
| (c) | OMS L POD OXDZR TANK ULLAGE PRESS | V43P4221C |
| (d) | OMS L POD FUEL TANK ULLAGE PRESS | V43P4321C |
| (e) | OMS R POD OXDZR TANK ULLAGE PRESS | V43P5221C |
| (f) | OMS R POD FUEL TANK ULLAGE PRESS | V43P5321C |
| (g) | OMS_ULLAGE_PRESS_LOWER_LMT | V97U9822C |
| (h) | LOMS TO AFT RCS PRESS ENA | V93X5100X |
| (i) | ROMS TO AFT RCS PRESS ENA | V93X5101X |
| (j) | PRESS_TIME_DELAY | V97U9823C |

If (a) is false, then proceed to monitor (b). Otherwise, proceed to monitor (j).

If (b) is false, then proceed to monitor (c), (d), and (h). Otherwise, return to Step 1.

If (c) or (d) is < (g) and (h) is true, then issue (1) through (4), set (9) true, and return to Step 1. Otherwise, proceed to monitor (e), (f), and (i).

If (e) or (f) is < (g), and (i) is true, then issue (5) through (8), set (9) true, and return to Step 1. Otherwise, return to Step 1.

If (j) seconds have elapsed since (9) was first set true, terminate outputs (1) through (8) below, and return to Step 1 until at least 1.5 seconds have elapsed since termination of outputs (1) through (8) in Step A1. Then after the 1.5 seconds have elapsed, proceed to Step A2.

| | | |
|-----|-------------------------------|------------|
| (1) | OMS L POD HE ISLN VLV A OP | V43K4180K |
| (2) | OMS L POD HE ISLN VLV B OP | V43K4181X |
| (3) | OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| (4) | OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| (5) | OMS R POD HE ISLN VLV A OP | V43K5180X |
| (6) | OMS R POD HE ISLN VLV B OP | V43K5181X |
| (7) | OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| (8) | OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |
| (9) | REPRESS ACTIVE FLAG | (INTERNAL) |

Step A2. This step monitors the state of the OMS/HE/VAPOR ISLN VALVES and checks for commfaults. If any of the following signals are true, return to Step 1.

| | | |
|-----|--|-----------|
| (1) | FA 1 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2845X |
| (2) | FA 2 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2846X |
| (3) | FA 3 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2847X |
| (4) | FA 4 INPUT PROM SEG 3, 10 STATUS (HFE) | V91X2848X |

Otherwise, monitor the following signals:

| | | |
|-----|------------------------------------|-----------|
| (a) | OMS L POD HE ISLN VLV A POSN OP | V43X4152X |
| (b) | OMS L POD HE ISLN VLV B POSN OP | V43X4154X |
| (c) | OMS L POD VAPOR ISLN VLV 1 POSN OP | V43X4156X |
| (d) | OMS L POD VAPOR ISLN VLV 2 POSN OP | V43X4158X |
| (e) | OMS R POD HE ISLN VLV A POSN OP | V43X5152X |
| (f) | OMS R POD HE ISLN VLV B POSN OP | V43X5154X |
| (g) | OMS R POD VAPOR ISLN VLV 1 POSN OP | V43X5156X |
| (h) | OMS R POD VAPOR ISLN VLV 2 POSN OP | V43X5158X |

If any signal (a) through (d) is true, then set (1) below to true in order to generate a CRT message line and Class 3 Alert Light and Tone, and then proceed to monitor (e) through (h). Otherwise, proceed to monitor (e) through (h).

If any signal (e) through (h) is true, then set (2) below to true in order to generate a CRT message line and Class 3 Alert Light and Tone, and proceed to monitor (a) through (h). Otherwise, proceed to monitor (a) through (h).

If (a) through (h) are all false, then set (3) below to false and return to Step 1. Otherwise, return to Step 1.

| | | |
|-----|------------------------------|------------|
| (1) | LT OMS HE/VAPOR ISO VLV MISC | V90X8274X |
| (2) | RT OMS HE/VAPOR ISO VLV MISC | V90X8275X |
| (3) | REPRESS ACTIVE FLAG | (INTERNAL) |

Subsequence B

Step B1. This step terminates the following aft OMS and aft RCS valve commands to establish a known signal condition for the GPC position of the respective three position cockpit switches.

| | |
|------------------------------------|-----------|
| OMS L POD XFD VLVS A CMD 1 CL | V43K4283X |
| OMS L POD OXDZR XFD VLV A CMD 2 CL | V43K4285X |
| OMS L POD FUEL XFD VLV A CMD 2 CL | V43K4385X |
| OMS L POD XFD VLVS B CMD 1 CL | V43K4287X |
| OMS L POD OXDZR XFD VLV B CMD 2 CL | V43K4289X |
| OMS L POD FUEL XFD VLV B CMD 2 CL | V43K4389X |
| OMS R POD XFD VLVS A CMD 1 CL | V43K5283X |
| OMS R POD OXDZR XFD VLV A CMD 2 CL | V43K5285X |
| OMS R POD FUEL XFD VLV A CMD 2 CL | V43K5385X |
| OMS R POD XFD VLVS B CMD 1 CL | V43K5287X |
| OMS R POD OXDZR XFD VLV B CMD 2 CL | V43K5289X |
| OMS R POD FUEL XFD VLV B CMD 2 CL | V43K5389X |
| RCS L AFT XFD VLV 1/2 GPC CL A | V42K2416X |
| RCS L AFT OX XFD VLV 1/2 GPC CL B | V42K2418X |
| RCS L AFT FU XFD VLV 1/2 GPC CL B | V42K2422X |
| RCS L AFT XFD V 3/4/5 GPC CL A | V42K2428X |
| RCS L AFT OX XFD V 3/4/5 GPC CL B | V42K2430X |

| | |
|---------------------------------------|-----------|
| RCS L AFT FU XFD V 3/4/5 GPC CL B | V42K2434X |
| RCS R AFT XFD VLV 1/2 GPC CL A | V42K3416X |
| RCS R AFT OX XFD VLV 1/2 GPC CL B | V42K3418X |
| RCS R AFT FU XFD VLV 1/2 GPC CL B | V42K3422X |
| RCS R AFT XFD V 3/4/5 GPC CL A | V42K3428X |
| RCS R AFT OX XFD V 3/4/5 GPC CL B | V42K3430X |
| RCS R AFT FU XFD V 3/4/5 GPC CL B | V42K3434X |
| RCS L AFT TK ISLN V 1/2 GPC CL A | V42K2353X |
| RCS L AFT OX TK ISLN V 1/2 GPC CL B | V42K2354X |
| RCS L AFT FU TK ISLN V 1/2 GPC CL B | V42K2355X |
| RCS L AFT OX TK ISLN V 3/4/5 A GPC CL | V42K2357X |
| RCS L AFT FU TK ISLN V 3/4/5 A GPC CL | V42K2358X |
| RCS L AFT OX TK ISLN V 3/4/5 B GPC CL | V42K2360X |
| RCS L AFT FU TK ISLN V 3/4/5 B GPC CL | V42K2361X |
| RCS R AFT TK ISLN V 1/2 GPC CL A | V42K3353X |
| RCS R AFT OX TK ISLN V 1/2 GPC CL B | V42K3354X |
| RCS R AFT FU TK ISLN V 1/2 GPC CL B | V42K3355X |
| RCS R AFT OX TK ISLN V-3/4/5 A GPC CL | V42K3357X |
| RCS R AFT FU TK ISLN V-3/4/5 A GPC CL | V42K3358X |
| RCS R AFT OX TK ISLN V-3/4/5 B GPC CL | V42K3360X |
| RCS R AFT FU TK ISLN V-3/4/5 B GPC CL | V42K3361X |
| OMS L POD XFD VLVS A CMD 1 OP | V43K4282X |
| OMS L POD OXDZR XFD VLV A CMD 2 OP | V43K4284X |
| OMS L POD FUEL XFD VLV A CMD 2 OP | V43K4384X |
| OMS L POD XFD VLVS B CMD 1 OP | V43K4286X |
| OMS L POD OXDZR XFD VLV B CMD 2 OP | V43K4288X |
| OMS L POD FUEL XFD VLV B CMD 2 OP | V43K4388X |
| OMS R POD XFD VLVS A CMD 1 OP | V43K5282X |
| OMS R POD OXDZR XFD VLV A CMD 2 OP | V43K5284X |
| OMS R POD FUEL XFD VLV A CMD 2 OP | V43K5384X |
| OMS R POD XFD VLVS B CMD 1 OP | V43K5286X |
| OMS R POD OXDZR XFD VLV B CMD 2 OP | V43K5288X |
| OMS R POD FUEL XFD VLV B CMD 2 OP | V43K5388X |
| RCS L AFT XFD VLV 1/2 GPC OP A | V42K2402X |
| RCS L AFT OX XFD VLV 1/2 GPC OP B | V42K2403X |
| RCS L AFT FU XFD VLV 1/2 GPC OP B | V42K2404X |
| RCS L AFT XFD VLV 3/4/5 GPC OP A | V42K2408X |
| RCS L AFT OX XFD V 3/4/5 GPC OP B | V42K2409X |
| RCS L AFT FU XFD V 3/4/5 GPC OP B | V42K2410X |
| RCS R AFT XFD VLV 1/2 GPC OP A | V42K3402X |
| RCS R AFT OX XFD VLV 1/2 GPC OP B | V42K3403X |
| RCS R AFT FU XFD VLV 1/2 GPC OP B | V42K3404X |

| | |
|---------------------------------------|-----------|
| RCS R AFT XFD VLV 3/4/5 GPC OP A | V42K3408X |
| RCS R AFT OX XFD V 3/4/5 GPC OP B | V42K3409X |
| RCS R AFT FU XFD V 3/4/5 GPC OP B | V42K3410X |
| | |
| RCS L AFT TK ISLN V 1/2 GPC OP A | V42K2342X |
| RCS L AFT OX TK ISLN V 1/2 GPC OP B | V42K2343X |
| RCS L AFT FU TK ISLN V 1/2 GPC OP B | V42K2344X |
| RCS L AFT OX TK ISLN V 3/4/5 A GPC OP | V42K2346X |
| RCS L AFT FU TK ISLN V 3/4/5 A GPC OP | V42K2347X |
| | |
| RCS L AFT OX TK ISLN V 3/4/5 B GPC OP | V42K2349X |
| RCS L AFT FU TK ISLN V 3/4/5 B GPC OP | V42K2350X |
| RCS R AFT TK ISLN V 1/2 GPC OP A | V42K3342X |
| RCS R AFT OX TK ISLN V 1/2 GPC OP B | V42K3343X |
| RCS R AFT FU TK ISLN V 1/2 GPC OP B | V42K3344X |
| RCS R AFT OX TK ISLN V 3/4/5 A GPC OP | V42K3346X |
| RCS R AFT FU TK ISLN V 3/4/5 A GPC OP | V42K3347X |
| RCS R AFT OX TK ISLN V 3/4/5 B GPC OP | V42K3349X |
| RCS R AFT FU TK ISLN V 3/4/5 B GPC OP | V42K3350X |
| | |
| OMS L POD TK VLVS A CMD 1 OP | V43K4270X |
| OMS L POD TK VLVS A CMD 1 CL | V43K4271X |
| OMS L POD OXDZR ISLN V A CMD 2 OP | V43K4272X |
| OMS L POD OXDZR ISLN V A CMD 2 CL | V43K4273X |
| OMS L POD TK VLVS B CMD 1 OP | V43K4274X |
| OMS L POD TK VLVS B CMD 1 CL | V43K4275X |
| OMS L POD OXDZR ISLN V B CMD 2 OP | V43K4276X |
| OMS L POD OXDZR ISLN V B CMD 2 CL | V43K4277X |
| OMS L POD FUEL ISLN VLV A CMD 2 OP | V43K4372X |
| OMS L POD FUEL ISLN VLV A CMD 2 CL | V43K4373X |
| OMS L POD FUEL ISLN VLV B CMD 2 OP | V43K4376X |
| OMS L POD FUEL ISLN VLV B CMD 2 CL | V43K4377X |
| OMS R POD TK VLVS A CMD 1 OP | V43K5270X |
| OMS R POD TK VLVS A CMD 1 CL | V43K5271X |
| OMS R POD OXDZR ISLN V A CMD 2 OP | V43K5272X |
| OMS R POD OXDZR ISLN V A CMD 2 CL | V43K5273X |
| OMS R POD TK VLVS B CMD 1 OP | V43K5274X |
| OMS R POD TK VLVS B CMD 1 CL | V43K5275X |
| OMS R POD OXDZR ISLN V B CMD 2 OP | V43K5276X |
| OMS R POD OXDZR ISLN V B CMD 2 CL | V43K5277X |
| OMS R POD FUEL ISLN VLV A CMD 2 OP | V43K5372X |
| OMS R POD FUEL ISLN VLV A CMD 2 CL | V43K5373X |
| OMS R POD FUEL ISLN VLV B CMD 2 OP | V43K5376X |
| OMS R POD FUEL ISLN VLV B CMD 2 CL | V43K5377X |

When all commands above have been terminated, the following signal is set false and the sequence returns to and continues processing Step 1.

(1) PRE-SEQ CMD TERM FLAG

(INTERNAL)

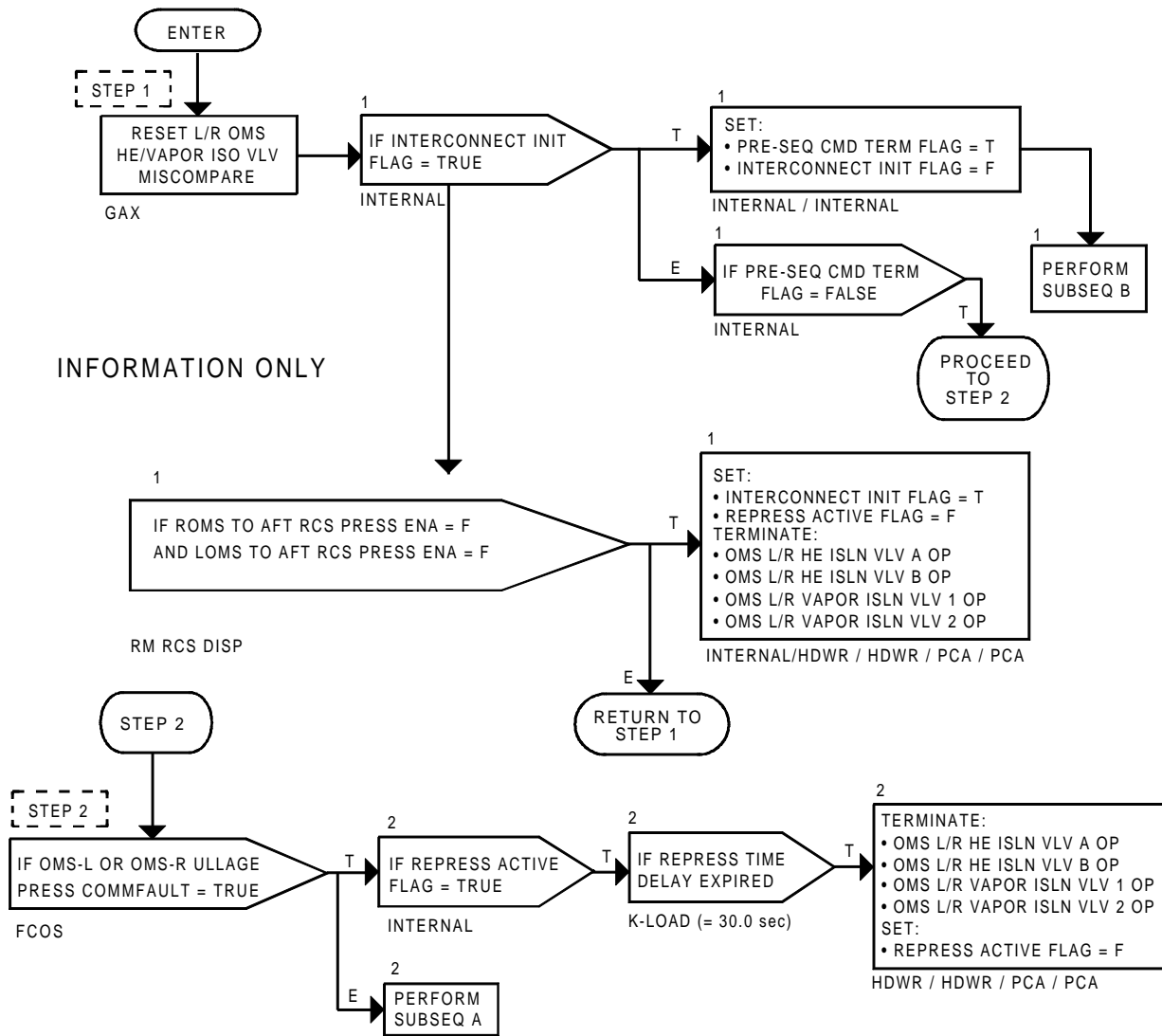


FIGURE 4.212.(1) Orbit OMS/RCS Connect (Sheet 1 of 4)

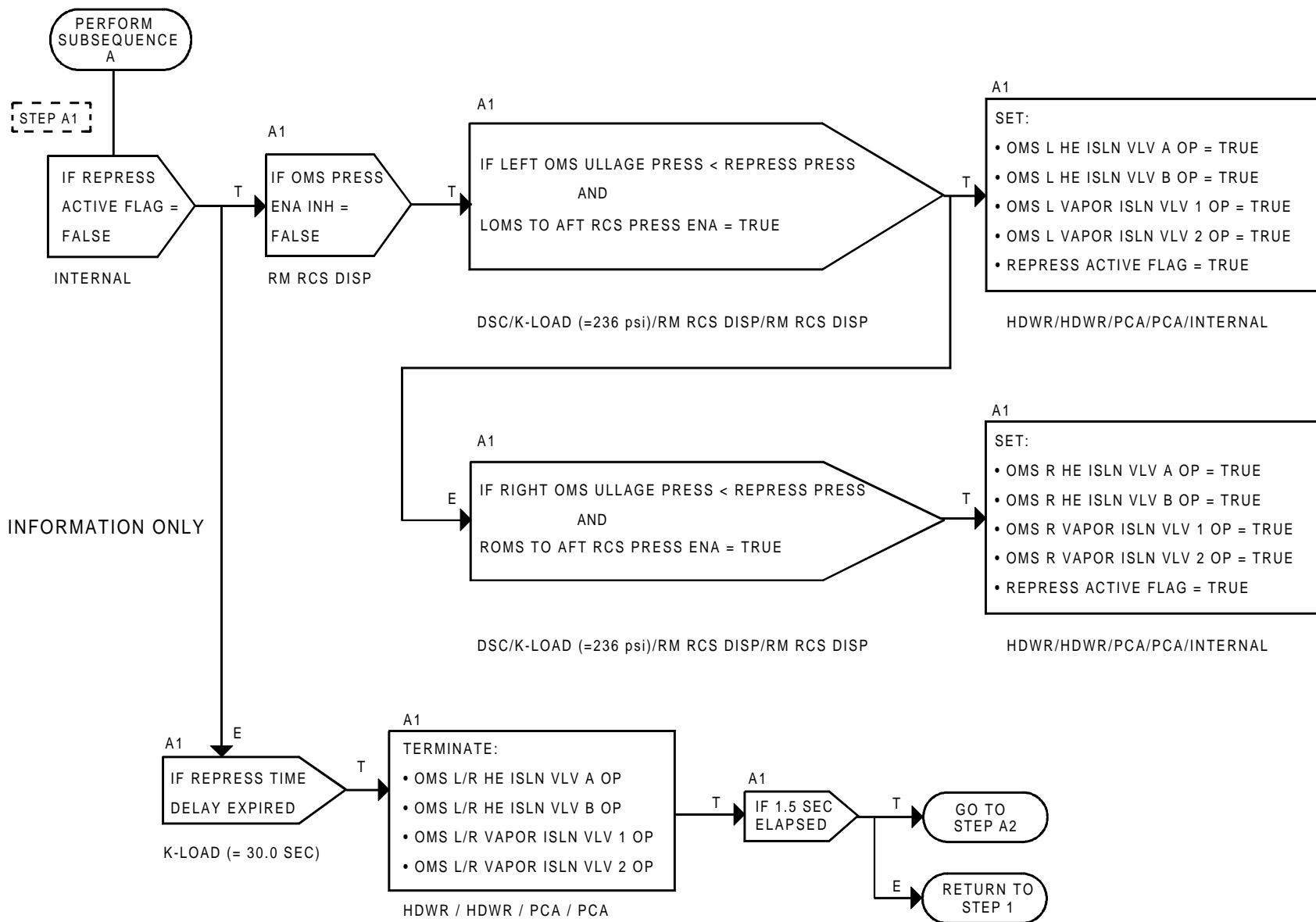


FIGURE 4.212.(2) Orbit OMS/RCS Connect Subsequence A (Sheet 2 of 4)

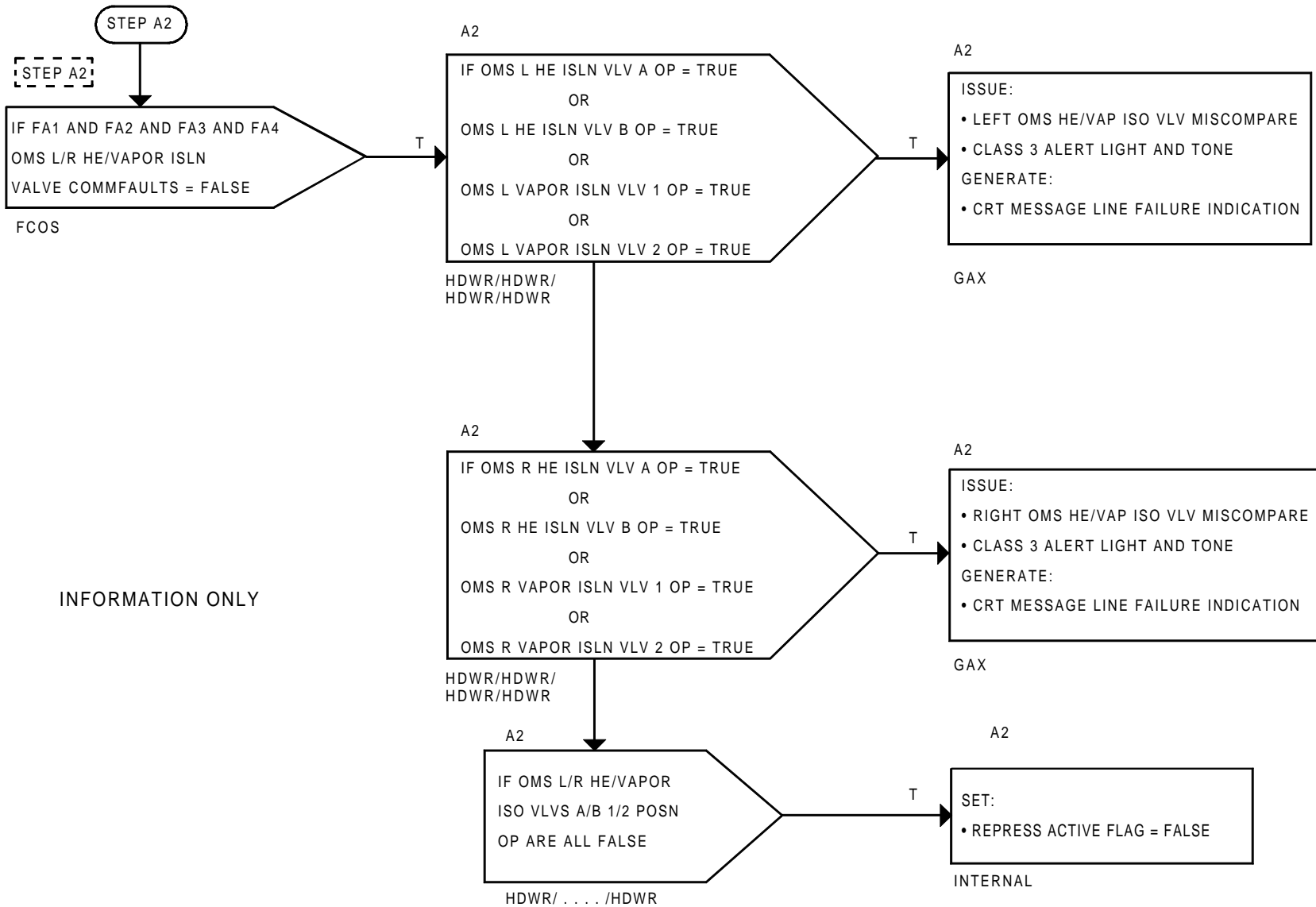
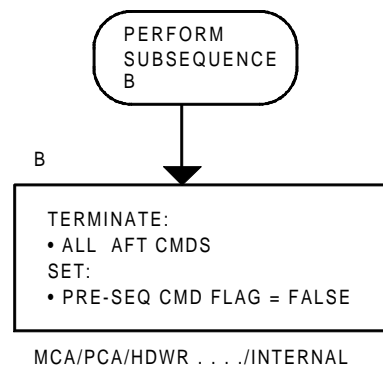


FIGURE 4.212.(3) Orbit OMS/RCS Connect Subsequence A2 (Sheet 3 of 4)



INFORMATION ONLY

FIGURE 4.212.(4) Orbit OMS/RCS Connect Subsequence B (Sheet 4 of 4)

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TABLE 4.7.2.4-1. INPUT FUNCTIONAL PARAMETERS FOR ONORBIT OMS/RCS INTERCONNECT (G4.212)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|------------------------------------|-------------|-------|-----------|------------------|---------|-------------|
| | V43P4221C | OMS-L POD OXDZR TANK ULLAGE PRESS | DSC OL2 | | AMU | | 93017G | * |
| | V43P4321C | OMS-L POD FUEL TANK ULLAGE PRESS | DSC OL1 | | AMU | | 93017G | * |
| | V43P5221C | OMS-R POD OXDZR TANK ULLAGE PRESS | DSC OR2 | | AMU | | 93017G | * |
| | V43P5321C | OMS-R POD FU TANK ULLAGE PRESS | DSC OR1 | | AMU | | 93017G | * |
| | V43X4152X | OMS-L POD HE ISLN VLV A POSN OP | HDWR | | BD | | 93017G | * |
| | V43X4154X | OMS-L POD HE ISLN VLV B POSN OP | HDWR | | BD | | 93017G | * |
| | V43X4156X | OMS-L POD VAPOR ISLN VLV 1 POSN OP | HDWR | | BD | | 93017G | * |
| | V43X4158X | OMS-L POD VAPOR ISLN VLV 2 POSN OP | HDWR | | BD | | 93017G | * |
| | V43X5152X | OMS-R POD HE ISLN VLV A POSN OP | HDWR | | BD | | 93017G | * |
| | V43X5154X | OMS-R POD HE ISLN VLV B POSN OP | HDWR | | BD | | 93017G | * |
| | V43X5156X | OMS-R POD VAPOR ISLN VLV 1 POSN OP | HDWR | | BD | | 93017G | * |
| | V43X5158X | OMS-R POD VAPOR ISLN VLV 2 POSN OP | HDWR | | BD | | 93017G | * |
| | V91X2841X | FA1 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2842X | FA2 INPUT PROM SEG 1,2 STATUS(MFE) | SYS S/W | | | | 93017G | * |
| | V91X2845X | FA1 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 89991E | |
| | V91X2846X | FA2 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2847X | FA3 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 90007G | |
| | V91X2848X | FA4 INPUT PROM SEG3,10 STATUS(HFE) | FCOS | | | | 92316B | |
| | V93X5100X | LOMS TO AFT RCS PRESS ENA | RM RCS DISP | | BD | | 92320D | |
| | V93X5101X | ROMS TO AFT RCS PRESS ENA | RM RCS DISP | | BD | | 92320D | |
| | V93X5116X | OMS PRESS ENA INHIBIT | RM RCS DISP | | BD | | 92320D | |

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

TABLE 4.7.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ONORBIT OMS/RCS INTERCONNECT (G4.212)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------|--------|------------------------------|-------------|-------|--------------|------------------|---------|-------------|
| V42K2342XA | RCS-L | AFT TK ISLN V-1/2 GPC OP A | MCA A3 | | | | | |
| V42K2343XA | RCS-L | AFT OX TK ISLN V1/2 GPC OP B | MCA A3 | | | | | |
| V42K2344XA | RCS-L | AFT FU TK ISLN V1/2 GPC OP B | MCA A3 | | | | | |
| V42K2346XB | RCS-L | AFT OX TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| V42K2347XB | RCS-L | AFT FU TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| V42K2349XB | RCS-L | AFT OX TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| V42K2350XB | RCS-L | AFT FU TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| V42K2353XB | RCS-L | AFT TK ISLN V-1/2 GPC CL A | MCA A3 | | | | | |
| V42K2354XB | RCS-L | AFT OX TK ISLN V1/2 GPC CL B | MCA A3 | | | | | |
| V42K2355XB | RCS-L | AFT FU TK ISLN V1/2 GPC CL B | MCA A3 | | | | | |
| V42K2357XB | RCS-L | AFT OX TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| V42K2358XB | RCS-L | AFT FU TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| V42K2360XB | RCS-L | AFT OX TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| V42K2361XB | RCS-L | AFT FU TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| V42K2402XC | RCS-L | AFT XFD VLV 1/2 GPC OP A | MCA A3 | | | | | |
| V42K2403XC | RCS-L | AFT OX XFD VLV-1/2 GPC OP B | MCA A3 | | | | | |
| V42K2404XC | RCS-L | AFT FU XFD VLV 1/2 GPC OP B | MCA A3 | | | | | |
| V42K2408XC | RCS-L | AFT XFD VLV 3/4/5 GPC OP A | MCA A2 | | | | | |
| V42K2409XC | RCS-L | AFT OX XFD V-3/4/5 GPC OP B | MCA A2 | | | | | |
| V42K2410XC | RCS-L | AFT FU XFD V-3/4/5 GPC OP B | MCA A2 | | | | | |
| V42K2416XC | RCS-L | AFT XFD VLV-1/2 GPC CL A | MCA A3 | | | | | |
| V42K2418XC | RCS-L | AFT OX XFD VLV-1/2 GPC CL B | MCA A3 | | | | | |
| V42K2422XC | RCS-L | AFT FU XFD VLV-1/2 GPC CL B | MCA A3 | | | | | |
| V42K2428XC | RCS-L | AFT XFD V-3/4/5 GPC CL A | MCA A2 | | | | | |
| V42K2430XC | RCS-L | AFT OX XFD V-3/4/5 GPC CL B | MCA A2 | | | | | |
| V42K2434XC | RCS-L | AFT FU XFD V-3/4/5 GPC CL B | MCA A2 | | | | | |
| V42K3342XB | RCS-R | AFT TK ISLN V-1/2 GPC OP A | MCA A3 | | | | | |
| V42K3343XB | RCS-R | AFT OX TK ISLN V-1/2 GPC OPB | MCA A3 | | | | | |
| V42K3344XB | RCS-R | AFT FU TK ISLN V-1/2 GPC OPB | MCA A3 | | | | | |
| V42K3346XB | RCS-R | AFT OX TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| V42K3347XB | RCS-R | AFT FU TK ISLN V3/4/5AGPC OP | MCA A1 | | | | | |
| V42K3349XB | RCS-R | AFT OX TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| V42K3350XB | RCS-R | AFT FU TK ISLN V3/4/5BGPC OP | MCA A2 | | | | | |
| V42K3353XB | RCS-R | AFT TK ISLN V-1/2 GPC CL A | MCA A3 | | | | | |
| V42K3354XB | RCS-R | AFT OX TK ISLN V-1/2 GPC CLB | MCA A3 | | | | | |
| V42K3355XB | RCS-R | AFT FU TK ISLN V-1/2 GPC CLB | MCA A3 | | | | | |
| V42K3357XB | RCS-R | AFT OX TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| V42K3358XB | RCS-R | AFT FU TK ISLN V3/4/5AGPC CL | MCA A1 | | | | | |
| V42K3360XB | RCS-R | AFT OX TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| V42K3361XB | RCS-R | AFT FU TK ISLN V3/4/5BGPC CL | MCA A2 | | | | | |
| V42K3402XC | RCS R | AFT XFD VLV-1/2 GPC OPEN A | MCA A3 | | | | | |
| V42K3403XC | RCS R | AFT OX XFD V-1/2 GPC OPEN B | MCA A3 | | | | | |
| V42K3404XC | RCS R | AFT FU XFD V-1/2 GPC OPEN B | MCA A3 | | | | | |
| V42K3408XC | RCS R | AFT XFD VLV-3/4/5 GPC OPEN A | MCA A1 | | | | | |
| V42K3409XC | RCS R | AFT OX XFD V-3/4/5 GPC OP B | MCA A1 | | | | | |
| V42K3410XC | RCS R | AFT FU XFD V-3/4/5 GPC OP B | MCA A1 | | | | | |

TABLE 4.7.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ONORBIT OMS/RCS INTERCONNECT (G4.212)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------|--------|------------------------------|-------------|-------|-----------|---------|---------|-------|
| V42K3416XC | RCS R | AFT XFD VLV-1/2 GPC CLOSE A | MCA A3 | | | | | |
| V42K3418XC | RCS R | AFT OX XFD V-1/2 GPC CLOSE B | MCA A3 | | | | | |
| V42K3422XC | RCS R | AFT FU XFD V-1/2 GPC CLOSE B | MCA A3 | | | | | |
| V42K3428XC | RCS R | AFT XFD VLV-3/4/5 GPC CL A | MCA A1 | | | | | |
| V42K3430XC | RCS-R | AFT OX XFD V-3/4/5 GPC CL B | MCA A1 | | | | | |
| V42K3434XC | RCS-R | AFT FU XFD V-3/4/5 GPC CL B | MCA A1 | | | | | |
| V43K4180XB | OMS-L | POD HE ISLN VLV A OP | HDWR | | | | | |
| V43K4181XB | OMS-L | POD HE ISLN VLV B OP | HDWR | | | | | |
| V43K4182XB | OMS-L | POD VAPOR ISLN VLV 1 OP | PCA A1 | | | | | |
| V43K4183XB | OMS-L | POD VAPOR ISLN VLV 2 OP | PCA A3 | | | | 89598A | |
| V43K4270X | OMS-L | POD TK VLVS A CMD 1 OP | MCA A1 | | BD | | | |
| V43K4271X | OMS-L | POD TK VLVS A CMD 1 CL | MCA A1 | | BD | | | |
| V43K4272X | OMS-L | POD OXDZR ISLN V A CMD 2 OP | MCA A1 | | BD | | | |
| V43K4273X | OMS-L | POD OXDZR ISLN V A CMD 2 CL | MCA A1 | | BD | | | |
| V43K4274X | OMS-L | POD TK VLVS B CMD 1 OP | MCA A3 | | BD | | | |
| V43K4275X | OMS-L | POD TK VLVS B CMD 1 CL | MCA A3 | | BD | | | |
| V43K4276X | OMS-L | POD OXDZR ISLN V B CMD 2 OP | MCA A3 | | BD | | | |
| V43K4277X | OMS-L | POD OXDZR ISLN V B CMD 2 CL | MCA A3 | | BD | | | |
| V43K4282XC | OMS-L | POD XFD VLVS A CMD 1 OP | MCA A1 | | | | | |
| V43K4283XC | OMS-L | POD XFD VLVS A CMD 1 CL | MCA A1 | | | | | |
| V43K4284XC | OMS-L | POD OXDZR XFD VLV A CMD 2 OP | MCA A1 | | | | | |
| V43K4285XC | OMS-L | POD OXDZR XFD VLV A CMD 2 CL | MCA A1 | | | | | |
| V43K4286XC | OMS-L | POD XFD VLVS B CMD 1 OP | MCA A2 | | | | | |
| V43K4287XC | OMS-L | POD XFD VLVS B CMD 1 CL | MCA A2 | | | | | |
| V43K4288XC | OMS-L | POD OXDZR XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| V43K4289XC | OMS-L | POD OXDZR XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| V43K4372X | OMS-L | POD FUEL ISLN VLV A CMD 2 OP | MCA A1 | | BD | | | |
| V43K4373X | OMS-L | POD FUEL ISLN VLV A CMD 2 CL | MCA A1 | | BD | | | |
| V43K4376X | OMS-L | POD FUEL ISLN VLV B CMD 2 OP | MCA A3 | | BD | | | |
| V43K4377X | OMS-L | POD FUEL ISLN VLV B CMD 2 CL | MCA A3 | | BD | | | |
| V43K4384XC | OMS-L | POD FUEL XFD VLV A CMD 2 OP | MCA A1 | | | | | |
| V43K4385XC | OMS-L | POD FUEL XFD VLV A CMD 2 CL | MCA A1 | | | | | |
| V43K4388XC | OMS-L | POD FUEL XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| V43K4389XC | OMS-L | POD FUEL XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| V43K5180XB | OMS-R | POD HE ISLN VLV A OP | HDWR | | | | | |
| V43K5181XB | OMS-R | POD HE ISLN VLV B OP | HDWR | | | | | |
| V43K5182XB | OMS-R | POD VAPOR ISLN VLV 1 OP | PCA A1 | | | | | |
| V43K5183XB | OMS-R | POD VAPOR ISLN VLV 2 OP | PCA A3 | | | | | |
| V43K5270X | OMS-R | POD TK VLVS A CMD 1 OP | MCA A1 | | BD | | | |
| V43K5271X | OMS-R | POD TK VLVS A CMD 1 CL | MCA A1 | | BD | | | |
| V43K5272X | OMS-R | POD OXDZR ISLN V A CMD 2 OP | MCA A1 | | BD | | | |
| V43K5273X | OMS-R | POD OXDZR ISLN V A CMD 2 CL | MCA A1 | | BD | | | |
| V43K5274X | OMS-R | POD TK VLVS B CMD 1 OP | MCA A3 | | BD | | | |
| V43K5275X | OMS-R | POD TK VLVS B CMD 1 CL | MCA A3 | | BD | | | |
| V43K5276X | OMS-R | POD OXDZR ISLN V B CMD 2 OP | MCA A3 | | BD | | | |
| V43K5277X | OMS-R | POD OXDZR ISLN V B CMD 2 CL | MCA A3 | | BD | | | |

TABLE 4.7.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ONORBIT OMS/RCS INTERCONNECT (G4.212)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|------------------------------------|-------------|-------|--------------|------------------|---------|-------------|
| | V43K5282XC | OMS-R POD XFD VLVS A CMD 1 OP | MCA A3 | | | | | |
| | V43K5283XC | OMS-R POD XFD VLVS A CMD 1 CL | MCA A3 | | | | | |
| | V43K5284XC | OMS-R POD OXDZR XFD VLV A CMD 2 OP | MCA A3 | | | | | |
| | V43K5285XC | OMS-R POD OXDZR XFD VLV A CMD 2 CL | MCA A3 | | | | | |
| | V43K5286XC | OMS-R POD XFD VLVS B CMD 1 OP | MCA A2 | | | | | |
| | V43K5287XC | OMS-R POD XFD VLVS B CMD 1 CL | MCA A2 | | | | | |
| | V43K5288XC | OMS-R POD OXDZR XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K5289XC | OMS-R POD OXDZR XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V43K5372X | OMS-R POD FUEL ISLN VLV A CMD 2 OP | MCA A1 | | | BD | | |
| | V43K5373X | OMS-R POD FUEL ISLN VLV A CMD 2 CL | MCA A1 | | | BD | | |
| | V43K5376X | OMS-R POD FUEL ISLN VLV B CMD 2 OP | MCA A3 | | | BD | | |
| | V43K5377X | OMS-R POD FUEL ISLN VLV B CMD 2 CL | MCA A3 | | | BD | | |
| | V43K5384XC | OMS-R POD FUEL XFD VLV A CMD 2 OP | MCA A3 | | | | | |
| | V43K5385XC | OMS-R POD FUEL XFD VLV A CMD 2 CL | MCA A3 | | | | | |
| | V43K5388XC | OMS-R POD FUEL XFD VLV B CMD 2 OP | MCA A2 | | | | | |
| | V43K5389XC | OMS-R POD FUEL XFD VLV B CMD 2 CL | MCA A2 | | | | | |
| | V90X8274X | LT OMS HE/VAPOR ISO VLV MISCOM | GAX | | | | | |
| | V90X8275X | RT OMS HE/VAPOR ISO VLV MISCOM | GAX | | | | | |

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 4.7.2.4-3. ONORBIT OMS/RCS INTERCONNECT (G4.212) 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 4.7.2.4-4. ONORBIT OMS/RCS INTERCONNECT (G4.212) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|---|-----------|----|-------------|-----------|----|--------|---|----------|---------|-------------|
| OMS_ULLAGE_PRESS_LOWER_LMT | V97U9822C | 00 | +236 | PSI | I | | S | P G4.212 | 90204A | |
| OMS TANK PRESS INIT LIMIT PRESS_TIME_DELAY | V97U9823C | 00 | +3.0 | E+01 SEC | F | | D | P G4.212 | 90204A | |
| OMS TANK PRESS TIME | | | | | | | | | | |

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

TABLE 4.7.2.4-5. ONORBIT OMS/RCS INTERCONNECT (G4.212) 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.

4.7.6 OMS Fire Sequence (4.182)

4.7.6.1 Introduction

The OMS engine firing sequence is scheduled by MSC when an OMS burn is to be performed. This sequence provides the controls to command the engines ON/OFF and to perform the engine purge function.

4.7.6.2 Overview

The sequence will command OMS engines ON when scheduled by MSC. When directed, the OMS engine ON commands are terminated and a purge is performed at the conclusion of the burn. If an OMS engine is manually shutdown by putting the ARM/PRESS switch to OFF, then that engine is not purged. If an OMS engine fails prematurely, the failed engine ON commands are terminated by the crew putting the ARM/PRESS switch to OFF, and the engine is not purged if the switch is not returned to the ARM/PRESS position. For an engine failure, the helium isolation valve commands are not terminated since propellants are required from the failed engine pod.

The capability exists to select individual engines to be included in the planned firing.

4.7.6.3 Detailed Requirements

OMS engine firing sequence is scheduled and descheduled by moding, sequence, and control (MSC).

Step 1. This step determines if an OMS engine firing is to be terminated.

The following signal is monitored:

- | | | |
|-----|---------------------|-----------|
| (a) | OMS CUT-OFF COMMAND | V90X8318X |
|-----|---------------------|-----------|

If (a) is true, proceed to Step 6.

If (a) is false, terminate (1) through (4) below and proceed to Step 2.

- | | | |
|-----|----------------------|-----------|
| (1) | OMS L PURGE VLV 1 OP | V43K4556X |
| (2) | OMS L PURGE VLV 2 OP | V43K4557X |
| (3) | OMS R PURGE VLV 1 OP | V43K5556X |
| (4) | OMS R PURGE VLV 2 OP | V43K5557X |

Step 2. This step determines which engines are to be commanded ON for this firing.

The following signal is monitored:

- | | | |
|-----|-------------------------------|-----------|
| (a) | PRIME PROP SYS INDICATOR FLAG | V94J3791C |
|-----|-------------------------------|-----------|

If not first pass, proceed to Step 3.

If (a) has a value of one on the first pass, of the signals listed below, issue (1) through (16), set (17) and (18) true, and proceed to Step 3.

If (a) has a value of two on first pass, of the signals listed below, issue (1) through (4) and (9) through (12), set (17) true, and proceed to Step 3.

If (a) has a value of three on first pass, of the signals listed below, issue (5) through (8) and (13) through (16), set (18) true, and proceed to Step 3.

| | | |
|------|-----------------------------------|-----------|
| (1) | OMS L POD HE ISLN VLV A OP | V43K4180X |
| (2) | OMS L POD HE ISLN VLV B OP | V43K4181X |
| (3) | OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| (4) | OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| (5) | OMS R POD HE ISLN VLV A OP | V43K5180X |
| (6) | OMS R POD HE ISLN VLV B OP | V43K5181X |
| (7) | OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| (8) | OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |
| (9) | OMS L ENG CONTROL VLV 1 COIL 1 OP | V43K4583X |
| (10) | OMS L ENG CONTROL VLV 1 COIL 2 OP | V43K4584X |
| (11) | OMS L ENG CONTROL VLV 2 COIL 1 OP | V43K4585X |
| (12) | OMS L ENG CONTROL VLV 2 COIL 2 OP | V43K4586X |
| (13) | OMS R ENG CONTROL VLV 1 COIL 1 OP | V43K5583X |
| (14) | OMS R ENG CONTROL VLV 1 COIL 2 OP | V43K5584X |
| (15) | OMS R ENG CONTROL VLV 2 COIL 1 OP | V43K5585X |
| (16) | OMS R ENG CONTROL VLV 2 COIL 2 OP | V43K5586X |
| (17) | OMS L ON CMD IND | V90X8271X |
| (18) | OMS R ON CMD IND | V90X8272X |

Step 3. This step monitors for an OMS engine failure.

The following signals are monitored:

| | | |
|-----|--------------------------------|-----------|
| (a) | LEFT OMS ENGINE SHUTDOWN FLAG | V90X7670X |
| (b) | RIGHT OMS ENGINE SHUTDOWN FLAG | V90X7671X |

If (a) and (b) are false, return to Step 1.

If (a) is true and (b) is false, proceed to Step 4.

If (a) is false and (b) is true, proceed to Step 5.

If (a) and (b) are both true, set (1) below true and return to Step 1.

| | | |
|-----|--------------------|-----------|
| (1) | OMS CUTOFF COMMAND | V90X8318X |
|-----|--------------------|-----------|

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Step 4. This step terminates left OMS engine ON commands when a left OMS engine has failed.

The following signal is monitored:

(a) PRIME PROP SYS INDICATOR FLAG V94J3791C

If (a) has a value of two on the first pass, of the signals listed below, terminate (1) through (4), set (5) false, issue (6), and return to Step 1. If not first pass, return to Step 1.

If (a) has a value of one on the first pass, of the signals listed below, terminate (1) through (4), set (5) false, and return to Step 1. If not first pass, return to Step 1.

| | | |
|-----|-----------------------------------|-----------|
| (1) | OMS L ENG CONTROL VLV 1 COIL 1 OP | V43K4583X |
| (2) | OMS L ENG CONTROL VLV 1 COIL 2 OP | V43K4584X |
| (3) | OMS L ENG CONTROL VLV 2 COIL 1 OP | V43K4585X |
| (4) | OMS L ENG CONTROL VLV 2 COIL 2 OP | V43K4586X |
| (5) | OMS L ON CMD IND | V90X8271X |
| (6) | OMS CUT-OFF COMMAND | V90X8318X |

Step 5. This step terminates right OMS engine ON commands when a right OMS engine has failed.

The following signal is monitored:

(a) PRIME PROP SYS INDICATOR FLAG V94J3791C

If (a) has a value of three on the first pass, of the signals listed below, terminate (1) through (4), set (5) false, issue (6), and return to Step 1. If not first pass, return to Step 1.

If (a) has a value of one on the first pass, of the signals listed below, terminate (1) through (4), set (5) false, and return to Step 1. If not first pass, return to Step 1.

| | | |
|-----|-----------------------------------|-----------|
| (1) | OMS R ENG CONTROL VLV 1 COIL 1 OP | V43K5583K |
| (2) | OMS R ENG CONTROL VLV 1 COIL 2 OP | V43K5584K |
| (3) | OMS R ENG CONTROL VLV 2 COIL 1 OP | V43K5585X |
| (4) | OMS R ENG CONTROL VLV 2 COIL 2 OP | V43K5586X |
| (5) | OMS R ON CMD IND | V90X8272X |
| (6) | OMS CUT-OFF COMMAND | V90X8318X |

Step 6. This step terminates the OMS engines firing when directed.

| | |
|-----------------------------------|-----------|
| OMS L POD HE ISLN VLV A OP | V43K4180X |
| OMS L POD HE ISLN VLV B OP | V43K4181X |
| OMS L POD VAPOR ISLN VLV 1 OP | V43K4182X |
| OMS L POD VAPOR ISLN VLV 2 OP | V43K4183X |
| OMS R POD HE ISLN VLV A OP | V43K5180X |
| OMS R POD HE ISLN VLV B OP | V43K5181X |
| OMS R POD VAPOR ISLN VLV 1 OP | V43K5182X |
| OMS R POD VAPOR ISLN VLV 2 OP | V43K5183X |
| OMS L ENG CONTROL VLV 1 COIL 1 OP | V43K4583X |
| OMS L ENG CONTROL VLV 1 COIL 2 OP | V43K4584X |
| OMS L ENG CONTROL VLV 2 COIL 1 OP | V43K4585X |
| OMS L ENG CONTROL VLV 2 COIL 2 OP | V43K4586X |
| OMS R ENG CONTROL VLV 1 COIL 1 OP | V43K5583X |
| OMS R ENG CONTROL VLV 1 COIL 2 OP | V43K5584X |
| OMS R ENG CONTROL VLV 2 COIL 1 OP | V43K5585X |
| OMS R ENG CONTROL VLV 2 COIL 2 OP | V43K5586X |

If first pass, terminate the above signals, set (1) and (2) false, and proceed to Step 7. If not first pass, proceed to Step 7.

| | |
|----------------------|-----------|
| (1) OMS L ON CMD IND | V90X8271X |
| (2) OMS R ON CMD IND | V90X8272X |

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Step 7. This step determines if an OMS auto purge is to be performed.

The following signals are monitored:

- | | | |
|-----|-----------------------------|-----------|
| (a) | SEL OMS L ENG ARM/PRESS CMD | V90X7540X |
| (b) | SEL OMS R ENG ARM/PRESS CMD | V90X7542X |
| (c) | OMS_PURGE_DELAY_TIME | V97U9825C |
| (d) | OMS_PURGE_TIME | V97U9824C |

If (a) and (b) are both false, terminate (1) through (4) below and return to Step 1 until expiration of (c) + (d). At that time, the OMS fire sequence is reinitialized and the sequence can be terminated.

If (a) and (b) are true, then issue (1) through (4) below after time delay (c) has expired.

If (b) is false and (a) is true, issue (1) and (2) below after time delay (c) has expired.

If (a) is false and (b) is true, issue (3) and (4) below after time delay (c) has expired.

- | | | |
|-----|----------------------|-----------|
| (1) | OMS L PURGE VLV 1 OP | V43K4556X |
| (2) | OMS L PURGE VLV 2 OP | V43K4557X |
| (3) | OMS R PURGE VLV 1 OP | V43K5556X |
| (4) | OMS R PURGE VLV 2 OP | V43K5557X |

After expiration of OMS purge time (d), terminate the above commands and reinitialize the OMS fire sequence to allow for subsequent engine firing, including enabling of first-pass indicators and the reenabling of purge delay and OMS purge timers.

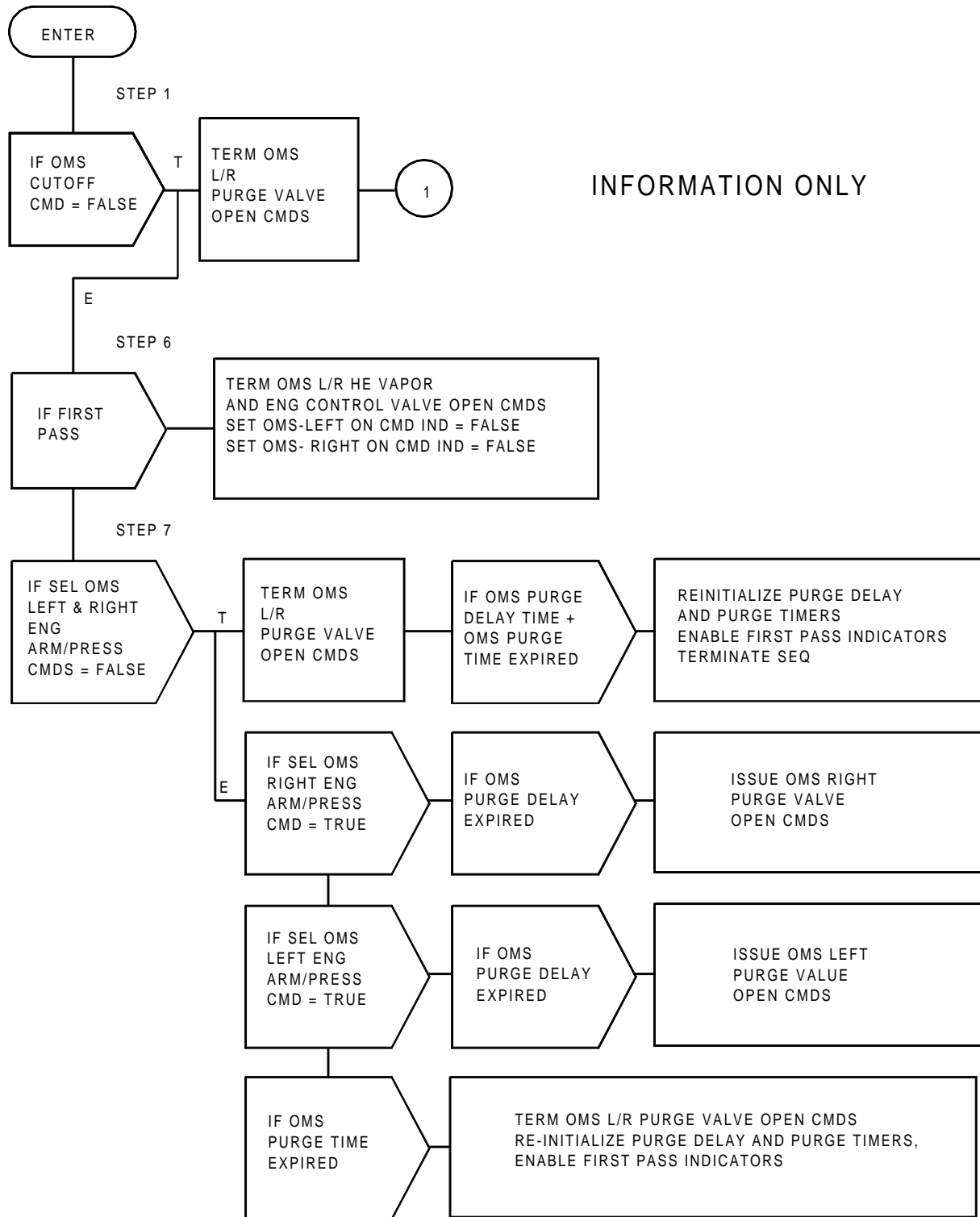


FIGURE 4.182.(1) OMS Fire Sequence (Sheet 1 of 2)

INFORMATION ONLY

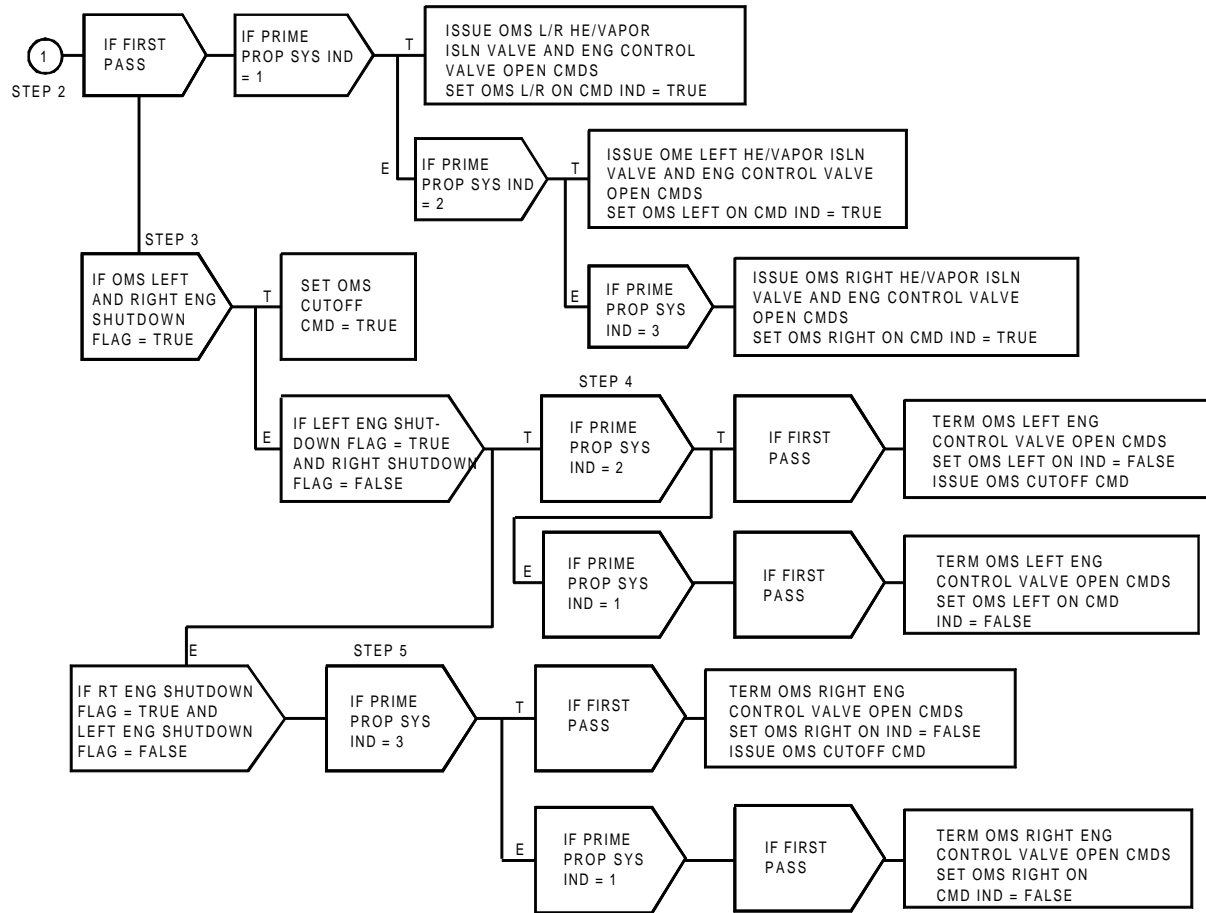


FIGURE 4.182.(2) OMS Fire Sequence (Sheet 2 of 2)

TABLE 4.7.6.4-1. INPUT FUNCTIONAL PARAMETERS FOR ORBITAL MANEUVERING SYSTEM FIRING SEQUENCER (G4.182)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------------|------------|--------------------------------|----------------|-------|-----------|---------|---------|-------|
| OMS_IGNITION_CMD | V90X8190XA | OMS IGNITION COMMAND FLAG | MSC | | BD | | 90007G | |
| PROP_FLAG_OFS | V94J3791CA | PRIME PROP SYS INDICATOR FLAG | ASC MNVR DIP | | | | 93017G | * |
| PROP_FLAG_OFS | V94J3791CB | PRIME PROP SYS INDICATOR FLAG | ORB MNVR DIP | | | | 93017G | * |
| PROP_FLAG_OFS | V94J3791CC | PRIME PROP SYS INDICATOR FLAG | DEORB MNVR DIP | | | | 93017G | * |
| S_LOMS_FAIL | V90X7670X | LEFT OMS ENGINE SHUTDOWN FLAG | OMS RM | | BD | | 93017G | * |
| S_OMS_CUTOFF | V90X8318XA | OMS CUTOFF CMD | ABT CNTL SEQ | | | | 93064D | |
| S_OMS_CUTOFF | V90X8318XB | OMS CUTOFF CMD | MSC | | | | 89461 | |
| S_ROMS_FAIL | V90X7671X | RIGHT OMS ENGINE SHUTDOWN FLAG | OMS RM | | BD | | 93017G | * |
| | V90X7540XA | SEL OMS-L ENG ARM/PRESS CMD | GN&C SW RM | | | | 90182 | |
| | V90X7542XA | SEL OMS-R ENG ARM/PRESS CMD | GN&C SW RM | | | | 90182 | |

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

TABLE 4.7.6.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ORBITAL MANEUVERING SYSTEM FIRING SEQUENCER (G4.182)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|------------------|------------|-----------------------------------|--|-------|-----------|---------|---------|-------|
| OMS_L_ON_CMD_IND | V90X8271X | OMS-L ON CMD IND | ABT CNTL SEQ ASC MNVR DIP DEORB GUID DEORB MNVR DIP GAX OMS RM ORB DAP ORB GUID ORB INS GUID ORB MNVR DIP OVERRIDE SPEC TRANS DAP | | | | 90120B | |
| OMS_R_ON_CMD_IND | V90X8272X | OMS-R ON CMD IND | ABT CNTL SEQ ASC MNVR DIP DEORB GUID DEORB MNVR DIP GAX OMS RM ORB DAP ORB GUID ORB INS GUID ORB MNVR DIP OVERRIDE SPEC TRANS DAP | | | | 90120B | |
| S_OMS_CUTOFF | V90X8318XC | OMS CUTOFF CMD | MSC TLM HDWR | | | | 93064D | |
| | V43K4180XA | OMS-L POD HE ISLN VLV A OP | HDWR | | | | | |
| | V43K4181XA | OMS-L POD HE ISLN VLV B OP | HDWR | | | | | |
| | V43K4182XA | OMS-L POD VAPOR ISLN VLV 1 OP | PCA A1 | | | | | |
| | V43K4183XA | OMS-L POD VAPOR ISLN VLV 2 OP | PCA A3 | | | | 89598A | |
| | V43K4556X | OMS-L PURGE VLV 1 OP | HDWR | | | BD | | |
| | V43K4557X | OMS-L PURGE VLV 2 OP | HDWR | | | BD | | |
| | V43K4583X | OMS-L ENG CONTROL VLV 1 COIL 1 OP | DL FMT 21/A DL FMT 22/A DL FMT 23/A HDWR | | | BD | 93017G | * |
| | V43K4584X | OMS-L ENGINE CNTL VLV 1 COIL 2 OP | HDWR | | | BD | | |
| | V43K4585X | OMS-L ENGINE CNTL VLV 2 COIL 1 OP | TLM HDWR | | | BD | | |
| | V43K4586X | OMS-L ENGINE CNTL VLV 2 COIL 2 OP | TLM HDWR | | | BD | | |
| | V43K5180XA | OMS-R POD HE ISLN VLV A OP | TLM HDWR | | | | | |
| | V43K5181XA | OMS-R POD HE ISLN VLV B OP | HDWR | | | | | |
| | V43K5182XA | OMS-R POD VAPOR ISLN VLV 1 OP | PCA A1 | | | | | |
| | V43K5183XA | OMS-R POD VAPOR ISLN VLV 2 OP | PCA A3 | | | | | |

TABLE 4.7.6.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM ORBITAL MANEUVERING SYSTEM FIRING SEQUENCER (G4.182)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|-----------------------------------|---|-------|-----------|---------|---------|-------|
| | V43K5556X | OMS-R PURGE VLV 1 OP | HDWR | | BD | | | |
| | V43K5557X | OMS-R PURGE VLV 2 OP | HDWR | | BD | | | |
| | V43K5583X | OMS-R ENG CONTROL VLV 1 COIL 1 OP | DL FMT 21/A DL FMT 22/A DL FMT 23/A HDWR | | BD | | 93017G | * |
| | V43K5584X | OMS-R ENGINE CNTL VLV 1 COIL 2 OP | HDWR TLM | | BD | | | |
| | V43K5585X | OMS-R ENGINE CNTL VLV 2 COIL 1 OP | HDWR TLM | | BD | | | |
| | V43K5586X | OMS-R ENGINE CNTL VLV 2 COIL 2 OP | HDWR TLM | | BD | | | |
| | V72M7861P | MDM FA03 DSCR OUT SET CD 07 CH 1 | DL FMT 21/A DL FMT 22/A DL FMT 23/A | | | | 93017G | * |
| | V72M7888P | MDM FA04 DSCR OUT SET CD 15 CH 1 | DL FMT 21/A DL FMT 22/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 4.7.6.4-3. ORBITAL MANEUVERING SYSTEM FIRING SEQUENCER (G4.182) 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 4.7.6.4-4. ORBITAL MANEUVERING SYSTEM FIRING SEQUENCER (G4.182) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--------------------------|-----------|----|-------------|-----------|-----|--------|---|----------|---------|-------------|
| OMS_PURGE_DELAY_TIME | V97U9825C | 00 | +3.0 | E-01 | SEC | F | D | C G4.182 | 59956 | |
| OMS_PURGE_DELAY TIME | | | | | | | | | | |
| OMS_PURGE_TIME | V97U9824C | 00 | +2.0000000 | E+00 | SEC | F | D | C G4.182 | 59956 | |
| OMS_PURGE TIME | | | | | | | | | | |

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

TABLE 4.7.6.4-5. ORBITAL MANEUVERING SYSTEM FIRING SEQUENCER (G4.182) 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.

4.7.9 OMS to RCS Gauging (4.101)

4.7.9.1 Introduction

OMS to RCS propellant quantities are calculated by burn time integration. Once each cycle, the accumulated thruster cycles are used to compute the OMS propellant used by the Aft RCS jets since initiation of the gauging. Gauging is initiated by entering LOMS TO AFT RCS PRESS ENA or ROMS TO AFT RCS PRESS ENA items on the RM RCS (SPEC 23) display, and terminated by either an OMS PRESS ENA OFF item entry on the same display, or by reselection of the currently active item entry.

4.7.9.2 Overview

Since the OMS to RCS interconnect may be used at different times in the mission, but only from one pod at a time, it is necessary to maintain a summation of total OMS propellant used from each pod. This means that a record must be maintained of total quantity used from the currently selected pod, as well as a separate total from the other pod. The number of Aft RCS main and vernier thruster 80-millisecond command cycles are provided by the RCS CMD SOP during the OMS to RCS interconnect operations. The RCS CMD SOP also supplies the number of Aft main thruster startup cycles. The number of jet thruster cycles are all re-initialized to zero by the RCS CMD SOP anytime that the two Press Enables on the RM RCS display are initialized in or set to a false state. When the total quantity used from either OMS pod exceeds a predetermined limit, an alert is issued to generate a CRT message line and a Class 3 alert light and tone.

The total OMS propellant used from each pod can be updated via keyboard entries on the RM RCS (SPEC 23) display. When this action is taken, the total OMS propellant used from the designated pod is reset to the new value. These quantities are to be carried across any and all combinations of OPS 2, OPS 3, and OPS 8 transitions.

4.7.9.3 Detailed Requirements

Step 1. This step initializes the calculation of OMS propellant used by the RCS during On-orbit OMS to aft RCS interconnect.

If this is the first pass after each initiation, set the following quantity to zero and proceed to Step 2. If not first pass, proceed to Step 2.

(1) WAPT(N-1) (INTERNAL)

Step 2. This step determines the amount of propellants used during the current operation by the aft RCS primary and vernier jets.

The following signals are monitored:

| | | |
|-----|--|-----------|
| (a) | TOTAL NO. AFT RCS MAIN THRUSTER CYCLES (N_{Am}) | V95Q1650C |
| (b) | TOTAL NO. AFT RCS VERNIER THRUSTER CYCLES (N_{Av}) | V95Q1651C |
| (c) | TOTAL NO. AFT RCS MAIN THRUSTER STARTUPS (N_{As}) | V95Q1652C |

Compute the quantity of propellants used since initiation of this operation using the following algorithm and then proceed to Step 3.

$$W_{Apm} = A_1 N_{Am} + A_2 N_{As}$$

$$W_{Apv} = B_1 N_{Av}$$

$$W_{Apt} = W_{Apm} + W_{Apv}$$

where

W_{Apm} = Total aft main jet propellant weight used

A_1 = Main jet flow rate per 80–ms cycle ($A_1 = 2.50 \text{ E} - 01 \text{ lb}/80\text{–ms cycle}$)

A_2 = Correction factor for startups/shutdown flow found by test ($A_2 = 0$)

N_{Am} = Total number of aft RCS main thruster cycles = signal (a)

N_{As} = Total number of aft RCS main thruster startups = signal (c)

W_{Apv} = Total aft vernier jet propellant weight used

B_1 = Aft vernier jet flow rate per 80–ms cycle ($B_1 = 7.20 \text{ E} - 03 \text{ lb}/80\text{–ms cycle}$)

N_{Av} = Total Number of aft vernier thruster cycles = signal (b)

W_{Apt} = Total propellant weight used by the aft jets in this operation

Step 3. This step provides the means for the crew to update the stored values of the left and right OMS propellants used for CRT display. The value entered via keyboard entry on the RM RCS (SPEC 23) Display will replace the current accumulated value in pounds of OMS propellant used for On-Orbit Aft RCS jet firings.

The following signals are monitored:

| | | |
|-----|---------------------------------|-----------|
| (a) | NEW OMS L USAGE IN LBS | V90Q8455C |
| (b) | NEW OMS R USAGE IN LBS | V90Q8456C |
| (c) | CREW UPDATE OF OMS L USAGE FLAG | V90X0432X |
| (d) | CREW UPDATE OF OMS R USAGE FLAG | V90X0433X |

If (c) is on, then replace (1) with (a) and set (c) off, hold (c) across any and all transitions between OPS 2, OPS 3, and OPS 8, and proceed to monitor (d). Otherwise, proceed to monitor (d).

If (d) is on, then replace (2) with (b) and set (d) off, hold (d) across any and all transitions between OPS 2, OPS 3 and OPS 8, and proceed to Step 4. Otherwise, proceed to Step 4.

| | | |
|-----|-----------------------------------|------------|
| (1) | LEFT OMS QUANTITY USED IN POUNDS | (Internal) |
| (2) | RIGHT OMS QUANTITY USED IN POUNDS | (Internal) |

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Step 4. This step updates the accumulated quantity of OMS propellant used in pounds by the Aft RCS jets for the selected OMS pod.

The following signals are monitored:

- | | | |
|-----|---------------------------|-----------|
| (a) | LOMS TO AFT RCS PRESS ENA | V93X5100X |
| (b) | ROMS TO AFT RCS PRESS ENA | V93X5101X |

If (a) and (b) are false, return to Step 1.

If (a) is true, then the following summation is performed:

$$(1) = (1) + [W_{Apt}(N) - W_{Apt}(N-1)]$$

If (b) is true, then the following summation is performed.

$$(2) = (2) + [W_{Apt}(N) - W_{Apt}(N-1)]$$

Then proceed to Step 5.

- | | | |
|-----|-----------------------------------|------------|
| (1) | LEFT OMS QUANTITY USED IN POUNDS | (Internal) |
| (2) | RIGHT OMS QUANTITY USED IN POUNDS | (Internal) |

Step 5. This step provides the conversion of the stored values of left and right OMS propellants from a value in pounds to a value in percent to be used for CRT display.

The following values are monitored:

- | | | |
|-----|-----------------------------------|------------|
| (a) | LEFT OMS QUANTITY USED IN POUNDS | (Internal) |
| (b) | RIGHT OMS QUANTITY USED IN POUNDS | (Internal) |

Perform the following calculations:

$$(1) = (a) \times 7.72 \times 10^{-3}$$

$$(2) = (b) \times 7.72 \times 10^{-3}$$

Proceed to Step 6.

- | | | |
|-----|--------------------------------|-----------|
| (1) | LT OMS TOTAL QUANTITY USED (%) | V90Q8535C |
| (2) | RT OMS TOTAL QUANTITY USED (%) | V90Q8536C |

Step 6. This step determines when the total quantity of propellant used from the OMS pods exceeds a predetermined limit.

The following signals are monitored:

- | | | |
|-----|----------------------------------|------------|
| (a) | LOMS TO AFT RCS PRESS ENA | V93X5100X |
| (b) | ROMS TO AFT RCS PRESS ENA | V93X5101X |
| (c) | QUANT_OMS_LMT | V97U9826C |
| (d) | LEFT OMS QUANTITY USED IN POUNDS | (Internal) |

(e) RIGHT OMS QUANTITY USED IN POUNDS

(Internal)

If (a) is true, then proceed to monitor (d) and (c). Otherwise, proceed to monitor (b).

If (d) is greater than (c), then issue (1) below and return to Step 1. Otherwise, return to Step 1.

If (b) is true, then proceed to monitor (e) and (c). Otherwise, return to Step 1.

If (e) is greater than (c), then issue (2) below and return to Step 1. Otherwise, return to Step 1.

(1) LT OMS PROP USED EXCEEDS LIMIT

V90X8531X

(2) RT OMS PROP USED EXCEEDS LIMIT

V90X8532X

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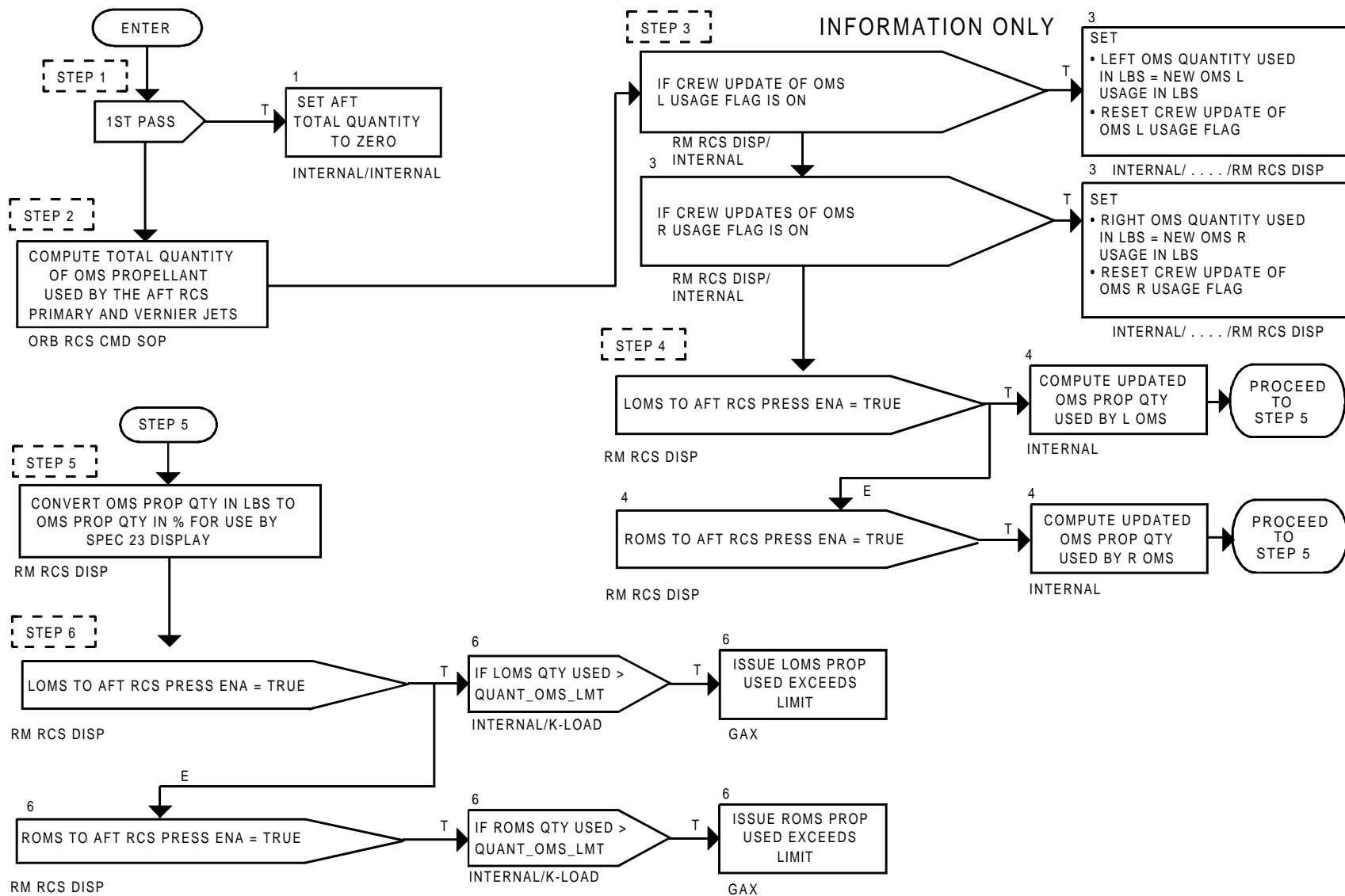


FIGURE 4.101. OMS to RCS Gauging

TABLE 4.7.9.4-1. INPUT FUNCTIONAL PARAMETERS FOR OMS TO RCS QUANTITY GAUGING (G4.101)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------|-----------|----------------------------------|-----------------|--------|-----------|------------------|----------|-------------|
| RCS_AFT_MN | V95Q1650C | TOT NO AFT RCS MN THRUSTER CYC | ORB RCS CMD SOP | COUNTS | | | D 92320D | |
| RCS_AFT_MN_ST | V95Q1652C | TOT NO AFT MN THRUSTER START UPS | ORB RCS CMD SOP | COUNTS | | | 92320D | |
| RCS_AFT_VR | V95Q1651C | TOT NO AFT RCS VR THRUSTER CYC | ORB RCS CMD SOP | COUNTS | | | D 92320D | |
| UPD_L_OMS_USG | V90X0432X | CREW UPDATE OF OMS L USAGE FLAG | RM RCS DISP | | BD | | 92870A | |
| UPD_R_OMS_USG | V90X0433X | CREW UPDATE OF OMS R USAGE FLAG | RM RCS DISP | | BD | | 92870A | |
| | V90Q8455C | NEW OMS L USAGE IN LBS | RM RCS DISP | LBS | SPL | | 92320D | |
| | V90Q8456C | NEW OMS R USAGE IN LBS | RM RCS DISP | LBS | SPL | | 92320D | |
| | V93X5100X | LOMS TO AFT RCS PRESS ENA | RM RCS DISP | | BD | | 92320D | |
| | V93X5101X | ROMS TO AFT RCS PRESS ENA | RM RCS DISP | | BD | | 92320D | |

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

TABLE 4.7.9.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM OMS TO RCS QUANTITY GAUGING (G4.101)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|------------|--------------------------------|---|-------|-----------|------------------|---------|-------------|
| | V90Q8535CA | LT OMS TOTAL QUANTITY USED(%) | DL FMT 22/A DL FMT 32/1 | PCT | SPL | | 93017G | * |
| | V90Q8536CA | RT OMS TOTAL QUANTITY USED(%) | DL FMT 22/A DL FMT 32/1 RM RCS DISP | PCT | SPL | | 93017G | * |
| | V90X8531X | LT OMS PROP USED EXCEEDS LIMIT | RM RCS DISP | | BD | | | |
| | V90X8532X | RT OMS PROP USED EXCEEDS LIMIT | RM RCS DISP | | BD | | | |

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 4.7.9.4-3. OMS TO RCS QUANTITY GAUGING (G4.101) 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 4.7.9.4-4. OMS TO RCS QUANTITY GAUGING (G4.101) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|---|-----------|----|-------------|-----------|----|--------|---|---------|---------|-------------|
| QUANT_OMS_LMT MAX OMS PROP ALLOWED FOR USE ON ORBIT | V97U9826C | 00 | +1.0 | E+05 LBS | F | S | P | G4.101 | 92320D | |

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

TABLE 4.7.9.4-5. OMS TO RCS QUANTITY GAUGING (G4.101) CONSTANTS

| FSSR NAME DESCRIPTION | MSID | MC | CONSTANT VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|---|-----------|----|----------------|-----------------|----|--------|---|---------|---------|-------------|
| AFT_MAIN_JET_FLOWRATE AFT MAIN JET FLOWRATE (A1) | V97U6148C | 00 | +2.50 | E-01 LB/80 MSEC | F | S | P | G4.101 | 92320D | |
| AFT_VERNIER_JET_FLOWRATE AFT VERNIER JET FLOWRATE (B1) | V97U6149C | 00 | +7.20 | E-03 LB/80 MSEC | F | S | P | G4.101 | 92320D | |

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

4.8.1 Master Events Controller SOP (4.228)

The purpose of the master events controller (MEC) SOP principal function is to process user function discrete commands to generate the following serial–digital signals to the MEC: MEC critical commands, MEC noncritical commands, and MEC master reset commands.

The MEC SOP shall be processed on demand as required by the R/S LCH SEQ, SRB SEP SEQ, or ET SEP SEQ. The MEC SOP interfaces are indicated in the functional block diagram in Figure 4.8.1–1. The MEC critical and noncritical commands are shown in Tables 4.8.1–1 and 4.8.1–2, respectively. The input and output parameters are shown in Tables 4.8.1–3 and 4.8.1–4, respectively. The output requirements are shown in Table 4.8.1–5.

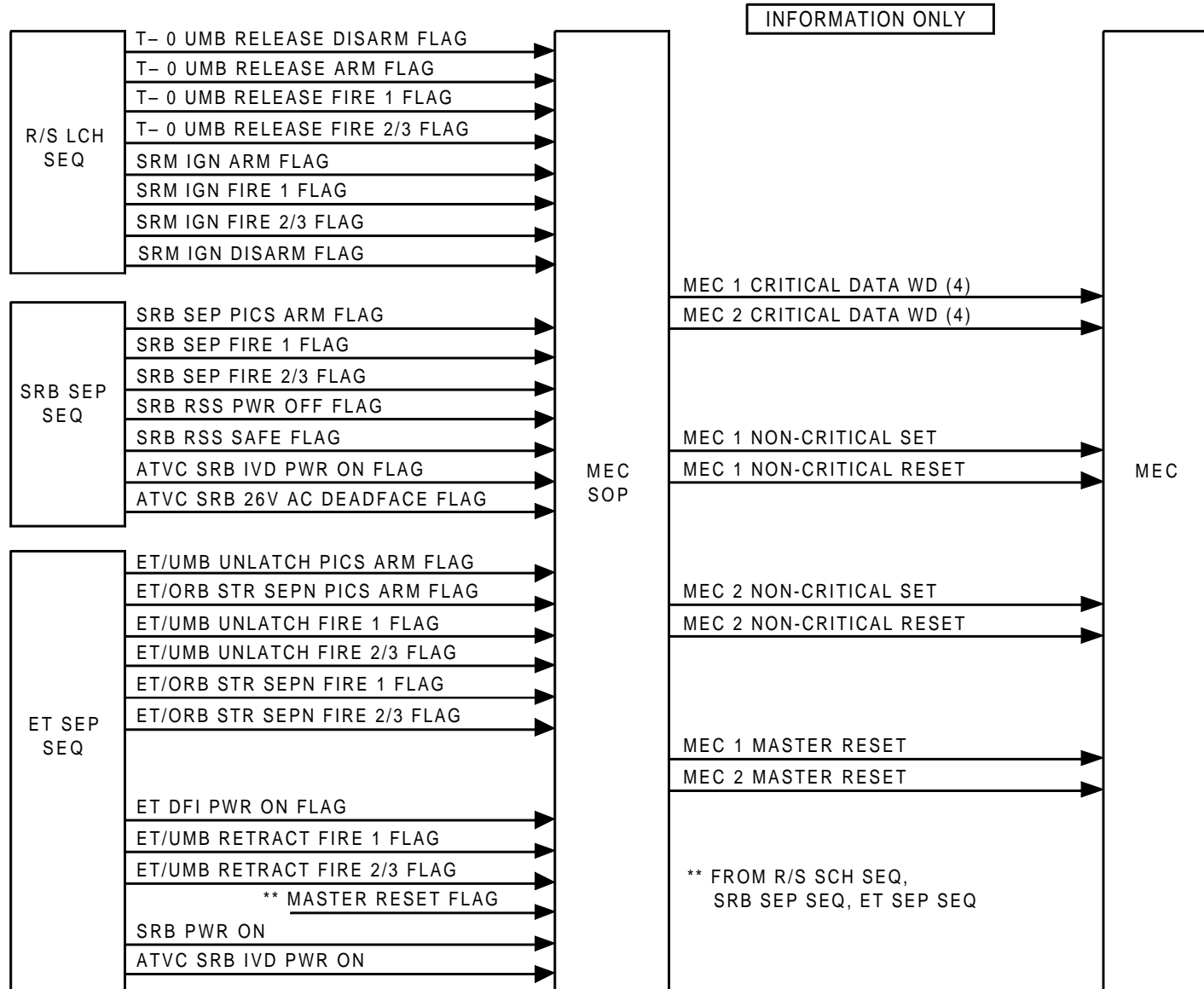


FIGURE 4.228. MEC SOP Functional Block Diagram

Table 4.8.1-1.MEC Critical Command Processing

| Input Flag | Output – Bits 9–24 in Command Data Word | | | |
|-----------------------------------|---|---|--------------------|-----------|
| | Parameter | | CMD Constant | Hex Value |
| T0_UMB_ARM = 1 V90X8407X | CRIT_CMD1 (1) | = | UMB_RLS_ARM (1) | CEDC |
| | CRIT_CMD2 (1) | = | UMB_RLS_ARM (2) | CEDC |
| T0_UMB_DISARM = 1 V90X0449X | CRIT_CMD1 (1) | = | UMB_RLS_DISARM (1) | 0000 |
| | CRIT_CMD2 (1) | = | UMB_RLS_DISARM (2) | 0000 |
| SRM_IGN_ARM = 1 V90X8404X | CRIT_CMD1 (2) | = | SRM_ARM (1) | 3EAC |
| | CRIT_CMD2 (2) | = | SRM_ARM (2) | 3EAC |
| SRM_IGN_DISARM = 1 V90X0448X | CRIT_CMD1 (2) | = | SRM_DISARM (1) | 0000 |
| | CRIT_CMD2 (2) | = | SRM_DISARM (2) | 0000 |
| SRM_IGN_FIRE1 = 1 V90X8405X | CRIT_CMD1 (3) | = | SRM_FIRE1 (1) | 3E6A |
| | CRIT_CMD2 (3) | = | SRM_FIRE1 (2) | 3E6A |
| SRM_IGN_FIRE2/3 = 1 V90X8699X | CRIT_CMD1 (4) | = | SRM_FIRE2 (1) | 3E42 |
| | CRIT_CMD2 (4) | = | SRM_FIRE2 (2) | 3E42 |
| T0_UMB_FIRE1 = 1 V90X8408X | CRIT_CMD1 (3) | = | UMB_FIRE1 (1) | CE6A |
| | CRIT_CMD2 (3) | = | UMB_FIRE1 (2) | CE6A |
| T0_UMB_FIRE2/3 = 1 V90X8698X | CRIT_CMD1 (4) | = | UMB_FIRE2 (1) | CE9A |
| | CRIT_CMD2 (4) | = | UMB_FIRE2 (2) | CE9A |
| SRB_SEP_ARM = 1 V90X8335X | CRIT_CMD1 (2) | = | SRB_ARM (1) | 3154 |
| | CRIT_CMD2 (2) | = | SRB_ARM (2) | 3154 |
| SRB_SEP_FIRE1 = 1 V90X8341X | CRIT_CMD1 (2) | = | SRB_FIRE1 (1) | 316A |
| | CRIT_CMD2 (2) | = | SRB_FIRE1 (2) | 316A |
| SRB_SEP_FIRE2/3 = 1 V90X8354X | CRIT_CMD1 (3) | = | SRB_FIRE2 (1) | 319B |
| | CRIT_CMD2 (3) | = | SRB_FIRE2 (2) | 319B |
| ET_UMB_UNLCH_ARM = 1 V90X8247X | CRIT_CMD1 (2) | = | ET_UMB_ARM (1) | C121 |
| | CRIT_CMD2 (2) | = | ET_UMB_ARM (2) | C121 |

| Table 4.8.1-1.MEC Critical Command Processing | | | | |
|---|---|---|-------------------|-----------|
| Input Flag | Output – Bits 9–24 in Command Data Word | | | |
| | Parameter | | CMD Constant | Hex Value |
| ET_UMB_RETR_CMD1 = 1 V90X8263X | CRIT_CMD1 (4) | = | ET_UMB_CMD1 (1) | 7463 |
| | CRIT_CMD2 (4) | = | ET_UMB_CMD1 (2) | 7463 |
| ET_UMB_UNLCH_FIRE1 = 1 V90X8256X | CRIT_CMD1 (3) | = | ET_UMB_FIRE1 (1) | C162 |
| | CRIT_CMD2 (3) | = | ET_UMB_FIRE1 (2) | C162 |
| ET_UMB_UNLCH_FIRE 2/3 = 1 V90X8242X | CRIT_CMD1 (2) | = | ET_UMB_FIRE2 (1) | C193 |
| | CRIT_CMD2 (2) | = | ET_UMB_FIRE2 (2) | C193 |
| ET_UMB_RETR CMD 2/3 = 1 V90X8243X | CRIT_CMD1 (1) | = | ET_UMB_CMD2 (1) | 7498 |
| | CRIT_CMD2 (1) | = | ET_UMB_CMD2 (2) | 7498 |
| ET_SEP_ARM = 1 V90X8265X | CRIT_CMD1 (1) | = | ET_SEP_ARM (1) | E117 |
| | CRIT_CMD2 (1) | = | ET_SEP_ARM (2) | E117 |
| ET_SEP_FIRE1 = 1 V90X8244X | CRIT_CMD1 (2) | = | SEP_ET_FIRE1 (1) | E168 |
| | CRIT_CMD2 (2) | = | SEP_ET_FIRE1 (2) | E168 |
| ET_SEP_FIRE 2/3 = 1 V90X8241X | CRIT_CMD1 (3) | = | SEP_ET_FIRE2 (1) | E199 |
| | CRIT_CMD2 (3) | = | SEP_ET_FIRE2 (2) | E199 |
| SRB_RSS_SAFE = 1 V90X8337X | CRIT_CMD1 (3) | = | RSS_SRB_SAFE1 (1) | EB68 |
| | CRIT_CMD2 (3) | = | RSS_SRB_SAFE1 (2) | EB68 |
| | CRIT_CMD1 (4) | = | RSS_SRB_SAFE2 (1) | EB95 |
| | CRIT_CMD2 (4) | = | RSS_SRB_SAFE2 (2) | EB95 |
| ATVC_26V_DD_FACE = 1 V90X8339X | CRIT_CMD1 (1) | = | ATVC_1/2_DDFC (1) | EC68 |
| | CRIT_CMD2 (1) | = | ATVC_1/2_DDFC (2) | EC68 |
| | CRIT_CMD1 (4) | = | ATVC_3/4_DDFC (1) | EC9D |
| | CRIT_CMD2 (4) | = | ATVC_3/4_DDFC (2) | EC9D |

4.8.1.1 MEC Critical Command Processing

The MEC SOP shall monitor command flags from the user functions and shall generate critical command data words to the two MEC's for each of the user function command flags as defined in Table 4.8.1-1. The user function command flag shall then be reset. The resulting parameter command constant shall be maintained until replaced by a new parameter command constant resulting from a user function command flag or until zeroed by the MEC 1 and 2 master reset (see Section 4.8.1.3).

MEC critical commands must comply with the following timing constraints: (1) the MEC 1 to MEC 2 timing interval shall be less than 400 microseconds (the MEC 1 to MEC 2 timing interval refers to the interval between like commands issued to MEC 1 and MEC 2 by any single GN&C computer) and (2) a single GPC shall not issue successive commands to a MEC with less than 25 microseconds between the commands. Timing constraints that apply to MEC commands are also presented in the Level A CPDS, SS-P-0002-170, Section 4.4.2 Timing and Periodicity, Items (e), (f), (g), (h).

4.8.1.1.1 Initialization Requirements

The critical command data words, as defined in Table 4.8.1-5, shall be initialized with HEX CODE 0000 upon entry into OPS 1.

4.8.1.2 MEC Noncritical Command Processing

The MEC SOP shall monitor noncritical command flags from the user functions and shall generate noncritical set and reset command data words to the two MEC's for each of the user function command flags as defined in Table 4.8.1-2. MEC noncritical commands must comply with the following timing constraints: (1) the MEC 1 to MEC 2 timing interval shall be less than 400 microseconds (the MEC 1 to MEC 2 timing interval refers to the interval between like commands issued to MEC 1 and MEC 2 by any single GN&C computer) and (2) a single GPC shall not issue successive commands to a MEC with less than 25 microseconds between the commands, and (3) MEC noncritical commands from the redundant set GPC's must be allowed to remain at the MEC ports as a set for at less 25 microseconds before being overwritten by other MEC commands. This is to ensure that identical noncritical commands are resident in each port of the MEC for at least 25 microseconds. (4) The SRB Power Reset Command must be sent at least twice and two of the commands must be separated by a minimum of 1.01 seconds. Timing constraints that apply to MEC commands are also presented in the Level A CPDS, SS-P-0002-170, Section 4.4.2 Timing and Periodicity, Items (e), (f), (g), and (h).

The cumulative status of both the set and reset commands shall be maintained during OPS 1. Whenever a noncritical command flag is set by the user function, the MEC SOP shall modify the cumulative set and reset command parameters as defined in Table 4.8.1-2. The user function command flag shall then be reset. The resulting parameter command constants shall be maintained until modified in response to subsequent user function command flags or, in the case of the FIRE3 commands, until reset by the MEC 1 and 2 master reset (see Section 4.8.1.3).

4.8.1.2.1 Initialization Requirements

The noncritical command data words, as defined in Table 4.8.1-5, shall be initialized with the Hex Code 607C for the SET data words and Hex Code 9F83 for the RESET data words.

During OPS 3 and OPS 8, the set command shall be initialized and maintained with Hex Code 0003 and cyclically output to MEC's 1 and 2. Additionally, the reset command may be set to FFFC and cyclically output. Output of the reset command to the MEC is not required.

| Table 4.8.1-2.MEC Noncritical Command Processing | | | | |
|--|---|------------------------|--------------|-----------|
| Input Flag Parameter | Name | Hex Code Bits Affected | Parameter * | Hex Code* |
| OPS 1 INITIALIZATION (see 4.8.1.2.1) | Initial noncritical command data words | 607C = 1 | NCRIT_SET(1) | 607C |
| | | 607C = 1 | NCRIT_SET(2) | 607C |
| | | 9F83 = 1 | NCRIT_RST(1) | 9F83 |
| | | 9F83 = 1 | NCRIT_RST(2) | 9F83 |
| SRM_IGN_FIRE 2/3 = 1 | IGN_SRM_FIRE3 | 1000 = 1 | NCRIT_SET(1) | 707C |
| | | 1000 = 1 | NCRIT_SET(2) | 707C |
| | | 1000 = 0 | NCRIT_RST(1) | 8F83 |
| | | 1000 = 0 | NCRIT_RST(2) | 8F83 |
| TO_UMB_FIRE 2/3 = 1 | UMB_TO_FIRE3 | 0800 = 1 | NCRIT_SET(1) | 787C |
| | | 0800 = 1 | NCRIT_SET(2) | 787C |
| | | 0800 = 0 | NCRIT_RST(1) | 8783 |
| | | 0800 = 0 | NCRIT_RST(2) | 8783 |
| MEC 1 & 2 MASTER RESET = 1 | IGN_SRM_FIRE3 | 1000 = 0 | NCRIT_SET(1) | 687C |
| | | 1000 = 0 | NCRIT_SET(2) | 687C |
| | | 1000 = 1 | NCRIT_RST(1) | 9783 |
| | | 1000 = 1 | NCRIT_RST(2) | 9783 |
| | UMB_TO_FIRE3 | 0800 = 0 | NCRIT_SET(1) | 607C |
| | | 0800 = 0 | NCRIT_SET(2) | 607C |
| | | 0800 = 1 | NCRIT_RST(1) | 9F83 |
| | | 0800 = 1 | NCRIT_RST(2) | 9F83 |
| SRB_RSS_OFF (TRUE) = 1 | RSS_SRB_OFF(1 & 2) | 0600 = 1 | NCRIT_SET(1) | 667C |
| | | 0600 = 1 | NCRIT_SET(2) | 667C |
| | RSS_SRB_OFF(3 & 4) | 0600 = 0 | NCRIT_RST(1) | 9983 |
| | | 0600 = 0 | NCRIT_RST(2) | 9983 |
| ATVC_IVD_PWR = 1 | ATVC_SRB_PWR(1 & 2) | 000C = 0 | NCRIT_SET(1) | 6670 |
| | | 000C = 0 | NCRIT_SET(2) | 6670 |
| | ATVC_SRB_PWR(3 & 4) | 000C = 1 | NCRIT_RST(1) | 998F |
| | | 000C = 1 | NCRIT_RST(2) | 998F |

Table 4.8.1-2.MEC Noncritical Command Processing

| Input Flag Parameter | Name | Hex Code Bits Affected | Parameter * | Hex Code* |
|-------------------------------|--------------------|------------------------|--------------|-----------|
| SRB_SEP_FIRE 2/3 = 1 | SEP_SRB_FIRE3 | 0100 = 1 | NCRIT_SET(1) | 6770 |
| | SEP_SRB_FIRE3 | 0100 = 1 | NCRIT_SET(2) | 6770 |
| | SEP_SRB_FIRE3 | 0100 = 0 | NCRIT_RST(1) | 988F |
| | SEP_SRB_FIRE3 | 0100 = 0 | NCRIT_RST(2) | 988F |
| SRB_PWR_ON = 1 | SRB_PWR(1,2,5 & 6) | 6030 = 0 | NCRIT_SET(1) | 0740 |
| | SRB_PWR(3,4,7 & 8) | 6030 = 0 | NCRIT_SET(2) | 0740 |
| | SRB_PWR(1,2,5 & 6) | 6030 = 1 | NCRIT_RST(1) | F8BF |
| | SRB_PWR(3,4,7 & 8) | 6030 = 1 | NCRIT_RST(2) | F8BF |
| SRB_RSS_OFF (FALSE) = 1 | RSS_SRB_OFF(1 & 2) | 0600 = 0 | NCRIT_SET(1) | 0140 |
| | RSS_SRB_OFF(3 & 4) | 0600 = 0 | NCRIT_SET(2) | 0140 |
| | RSS_SRB_OFF(1 & 2) | 0600 = 1 | NCRIT_RST(1) | FEBF |
| | RSS_SRB_OFF(3 & 4) | 0600 = 1 | NCRIT_RST(2) | FEBF |
| MEC 1 & 2 MASTER RESET = 1 | SEP_SRB_FIRE3 | 0100 = 0 | NCRIT_SET(1) | 0040 |
| | SEP_SRB_FIRE3 | 0100 = 0 | NCRIT_SET(2) | 0040 |
| | SEP_SRB_FIRE3 | 0100 = 1 | NCRIT_RST(1) | FFBF |
| | SEP_SRB_FIRE3 | 0100 = 1 | NCRIT_RST(2) | FFBF |
| ET_DFI = 1 | ET_DFI_PWR | 0040 = 0 | NCRIT_SET(1) | 0000 |
| | ET_DFI_PWR | 0040 = 0 | NCRIT_SET(2) | 0000 |
| | ET_DFI_PWR | 0040 = 1 | NCRIT_RST(1) | FFFF |
| | ET_DFI_PWR | 0040 = 1 | NCRIT_RST(2) | FFFF |
| ET_UMB_UNLCH_ FIRE 2/3 = 1 | ET_UNLCH_UMB_FIRE3 | 0080 = 1 | NCRIT_SET(1) | 0080 |
| | ET_UNLCH_UMB_FIRE3 | 0080 = 1 | NCRIT_SET(2) | 0080 |
| | ET_UNLCH_UMB_FIRE3 | 0080 = 0 | NCRIT_RST(1) | FF7F |
| | ET_UNLCH_UMB_FIRE3 | 0080 = 0 | NCRIT_RST(2) | FF7F |
| ET_UMB_RETR_CMD 2/3 = 1 | ET_RETR_UMB_CMD3 | 0002 = 1 | NCRIT_SET(1) | 0082 |
| | ET_RETR_UMB_CMD3 | 0002 = 1 | NCRIT_SET(2) | 0082 |
| | ET_RETR_UMB_CMD3 | 0002 = 0 | NCRIT_RST(1) | FF7D |
| | ET_RETR_UMB_CMD3 | 0002 = 0 | NCRIT_RST(2) | FF7D |
| ET_SEP_FIRE 2/3 = 1 | SEP_ET_FIRE3 | 0001 = 1 | NCRIT_SET(1) | 0083 |
| | SEP_ET_FIRE3 | 0001 = 1 | NCRIT_SET(2) | 0083 |
| | SEP_ET_FIRE3 | 0001 = 0 | NCRIT_RST(1) | FF7C |
| | SEP_ET_FIRE3 | 0001 = 0 | NCRIT_RST(2) | FF7C |

| Table 4.8.1-2.MEC Noncritical Command Processing | | | | |
|--|--------------------|------------------------|--------------|-----------|
| Input Flag Parameter | Name | Hex Code Bits Affected | Parameter * | Hex Code* |
| MEC 1 & 2 MASTER RESET 1 | ET_UNLCH_UMB_FIRE3 | 0080 = 0 | NCRIT_SET(1) | 0003 |
| | ET_UNLCH_UMB_FIRE3 | 0080 = 0 | NCRIT_SET(2) | 0003 |
| | ET_UNLCH_UMB_FIRE3 | 0080 = 1 | NCRIT_RST(1) | FFFC |
| | ET_UNLCH_UMB_FIRE3 | 0080 = 1 | NCRIT_RST(2) | FFFC |
| | ET_RETR_UMB_CMD3 | 0002 = 0 | NCRIT_SET(1) | 0001 |
| | ET_RETR_UMB_CMD3 | 0002 = 0 | NCRIT_SET(2) | 0001 |
| | ET_RETR_UMB_CMD3 | 0002 = 1 | NCRIT_RST(1) | FFFE |
| | ET_RETR_UMB_CMD3 | 0002 = 1 | NCRIT_RST(2) | FFFE |
| | SEP_ET_FIRE3 | 0001 = 0 | NCRIT_SET(1) | 0000 |
| | SEP_ET_FIRE3 | 0001 = 0 | NCRIT_SET(2) | 0000 |
| | SEP_ET_FIRE3 | 0001 = 1 | NCRIT_RST(1) | FFFF |
| | SEP_ET_FIRE3 | 0001 = 1 | NCRIT_RST(2) | FFFF |

*For information only: cumulative effects of MEC SOP response to user flags.

4.8.1.3 MEC Master Reset

The MEC SOP monitors master reset command flags from the user functions and generates master reset commands to the two MEC's as follows:

- (a) The M_RESET_USER flag in the 1 state (which is master reset commanded) shall result in the issuing of the MASTER_RESET command to each MEC, zeroing the MEC critical command output buffers, and the RESET of all of the noncritical FIRE 3 commands listed in Table 4.8.1-2. This flag shall remain set for two cycles. Once two cycles have occurred, the MASTER_RESET flags shall be set to the zero state.

Table 4.8.1-3.MEC SOP Input Parameters

| Name | MSID/MML | Description | Input Source | Signal Type | Range |
|-----------------------------|---------------------|---|---------------------------|-------------|-------|
| T0_UMB_ARM | V90X8407X G48010 | T-0 UMB RELEASE ARM FLAG (1=ARM) | R/S LCH SEQ | DISCRETE | 0, 1 |
| T0_UMB_FIRE1 | V90X8408X G48011 | T-0 UMB RELEASE FIRE 1 FLAG (1=FIRE) | R/S LCH SEQ | DISCRETE | 0, 1 |
| T0_UMB_FIRE2/3 | V90X8698X | T-0 UMB RELEASE FIRE 2/3 FLAG (1=FIRE) | R/S LCH SEQ | DISCRETE | 0, 1 |
| SRM_IGN_ARM | V90X8404X G48013 | SRM IGN ARM FLAG (1=ARM) | R/S LCH SEQ | DISCRETE | 0, 1 |
| SRM_IGN_FIRE1 | V90X8405X G48014 | SRM IGN FIRE 1 FLAG (1=FIRE) | R/S LCH SEQ | DISCRETE | 0, 1 |
| SRM_IGN_FIRE2/3 | V90X8699X | SRM IGN FIRE 2/3 FLAG (1=FIRE) | R/S LCH SEQ | DISCRETE | 0, 1 |
| SRB_SEP_ARM | V90X8335X G4B016 | SRB SEP PICS ARM FLAG (1=ARM) | SRB SEP SEQ | DISCRETE | 0, 1 |
| SRM_IGN_DISARM | V90X0448X | SRM IGN DISARM FLAG (1=DISARM) | R/S LCH SEQ | DISCRETE | 0, 1 |
| T0_UMB_DISARM | V90X0449X | T-0 UMB RELEASE DISARM FLAG (1=DISARM) | R/S LCH SEQ | DISCRETE | 0, 1 |
| SRB_SEP_FIRE1 | V90X8341X G48017 | SRB SEP FIRE 1 FLAG (1=FIRE) | SRB SEP SEQ | DISCRETE | 0, 1 |
| SRB_SEP FIRE2/3 | V90X8354X | SRB SEP FIRE 2/3 FLAG (1=FIRE) | SRB SEP SEQ | DISCRETE | 0, 1 |
| SRB_PWR_ON | V90X8343X G48019 | SRB PWR ON (1=RESET) | ET SEP SEQ | DISCRETE | 0, 1 |
| SRB_RSS_OFF (TRUE/FALSE) | V90X8336X G48020 | SRB RSS PWR OFF FLAG (TRUE=1=SET OFF CMD FALSE=1=RESET OFF CMD) | SRB SEP SEQ | DISCRETE | 0, 1 |
| SRB_RSS_SAFE | V90X8337X G48021 | SRB RSS SAFE FLAG (1=SAFE) | SRB SEP SEQ | DISCRETE | 0, 1 |
| ATVC_IVD_PWR | V90X8338X G48022 | ATVC SRB IVD POWER ON (1=OFF) | SRB SEP SEQ ET SEP SEQ | DISCRETE | 0, 1 |
| ATVC_26V_DDFACE | V90X8339X G48023 | ATVC SRB 26V AC DEADFACE FLAG (1=DEADFACE) | SRB SEP SEQ | DISCRETE | 0, 1 |
| ET_UMB_UNLCH_ARM | V90X8247X G48000 | ET/UMB UNLATCH PICS ARM FLAG (1=ARM) | ET SEP SEQ | DISCRETE | 0, 1 |
| ET_UMB_UNLCH_FIRE1 | V90X8256X G48001 | ET/UMB UNLATCH FIRE 1 FLAG (1=FIRE) | ET SEP SEQ | DISCRETE | 0, 1 |
| ET_UMB_UNLCH_ FIRE2/3 | V90X8242X | ET/UMB UNLATCH FIRE 2/3 FLAG (1=FIRE) | ET SEP SEQ | DISCRETE | 0, 1 |
| ET_SEP_FIRE1 | V90X8244X G48003 | ET/ORB STR SEPN FIRE 1 FLAG (1=FIRE) | ET SEP SEQ | DISCRETE | 0, 1 |

| Table 4.8.1-3.MEC SOP Input Parameters | | | | | |
|--|--|---|--|-------------|-------|
| Name | MSID/MML | Description | Input Source | Signal Type | Range |
| ET_SEP_FIRE2/3 | V90X8241X | ET/ORB STR SEPN FIRE 2/3 FLAG (1=FIRE) | ET SEP SEQ | DISCRETE | 0, 1 |
| ET_DFI_PWR | V90X8255X G48007 | ET DFI PWR ON (1=OFF) | ET SEP SEQ | DISCRETE | 0, 1 |
| M_RSET_USER | V90X8258XA V90X8258XB V90X8258XC G48009 | MEC 1&2 MASTER RESET FLAG (1=ACTIVATE) | ET SEP SEQ SRB SEP SEQ R/S LCH SEQ | DISCRETE | 0, 1 |
| ET_UMB_RETR_CMD1 | V90X8263X | ET/UMB RETRACT FIRE 1 FLAG (1=FIRE) | ET SEP SEQ | DISCRETE | 0, 1 |
| ET_UMB_RETR_CMD2/3 | V90X8243X | ET/UMB RETRACT FIRE 2/3 FLAG (1=FIRE) | ET SEP SEQ | DISCRETE | 0, 1 |
| ET_SEP_ARM | V90X8265X | ET/ORB STR SEP PICS ARM FLAG (1=ARM) | ET SEP SEQ | DISCRETE | 0, 1 |

4.8.1.4 Critical Pairs

The following combinations of FIRE 2 critical commands and FIRE 3 noncritical commands form critical pairs which have special output timing requirements.

| | |
|------------------------------------|-----------|
| MEC 1 SRM IGN FIRE 2 CMD | V76K6954B |
| MEC 1 SRM IGN FIRE 3 CMD | V76K6955B |
| MEC 2 SRM IGN FIRE 2 CMD | V76K6964B |
| MEC 2 SRM IGN FIRE 3 CMD | V76K6965B |
| MEC 1 L TO UMB RELEASE FIRE 2 CMD | V76K4611B |
| MEC 1 L TO UMB RELEASE FIRE 3 CMD | V76K4612B |
| MEC 2 R TO UMB RELEASE FIRE 2 CMD | V76K4615B |
| MEC 2 R TO UMB RELEASE FIRE 3 CMD | V76K4616B |
| MEC 1 SRB SEPN FIRE 2 CMD | V76K6959B |
| MEC 1 SRB SEPN FIRE 3 CMD | V76K6960B |
| MEC 2 SRB SEPN FIRE 2 AND RCVY ARM | V76K6969B |
| MEC 2 SRB SEPN FIRE 3 CMD | V76K6970B |
| MEC 1 ET/UMB UNLATCH FIRE 2 CMD | V76K4623B |
| MEC 1 ET/UMB UNLATCH FIRE 3 CMD | V76K4625B |
| MEC 2 ET/UMB UNLATCH FIRE 2 CMD | V76K4624B |
| MEC 2 ET/UMB UNLATCH FIRE 3 CMD | V76K4626B |
| MEC 1 ET/UMB RETR FIRE 2 CMD | V76K4656B |

| | |
|----------------------------------|-----------|
| MEC 1 ET/UMB RETR FIRE 3 CMD | V76K4657B |
| MEC 2 ET/UMB RETR FIRE 2 CMD | V76K4660B |
| MEC 2 ET/UMB RETR FIRE 3 CMD | V76K4661B |
| MEC 1 ET/ORB STR SEPN FIRE 2 CMD | V76K6914B |
| MEC 1 ET/ORB STR SEPN FIRE 3 CMD | V76K6921B |
| MEC 2 ET/ORB STR SEPN FIRE 2 CMD | V76K6916B |
| MEC 2 ET/ORB STR SEPN FIRE 3 CMD | V76K6922B |

For each critical pair listed above, the respective FIRE 2 critical command and FIRE 3 noncritical command must be issued together so that the FIRE 2 command shall not precede the FIRE 3 command by more than 4.176 milliseconds nor occur after the FIRE 3 command by more than 0.725 millisecond.

Timing constraints that apply to MEC commands are also presented in the Level A CPDS, SS-P-0002-170, Section 4.4.2 Timing and Periodicity, Items (e), (f), (g), and (h).

| Name | MSID/MML | Description | Non-Crit-CMD Hex Code | Crit-CMD Hex Code | Range |
|------------------|-----------|-----------------------------------|-----------------------|-------------------|-------|
| RSS_SRB_OFF(1) | V76K7006B | MEC 1 RSS L SRB PWR OFF CMD | 0400 | | |
| RSS_SRB_OFF(2) | V76K7007B | MEC 1 RSS R SRB PWR OFF CMD | 0200 | | |
| RSS_SRB_OFF(3) | V76K7106B | MEC 2 RSS L SRB PWR OFF CMD | 0400 | | |
| RSS_SRB_OFF(4) | V76K7107B | MEC 2 RSS R SRB PWR OFF CMD | 0200 | | |
| RSS_SRB_SAFE1(1) | V76K7508B | MEC 1 RSS L SAFE 1 CMD | | EB68 | |
| RSS_SRB_SAFE2(1) | V76K7509B | MEC 1 RSS R SAFE 2 CMD | | EB95 | |
| RSS_SRB_SAFE1(2) | V76K7608B | MEC 2 RSS R SAFE 1 CMD | | EB68 | |
| RSS_SRB_SAFE2(2) | V76K7609B | MEC 2 RSS L SAFE 2 CMD | | EB95 | |
| ATVC_SRB_PWR(1) | V76K7013B | MEC 1 ATVC 2 SRB IVD A PWR ON CMD | 0008 | | |
| ATVC_SRB_PWR(2) | V76K7014B | MEC 1 ATVC 4 SRB IVD B PWR ON CMD | 0004 | | |
| ATVC_SRB_PWR(3) | V76K7114B | MEC 2 ATVC 3 SRB IVD B PWR ON CMD | 0004 | | |
| ATVC_SRB_PWR(4) | V76K7113B | MEC 2 ATVC 1 SRB IVD C PWR ON CMD | 0008 | | |
| ATVC_DDFC(1) | V76K7515B | MEC 1 ATVC 2 SRB 26V DEADFACE CMD | | EC68 | |
| ATVC_DDFC(2) | V76K7516B | MEC 1 ATVC 4 SRB 26V DEADFACE CMD | | EC9D | |

| Table 4.8.1-4.MEC SOP Output Parameters | | | | | |
|---|-----------|-----------------------------------|-----------------------|-------------------|-------|
| Name | MSID/MML | Description | Non-Crit-CMD Hex Code | Crit-CMD Hex Code | Range |
| ATVC_DDFC(3) | V76K7615B | MEC 2 ATVC 1 SRB 26V DEADFACE CMD | | EC68 | |
| ATVC_DDFC(4) | V76K7616B | MEC 2 ATVC 3 SRB 26V DEADFACE CMD | | EC9D | |
| SRB_PWR(1) | V76K7002B | MEC 1 L SRB PWR A CMD | 4000 | | |
| SRB_PWR(2) | V76K7003B | MEC 1 R SRB PWR A CMD | 2000 | | |
| SRB_PWR(3) | V76K7102B | MEC 2 L SRB PWR B CMD | 4000 | | |
| SRB_PWR(4) | V76K7103B | MEC 2 R SRB PWR B CMD | 2000 | | |
| SRB_PWR(5) | V76K7011B | MEC 1 L SRB PWR C CMD | 0020 | | |
| SRB_PWR(6) | V76K7012B | MEC 1 R SRB PWR C CMD | 0010 | | |
| SRB_PWR(7) | V76K7111B | MEC 2 L SRB PWR C CMD | 0020 | | |
| SRB_PWR(8) | V76K7112B | MEC 2 R SRB PWR C CMD | 0010 | | |
| UMB_RLS_ARM(1) | V76K4609B | MEC 1 L T0 UMB RELEASE ARM CMD | | CEDC | |
| UMB_RLS_ARM(2) | V76K4613B | MEC 2 R T0 UMB RELEASE ARM CMD | | CEDC | |
| SRM_ARM(1) | V76K6951B | MEC 1 SRM IGN ARM CMD | | 3EAC | |
| SRM_ARM(2) | V76K6961B | MEC 2 SRM IGN ARM CMD | | 3EAC | |
| SRM_FIRE1(1) | V76K6953B | MEC 1 SRM IGN FIRE 1 CMD | | 3E6A | |
| SRM_FIRE1(2) | V76K6963B | MEC 2 SRM IGN FIRE 1 CMD | | 3E6A | |
| SRM_FIRE2(1) | V76K6954B | MEC 1 SRM IGN FIRE 2 CMD | | 3E42 | |
| SRM_FIRE2(2) | V76K6964B | MEC 2 SRM IGN FIRE 2 CMD | | 3E42 | |
| SRM_FIRE3(1) | V76K6955B | MEC 1 SRM IGN FIRE 3 CMD | 1000 | | |
| SRM_FIRE3(2) | V76K6965B | MEC 2 SRM IGN FIRE 3 CMD | 1000 | | |
| UMB_FIRE1(1) | V76K4610B | MEC 1 L T0 UMB RELEASE FIRE 1 CMD | | CE6A | |
| UMB_FIRE1(2) | V76K4614B | MEC 2 R T0 UMB RELEASE FIRE 1 CMD | | CE6A | |
| UMB_FIRE2(1) | V76K4611B | MEC 1 L T0 UMB RELEASE FIRE 2 CMD | | CE9A | |
| UMB_FIRE2(2) | V76K4615B | MEC 2 R T0 UMB RELEASE FIRE 2 CMD | | CE9A | |
| UMB_FIRE3(1) | V76K4612B | MEC 1 L T0 UMB RELEASE FIRE 3 CMD | 0800 | | |
| UMB_FIRE3(2) | V76K4616B | MEC 2 R T0 UMB RELEASE FIRE 3 CMD | 0800 | | |

| Table 4.8.1-4.MEC SOP Output Parameters | | | | | |
|---|-----------|---------------------------------------|-----------------------|-------------------|-------|
| Name | MSID/MML | Description | Non-Crit-CMD Hex Code | Crit-CMD Hex Code | Range |
| SRB_ARM(1) | V76K6956B | MEC 1 SRB SEPN ARM CMD | | 3154 | |
| SRB_ARM(2) | V76K6966B | MEC 2 SRB SEPN ARM CMD | | 3154 | |
| SRB_FIRE1(1) | V76K6958B | MEC 1 SRB SEPN FIRE 1 CMD | | 316A | |
| SRB_FIRE1(2) | V76K6968B | MEC 2 SRB SEPN FIRE 1 AND RCVY PWR ON | | 316A | |
| SRB_FIRE2(1) | V76K6959B | MEC 1 SRB SEPN FIRE 2 CMD | | 319B | |
| SRB_FIRE2(2) | V76K6969B | MEC 2 SRB SEPN FIRE 2 AND RCVY ARM | | 319B | |
| SRB_FIRE3(1) | V76K6960B | MEC 1 SRB SEPN FIRE 3 CMD | 0100 | | |
| SRB_FIRE3(2) | V76K6970B | MEC 2 SRB SEPN FIRE 3 CMD | 0100 | | |
| ET_UMB_UNLCH_ARM(1) | V76K4617B | MEC 1 ET/UMB UNLATCH ARM CMD | | C121 | |
| ET_UMB_UNLCH_ARM(2) | V76K4618B | MEC 2 ET/UMB UNLATCH ARM CMD | | C121 | |
| ET_UMB_RETR_CMD1(1) | V76K4655B | MEC 1 ET/UMB RETR FIRE 1 CMD | | 7463 | |
| ET_UMB_RETR_CMD1(2) | V76K4659B | MEC 2 ET/UMB RETR FIRE 1 CMD | | 7463 | |
| ET_UMB_UNLCH_FIRE1(1) | V76K4619B | MEC 1 ET/UMB UNLATCH FIRE 1 CMD | | C162 | |
| ET_UMB_UNLCH_FIRE1(2) | V76K4620B | MEC 2 ET/UMB UNLATCH FIRE 1 CMD | | C162 | |
| ET_UMB_UNLCH_FIRE2(1) | V76K4623B | MEC 1 ET/UMB UNLATCH FIRE 2 CMD | | C193 | |
| ET_UMB_UNLCH_FIRE2(2) | V76K4624B | MEC 2 ET/UMB UNLATCH FIRE 2 CMD | | C193 | |
| ET_UMB_UNLCH_FIRE3(1) | V76K4625B | MEC 1 ET/UMB UNLATCH FIRE 3 CMD | 0080 | | |
| ET_UMB_UNLCH_FIRE3(2) | V76K4626B | MEC 2 ET/UMB UNLATCH FIRE 3 CMD | 0080 | | |
| ET_UMB_RETR_CMD2(1) | V76K4656B | MEC 1 ET/UMB RETR FIRE 2 CMD | | 7498 | |
| ET_UMB_RETR_CMD2(2) | V76K4660B | MEC 2 ET/UMB RETR FIRE 2 CMD | | 7498 | |
| ET_UMB_RETR_CMD3(1) | V76K4657B | MEC 1 ET/UMB RETR FIRE 3 CMD | 0002 | | |
| ET_UMB_RETR_CMD3(2) | V76K4661B | MEC 2 ET/UMB RETR FIRE 3 CMD | 0002 | | |

| Table 4.8.1-4.MEC SOP Output Parameters | | | | | |
|---|-----------|----------------------------------|-----------------------|-------------------|-------|
| Name | MSID/MML | Description | Non-Crit-CMD Hex Code | Crit-CMD Hex Code | Range |
| SEP_ET_ARM(1) | V76K6909B | MEC 1 ET/ORB STR SEPN ARM CMD | | E117 | |
| SEP_ET_ARM(2) | V76K6911B | MEC 2 ET/ORB STR SEPN ARM CMD | | E117 | |
| SEP_ET_FIRE1(1) | V76K6913B | MEC 1 ET/ORB STR SEPN FIRE 1 CMD | | E168 | |
| SEP_ET_FIRE1(2) | V76K6915B | MEC 2 ET/ORB STR SEPN FIRE 1 CMD | | E168 | |
| SEP_ET_FIRE2(1) | V76K6914B | MEC 1 ET/ORB STR SEPN FIRE 2 CMD | | E199 | |
| SEP_ET_FIRE2(2) | V76K6916B | MEC 2 ET/ORB STR SEPN FIRE 2 CMD | | E199 | |
| SEP_ET_FIRE3(1) | V76K6921B | MEC 1 ET/ORB STR SEPN FIRE 3 CMD | 0001 | | |
| SEP_ET_FIRE3(2) | V76K6922B | MEC 2 ET/ORB STR SEPN FIRE 3 CMD | 0001 | | |

Table 4.8.1-5.MEC SOP Output Requirements

| Name | MSID/G No. | Description | Output Destination | Signal Type | Range |
|-----------------|------------|-----------------------------------|--------------------|-------------|--------------|
| CRIT_CMD1(1) | | MEC 1 CRITICAL CMD DATA WORD 1 | MEC 1 | HEX CODE | 0000 TO FFFF |
| CRIT_CMD1(2) | | MEC 1 CRITICAL CMD DATA WORD 2 | MEC 1 | HEX CODE | 0000 TO FFFF |
| CRIT_CMD1(3) | | MEC 1 CRITICAL CMD DATA WORD 3 | MEC 1 | HEX CODE | 0000 TO FFFF |
| CRIT_CMD1(4) | | MEC 1 CRITICAL CMD DATA WORD 4 | MEC 1 | HEX CODE | 0000 TO FFFF |
| CRIT_CMD2(1) | | MEC 2 CRITICAL CMD DATA WORD 1 | MEC 2 | HEX CODE | 0000 TO FFFF |
| CRIT_CMD2(2) | | MEC 2 CRITICAL CMD DATA WORD 2 | MEC 2 | HEX CODE | 0000 TO FFFF |
| CRIT_CMD2(3) | | MEC 2 CRITICAL CMD DATA WORD 3 | MEC 2 | HEX CODE | 0000 TO FFFF |
| CRIT_CMD2(4) | | MEC 2 CRITICAL CMD DATA WORD 4 | MEC 2 | HEX CODE | 0000 TO FFFF |
| NCRIT_SET(1) | | MEC 1 NONCRITICAL SET DATA WORD | MEC 1 | HEX CODE | 0000 TO FFFF |
| NCRIT_SET(2) | | MEC 2 NONCRITICAL SET DATA WORD | MEC 2 | HEX CODE | 0000 TO FFFF |
| NCRIT_RST(1) | | MEC 1 NONCRITICAL RESET DATA WORD | MEC 1 | HEX CODE | 0000 TO FFFF |
| NCRIT_RST(2) | | MEC 2 NONCRITICAL RESET DATA WORD | MEC 2 | HEX CODE | 0000 TO FFFF |
| MASTER_RESET(1) | V76K7098B | MEC 1 MASTER RESET (1=ACTIVATE) | MEC 1 | DISCRETE | 0,1 |
| MASTER_RESET(2) | V76K7198B | MEC 2 MASTER RESET (1=ACTIVATE) | MEC 2 | DISCRETE | 0,1 |

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TABLE 4.8.1.4-1. INPUT FUNCTIONAL PARAMETERS FOR MASTER EVENTS CONTROLLER SOP (G4.228)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|----------------------|------------|-------------------------------|-------------|-------|-----------|---------|---------|-------|
| ATVC_26V_DDFACE | V90X8339XA | ATVC SRB 26V AC DEADFACE FLAG | SRB SEP SEQ | | | | 89456A | |
| ATVC_IVD_PWR | V90X8338XA | ATVC SRB IVD PWR ON FLAG | SRB SEP SEQ | | | | 89456A | |
| ATVC_IVD_PWR | V90X8338XB | ATVC SRB IVD PWR ON FLAG | ET SEP SEQ | | | | 89456A | |
| ET_DFI_PWR | V90X8255X | ET DFI PWR ON FLAG | ET SEP SEQ | | | | 89456A | |
| ET_SEP_ARM | V90X8265X | ET/ORB STR SEPN PICS ARM FLAG | ET SEP SEQ | | | | 89456A | |
| ET_SEP_FIRE1 | V90X8244X | ET/ORB STR SEPN FIRE 1 FLAG | ET SEP SEQ | | | | 89456A | |
| ET_SEP_FIRE2/3 | V90X8241X | ET/ORB STR SEPN FIRE 2/3 FLAG | ET SEP SEQ | | | | 89456A | |
| ET_UMB_RETR_CMD1 | V90X8263X | ET/UMB RETRACT FIRE 1 FLAG | ET SEP SEQ | | | | 92157 | |
| ET_UMB_RETR_CMD2/3 | V90X8243X | ET/UMB RETRACT FIRE 2/3 FLAG | ET SEP SEQ | | | | 89456A | |
| ET_UMB_UNLCH_ARM | V90X8247X | ET/UMB UNLATCH PICS ARM FLAG | ET SEP SEQ | | | | 89456A | |
| ET_UMB_UNLCH_FIRE1 | V90X8256X | ET/UMB UNLATCH FIRE 1 FLAG | ET SEP SEQ | | | | 92157 | |
| ET_UMB_UNLCH_FIRE2/3 | V90X8242X | ET/UMB UNLATCH FIRE 2/3 FLAG | ET SEP SEQ | | | | 92157 | |
| M_RSET_USER | V90X8258XA | MEC 1&2 MASTER RESET FLAG | ET SEP SEQ | | | | 89456A | |
| M_RSET_USER | V90X8258XB | MEC 1&2 MASTER RESET FLAG | SRB SEP SEQ | | | | 89456A | |
| M_RSET_USER | V90X8258XC | MEC 1&2 MASTER RESET FLAG | R/S LCH SEQ | | | | 89456A | |
| SRB_PWR_ON | V90X8343X | SRB POWER ON | ET SEP SEQ | | | | 89456A | |
| SRB_RSS_OFF | V90X8336X | SRB RSS PWR OFF FLAG | SRB SEP SEQ | | | | 89456A | |
| SRB_RSS_SAFE | V90X8337X | SRB RSS SAFE FLAG | SRB SEP SEQ | | | | 89456A | |
| SRB_SEP_ARM | V90X8335X | SRB SEP PICS ARM FLAG | SRB SEP SEQ | | | | 89456A | |
| SRB_SEP_FIRE1 | V90X8341X | SRB SEP FIRE 1 FLAG | SRB SEP SEQ | | | | 89456A | |
| SRB_SEP_FIRE2/3 | V90X8354X | SRB SEP FIRE 2/3 FLAG | SRB SEP SEQ | | | | 89456A | |
| SRM_IGN_ARM | V90X8404X | SRM IGN ARM FLAG | R/S LCH SEQ | | | | 89456A | |
| SRM_IGN_DISARM | V90X0448X | SRM IGN DISARM FLAG | R/S LCH SEQ | | | | 92148D | |
| SRM_IGN_FIRE1 | V90X8405X | SRM IGN FIRE 1 FLAG | R/S LCH SEQ | | | | 89456A | |
| SRM_IGN_FIRE2/3 | V90X8699X | SRM IGN FIRE 2/3 FLAG | R/S LCH SEQ | | BD | | 93017G | * |
| T0_UMB_ARM | V90X8407X | T-0 UMB RELEASE ARM FLAG | R/S LCH SEQ | | | | 93064D | |
| T0_UMB_DISARM | V90X0449X | T-0 UMB RELEASE DISARM FLAG | R/S LCH SEQ | | | | 92148D | |
| T0_UMB_FIRE1 | V90X8408X | T-0 UMB RELEASE FIRE 1 FLAG | R/S LCH SEQ | | | | 93064D | |
| T0_UMB_FIRE2/3 | V90X8698X | T-0 UMB RELEASE FIRE 2/3 FLAG | R/S LCH SEQ | | | | 92157 | |

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

TABLE 4.8.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MASTER EVENTS CONTROLLER SOP (G4.228)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------------------|-----------|------------------------------------|-------------|-------|-----------|------------------|---------|-------------|
| ATVC_DDFC(1) | V76K7515B | MEC 1 ATVC 2 SRB 26V DEADFACE CMD | MEC 1 | | BMD | | | |
| ATVC_DDFC(2) | V76K7516B | MEC 1 ATVC 4 SRB 26V DEADFACE CMD | MEC 1 | | BMD | | | |
| ATVC_DDFC(3) | V76K7615B | MEC 2 ATVC 1 SRB 26V DEADFACE CMD | MEC 2 | | BMD | | | |
| ATVC_DDFC(4) | V76K7616B | MEC 2 ATVC 3 SRB 26V DEADFACE CMD | MEC 2 | | BMD | | | |
| ATVC_SRB_PWR(1) | V76K7013B | MEC 1 ATVC 2 SRB IVD A PWR ON CMD | MEC 1 | | BD | | | |
| ATVC_SRB_PWR(2) | V76K7014B | MEC 1 ATVC 4 SRB IVD B PWR ON CMD | MEC 1 | | BD | | | |
| ATVC_SRB_PWR(3) | V76K7114B | MEC 2 ATVC 3 SRB IVD B PWR ON CMD | MEC 2 | | BD | | | |
| ATVC_SRB_PWR(4) | V76K7113B | MEC 2 ATVC 1 SRB IVD C PWR ON CMD | MEC 2 | | BD | | | |
| ET_UMB_RETR_CMD1(1) | V76K4655B | MEC 1 ET/UMB RETR CMD 1 | MEC 1 | | BMD | | | |
| ET_UMB_RETR_CMD1(2) | V76K4659B | MEC 2 ET/UMB RETR CMD 1 | MEC 2 | | BMD | | | |
| ET_UMB_RETR_CMD2(1) | V76K4656B | MEC 1 ET/UMB RETR CMD 2 | MEC 1 | | BMD | | | |
| ET_UMB_RETR_CMD2(2) | V76K4660B | MEC 2 ET/UMB RETR CMD 2 | MEC 2 | | BMD | | | |
| ET_UMB_RETR_CMD3(1) | V76K4657B | MEC 1 ET/UMB RETR FIRE 3 CMD | MEC 1 | | BD | | | |
| ET_UMB_RETR_CMD3(2) | V76K4661B | MEC 2 ET/UMB RETR FIRE 3 CMD | MEC 2 | | BD | | | |
| ET_UMB_UNLCH_ARM(1) | V76K4617B | MEC 1 ET/UMB UNLATCH ARM CMD | MEC 1 | | BMD | | | |
| ET_UMB_UNLCH_ARM(2) | V76K4618B | MEC 2 ET/UMB UNLATCH ARM CMD | MEC 2 | | BMD | | | |
| ET_UMB_UNLCH_FIRE1(1) | V76K4619B | MEC 1 ET/UMB UNLATCH FIRE 1 CMD | MEC 1 | | BMD | | | |
| ET_UMB_UNLCH_FIRE1(2) | V76K4620B | MEC 2 ET/UMB UNLATCH FIRE 1 CMD | MEC 2 | | BMD | | | |
| ET_UMB_UNLCH_FIRE2(1) | V76K4623B | MEC 1 ET/UMB UNLATCH FIRE 2 CMD | MEC 1 | | BMD | | | |
| ET_UMB_UNLCH_FIRE2(2) | V76K4624B | MEC 2 ET/UMB UNLATCH FIRE 2 CMD | MEC 2 | | BMD | | | |
| ET_UMB_UNLCH_FIRE3(1) | V76K4625B | MEC 1 ET/UMB UNLATCH FIRE 3 CMD | MEC 1 | | BD | | | |
| ET_UMB_UNLCH_FIRE3(2) | V76K4626B | MEC 2 ET/UMB UNLATCH FIRE 3 CMD | MEC 2 | | BD | | | |
| MASTER_RESET(1) | V76K7098B | MEC 1 MASTER RESET | MEC 1 | | BMD | | | |
| MASTER_RESET(2) | V76K7198B | MEC 2 MASTER RESET | MEC 2 | | BMD | | | |
| RSS_SRB_OFF(1) | V76K7006B | MEC 1 RSS L SRB PWR OFF CMD | MEC 1 | | BD | | | |
| RSS_SRB_OFF(2) | V76K7007B | MEC 1 RSS R SRB PWR OFF CMD | MEC 1 | | BD | | | |
| RSS_SRB_OFF(3) | V76K7106B | MEC 2 RSS L SRB PWR OFF CMD | MEC 2 | | BD | | | |
| RSS_SRB_OFF(4) | V76K7107B | MEC 2 RSS R SRB PWR OFF CMD | MEC 2 | | BD | | | |
| RSS_SRB_SAFE1(1) | V76K7508B | MEC 1 L SRB RSS SAFE 1 CMD | MEC 1 | | BMD | | 89598A | |
| RSS_SRB_SAFE1(2) | V76K7608B | MEC 2 R SRB RSS SAFE 1 CMD | MEC 2 | | BMD | | 89598A | |
| RSS_SRB_SAFE2(1) | V76K7509B | MEC 1 R SRB RSS SAFE 2 CMD | MEC 1 | | BMD | | 89456A | |
| RSS_SRB_SAFE2(2) | V76K7609B | MEC 2 L SRB RSS SAFE 2 CMD | MEC 2 | | BMD | | 89456A | |
| SEP_ET_ARM(1) | V76K6909B | MEC 1 ET/ORB STR SEPN ARM CMD | MEC 1 | | BMD | | | |
| SEP_ET_ARM(2) | V76K6911B | MEC 2 ET/ORB STR SEPN ARM CMD | MEC 2 | | BMD | | | |
| SEP_ET_FIRE1(1) | V76K6913B | MEC 1 ET/ORB STR SEPN FIRE 1 CMD | MEC 1 | | BMD | | | |
| SEP_ET_FIRE1(2) | V76K6915B | MEC 2 ET/ORB STR SEPN FIRE 1 CMD | MEC 2 | | BMD | | | |
| SEP_ET_FIRE2(1) | V76K6914B | MEC 1 ET/ORB STR SEPN FIRE 2 CMD | MEC 1 | | BMD | | | |
| SEP_ET_FIRE2(2) | V76K6916B | MEC 2 ET/ORB STR SEPN FIRE 2 CMD | MEC 2 | | BMD | | | |
| SEP_ET_FIRE3(1) | V76K6921B | MEC 1 ET/ORB STR SEPN FIRE 3 CMD | MEC 1 | | BD | | | |
| SEP_ET_FIRE3(2) | V76K6922B | MEC 2 ET/ORB STR SEPN FIRE 3 CMD | MEC 2 | | BD | | | |
| SRB_ARM(1) | V76K6956B | MEC 1 SRB SEPN ARM CMD | MEC 1 | | BMD | | | |
| SRB_FIRE1(1) | V76K6958B | MEC 1 SRB SEPN FIRE 1 CMD | MEC 1 | | BMD | | | |
| SRB_FIRE1(2) | V76K6968B | MEC 2 SRB SEP FIRE 1 & RCYV PWR ON | MEC 2 | | BMD | | 89456A | |
| SRB_FIRE2(1) | V76K6959B | MEC 1 SRB SEPN FIRE 2 CMD | MEC 1 | | BMD | | | |
| SRB_FIRE2(2) | V76K6969B | MEC 2 SRB SEP FIRE 2 & RCYV ARM | MEC 2 | | BMD | | 89456A | |
| SRB_FIRE3(1) | V76K6960B | MEC 1 SRB SEPN FIRE 3 CMD | MEC 1 | | BD | | 89456A | |

TABLE 4.8.1.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM MASTER EVENTS CONTROLLER SOP (G4.228)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|----------------|-----------|------------------------------------|-------------|-------|-----------|------------------|---------|-------------|
| SRB_FIRE3(2) | V76K6970B | MEC 2 SRB SEPN FIRE 3 CMD | MEC 2 | | BD | | 89456A | |
| SRB_PWR(1) | V76K7002B | MEC 1 L SRB PWR A CMD | MEC 1 | | BD | | | |
| SRB_PWR(2) | V76K7003B | MEC 1 R SRB PWR A CMD | MEC 1 | | BD | | | |
| SRB_PWR(3) | V76K7102B | MEC 2 L SRB PWR B CMD | MEC 2 | | BD | | | |
| SRB_PWR(4) | V76K7103B | MEC 2 R SRB PWR B CMD | MEC 2 | | BD | | | |
| SRB_PWR(5) | V76K7011B | MEC 1 L SRB PWR C CMD | MEC 1 | | BD | | | |
| SRB_PWR(6) | V76K7012B | MEC 1 R SRB PWR C CMD | MEC 1 | | BD | | | |
| SRB_PWR(7) | V76K7111B | MEC 2 L SRB PWR C CMD | MEC 2 | | BD | | 89456A | |
| SRB_PWR(8) | V76K7112B | MEC 2 R SRB PWR C CMD | MEC 2 | | BD | | 89456A | |
| SRM_ARM(1) | V76K6951B | MEC 1 SRM IGN ARM CMD | MEC 1 | | BMD | | | |
| SRM_ARM(2) | V76K6961B | MEC 2 SRM IGN ARM CMD | MEC 2 | | BMD | | | |
| SRM_ARM(2) | V76K6966B | MEC 2 SRB SEPN ARM CMD | MEC 2 | | BMD | | | |
| SRM_FIRE1(1) | V76K6953B | MEC 1 SRM IGN FIRE 1 CMD | MEC 1 | | BMD | | | |
| SRM_FIRE1(2) | V76K6963B | MEC 2 SRM IGN FIRE 1 CMD | MEC 2 | | BMD | | | |
| SRM_FIRE2(1) | V76K6954B | MEC 1 SRM IGN FIRE 2 CMD | MEC 1 | | BMD | | | |
| SRM_FIRE2(2) | V76K6964B | MEC 2 SRM IGN FIRE 2 CMD | MEC 2 | | BMD | | | |
| SRM_FIRE3(1) | V76K6955B | MEC 1 SRM IGN FIRE 3 CMD | MEC 1 | | BD | | | |
| SRM_FIRE3(2) | V76K6965B | MEC 2 SRM IGN FIRE 3 CMD | MEC 2 | | BD | | | |
| UMB_FIRE1(1) | V76K4610B | MEC 1 L T-0 UMB RELEASE FIRE 1 CMD | MEC 1 | | BMD | | | |
| UMB_FIRE1(2) | V76K4614B | MEC 2 R T-0 UMB RELEASE FIRE 1 CMD | MEC 2 | | BMD | | | |
| UMB_FIRE2(1) | V76K4611B | MEC 1 L T-0 UMB RELEASE FIRE 2 CMD | MEC 1 | | BMD | | | |
| UMB_FIRE2(2) | V76K4615B | MEC 2 R T-0 UMB RELEASE FIRE 2 CMD | MEC 2 | | BMD | | | |
| UMB_FIRE3(1) | V76K4612B | MEC 1 L T-0 UMB RELEASE FIRE 3 CMD | MEC 1 | | BD | | | |
| UMB_FIRE3(2) | V76K4616B | MEC 2 R T-0 UMB RELEASE FIRE 3 CMD | MEC 2 | | BD | | | |
| UMB_RLS_ARM(1) | V76K4609B | MEC 1 L T-0 UMB RELEASE ARM CMD | MEC 1 | | BMD | | | |
| UMB_RLS_ARM(2) | V76K4613B | MEC 2 R T-0 UMB RELEASE ARM CMD | MEC 2 | | BMD | | | |

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 4.8.1.4-3. MASTER EVENTS CONTROLLER SOP (G4.228) 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 4.8.1.4-4. MASTER EVENTS CONTROLLER SOP (G4.228) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD 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.

TABLE 4.8.1.4-5. MASTER EVENTS CONTROLLER SOP (G4.228) 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.

4.8.2 Space Shuttle Main Engine SOP (4.181)

4.8.2.1 Introduction

The SSME SOP normally performs the functions of interfacing the user functions with the SSME Controller through the Engine Interface Unit (EIU). For this, the SSME SOP becomes active upon entry into OPS 1 and continues in normal operation as the interface until completion of the propellant dumps after ET separation.

The capability shall exist to bypass the SSME SOP for certain ground test configurations. Under these circumstances the SOP will only set the Engine Ready indicators for the test and will not perform any other functions. This will allow testing to proceed with the assurance that no commands to the engines will be issued during the test.

| Table 4.8.2-1.SSME SOP Command Processing | | | |
|---|------------------|----------|--------|
| Input Command | Output Command | | |
| | CMD | | BCH |
| K_CMD = 65% | ME1_THRUST_LEVEL | = 043400 | 132124 |
| | ME2_THRUST_LEVEL | = 043400 | 132124 |
| | ME3_THRUST_LEVEL | = 043400 | 132124 |
| K_CMD = 66% | ME1_THRUST_LEVEL | = 044000 | 057330 |
| | ME2_THRUST_LEVEL | = 044000 | 057330 |
| | ME3_THRUST_LEVEL | = 044000 | 057330 |
| K_CMD = 67% | ME1_THRUST_LEVEL | = 044400 | 046014 |
| | ME2_THRUST_LEVEL | = 044400 | 046014 |
| | ME3_THRUST_LEVEL | = 044400 | 046014 |
| K_CMD = 68% | ME1_THRUST_LEVEL | = 045000 | 075560 |
| | ME2_THRUST_LEVEL | = 045000 | 075560 |
| | ME3_THRUST_LEVEL | = 045000 | 075560 |
| K_CMD = 69% | ME1_THRUST_LEVEL | = 045400 | 064644 |
| | ME2_THRUST_LEVEL | = 045400 | 064644 |
| | ME3_THRUST_LEVEL | = 045400 | 064644 |
| K_CMD = 70% | ME1_THRUST_LEVEL | = 046000 | 012610 |
| | ME2_THRUST_LEVEL | = 046000 | 012610 |
| | ME3_THRUST_LEVEL | = 046000 | 012610 |
| K_CMD = 71% | ME1_THRUST_LEVEL | = 046400 | 003534 |
| | ME2_THRUST_LEVEL | = 046400 | 003534 |
| | ME3_THRUST_LEVEL | = 046400 | 003534 |
| K_CMD = 72% | ME1_THRUST_LEVEL | = 047000 | 030040 |
| | ME2_THRUST_LEVEL | = 047000 | 030040 |
| | ME3_THRUST_LEVEL | = 047000 | 030040 |
| K_CMD = 73% | ME1_THRUST_LEVEL | = 047400 | 021364 |
| | ME2_THRUST_LEVEL | = 047400 | 021364 |
| | ME3_THRUST_LEVEL | = 047400 | 021364 |
| K_CMD = 74% | ME1_THRUST_LEVEL | = 050000 | 175146 |
| | ME2_THRUST_LEVEL | = 050000 | 175146 |
| | ME3_THRUST_LEVEL | = 050000 | 175146 |
| K_CMD = 75% | ME1_THRUST_LEVEL | = 050400 | 164262 |

| Table 4.8.2-1.SSME SOP Command Processing | | |
|---|---------------------------|--------|
| Input Command | Output Command | |
| | CMD | BCH |
| K_CMD = 76% | ME2_THRUST_LEVEL = 050400 | 164262 |
| | ME3_THRUST_LEVEL = 050400 | 164262 |
| | ME1_THRUST_LEVEL = 051000 | 157716 |
| | ME2_THRUST_LEVEL = 051000 | 157716 |
| | ME3_THRUST_LEVEL = 051000 | 157716 |
| K_CMD = 77% | ME1_THRUST_LEVEL = 051400 | 146432 |
| | ME2_THRUST_LEVEL = 051400 | 146432 |
| | ME3_THRUST_LEVEL = 051400 | 146432 |
| K_CMD = 78% | ME1_THRUST_LEVEL = 052000 | 130466 |
| | ME2_THRUST_LEVEL = 052000 | 130466 |
| | ME3_THRUST_LEVEL = 052000 | 130466 |
| K_CMD = 79% | ME1_THRUST_LEVEL = 052400 | 121742 |
| | ME2_THRUST_LEVEL = 052400 | 121742 |
| | ME3_THRUST_LEVEL = 052400 | 121742 |
| K_CMD = 80% | ME1_THRUST_LEVEL = 053000 | 112236 |
| | ME2_THRUST_LEVEL = 053000 | 112236 |
| | ME3_THRUST_LEVEL = 053000 | 112236 |
| K_CMD = 81% | ME1_THRUST_LEVEL = 053400 | 103112 |
| | ME2_THRUST_LEVEL = 053400 | 103112 |
| | ME3_THRUST_LEVEL = 053400 | 103112 |
| K_CMD = 82% | ME1_THRUST_LEVEL = 054000 | 066306 |
| | ME2_THRUST_LEVEL = 054000 | 066306 |
| | ME3_THRUST_LEVEL = 054000 | 066306 |
| K_CMD = 83% | ME1_THRUST_LEVEL = 054400 | 077022 |
| | ME2_THRUST_LEVEL = 054400 | 077022 |
| | ME3_THRUST_LEVEL = 054400 | 077022 |
| K_CMD = 84% | ME1_THRUST_LEVEL = 055000 | 044556 |
| | ME2_THRUST_LEVEL = 055000 | 044556 |
| | ME3_THRUST_LEVEL = 055000 | 044556 |
| K_CMD = 85% | ME1_THRUST_LEVEL = 055400 | 055672 |
| | ME2_THRUST_LEVEL = 055400 | 055672 |

Table 4.8.2-1.SSME SOP Command Processing

| Input Command | Output Command | |
|---------------|---------------------------|--------|
| | CMD | BCH |
| K_CMD = 86% | ME3_THRUST_LEVEL = 055400 | 055672 |
| | ME1_THRUST_LEVEL = 056000 | 023626 |
| | ME2_THRUST_LEVEL = 056000 | 023626 |
| K_CMD = 87% | ME3_THRUST_LEVEL = 056000 | 023626 |
| | ME1_THRUST_LEVEL = 056400 | 032502 |
| | ME2_THRUST_LEVEL = 056400 | 032502 |
| K_CMD = 88% | ME3_THRUST_LEVEL = 056400 | 032502 |
| | ME1_THRUST_LEVEL = 057000 | 001076 |
| | ME2_THRUST_LEVEL = 057000 | 001076 |
| K_CMD = 89% | ME3_THRUST_LEVEL = 057000 | 001076 |
| | ME1_THRUST_LEVEL = 057400 | 010352 |
| | ME2_THRUST_LEVEL = 057400 | 010352 |
| K_CMD = 90% | ME3_THRUST_LEVEL = 057400 | 010352 |
| | ME1_THRUST_LEVEL = 060000 | 126104 |
| | ME2_THRUST_LEVEL = 060000 | 126104 |
| K_CMD = 91% | ME3_THRUST_LEVEL = 060000 | 126104 |
| | ME1_THRUST_LEVEL = 060400 | 137220 |
| | ME2_THRUST_LEVEL = 060400 | 137220 |
| K_CMD = 92% | ME3_THRUST_LEVEL = 060400 | 137220 |
| | ME1_THRUST_LEVEL = 061000 | 104754 |
| | ME2_THRUST_LEVEL = 061000 | 104754 |
| K_CMD = 93% | ME3_THRUST_LEVEL = 061000 | 104754 |
| | ME1_THRUST_LEVEL = 061400 | 115470 |
| | ME2_THRUST_LEVEL = 061400 | 115470 |
| K_CMD = 94% | ME3_THRUST_LEVEL = 061400 | 115470 |
| | ME1_THRUST_LEVEL = 062000 | 163424 |
| | ME2_THRUST_LEVEL = 062000 | 163424 |
| K_CMD = 95% | ME3_THRUST_LEVEL = 062000 | 163424 |
| | ME1_THRUST_LEVEL = 062400 | 172700 |
| | ME2_THRUST_LEVEL = 062400 | 172700 |
| | ME3_THRUST_LEVEL = 062400 | 172700 |

Table 4.8.2-1.SSME SOP Command Processing

| Input Command | Output Command | |
|---------------|---------------------------|--------|
| | CMD | BCH |
| K_CMD = 96% | ME1_THRUST_LEVEL = 063000 | 141274 |
| | ME2_THRUST_LEVEL = 063000 | 141274 |
| | ME3_THRUST_LEVEL = 063000 | 141274 |
| K_CMD = 97% | ME1_THRUST_LEVEL = 063400 | 150150 |
| | ME2_THRUST_LEVEL = 063400 | 150150 |
| | ME3_THRUST_LEVEL = 063400 | 150150 |
| K_CMD = 98% | ME1_THRUST_LEVEL = 064000 | 035344 |
| | ME2_THRUST_LEVEL = 064000 | 035344 |
| | ME3_THRUST_LEVEL = 064000 | 035344 |
| K_CMD = 99% | ME1_THRUST_LEVEL = 064400 | 024060 |
| | ME2_THRUST_LEVEL = 064400 | 024060 |
| | ME3_THRUST_LEVEL = 064400 | 024060 |
| K_CMD = 100% | ME1_THRUST_LEVEL = 065000 | 017514 |
| | ME2_THRUST_LEVEL = 065000 | 017514 |
| | ME3_THRUST_LEVEL = 065000 | 017514 |
| K_CMD = 101% | ME1_THRUST_LEVEL = 065400 | 006630 |
| | ME2_THRUST_LEVEL = 065400 | 006630 |
| | ME3_THRUST_LEVEL = 065400 | 006630 |
| K_CMD = 102% | ME1_THRUST_LEVEL = 066000 | 070664 |
| | ME2_THRUST_LEVEL = 066000 | 070664 |
| | ME3_THRUST_LEVEL = 066000 | 070664 |
| K_CMD = 103% | ME1_THRUST_LEVEL = 066400 | 061540 |
| | ME2_THRUST_LEVEL = 066400 | 061540 |
| | ME3_THRUST_LEVEL = 066400 | 061540 |
| K_CMD = 104% | ME1_THRUST_LEVEL = 067000 | 052034 |
| | ME2_THRUST_LEVEL = 067000 | 052034 |
| | ME3_THRUST_LEVEL = 067000 | 052034 |
| K_CMD = 105% | ME1_THRUST_LEVEL = 067400 | 043310 |
| | ME2_THRUST_LEVEL = 067400 | 043310 |
| | ME3_THRUST_LEVEL = 067400 | 043310 |

| Table 4.8.2-1.SSME SOP Command Processing | | |
|---|----------------------------|--------|
| Input Command | Output Command | |
| | CMD | BCH |
| K_CMD = 106% | ME1_THRUST_LEVEL = 070000 | 117132 |
| | ME2_THRUST_LEVEL = 070000 | 117132 |
| | ME3_THRUST_LEVEL = 070000 | 117132 |
| K_CMD = 107% | ME1_THRUST_LEVEL = 070400 | 106216 |
| | ME2_THRUST_LEVEL = 070400 | 106216 |
| | ME3_THRUST_LEVEL = 070400 | 106216 |
| K_CMD = 108% | ME1_THRUST_LEVEL = 071000 | 135762 |
| | ME2_THRUST_LEVEL = 071000 | 135762 |
| | ME3_THRUST_LEVEL = 071000 | 135762 |
| K_CMD = 109% | ME1_THRUST_LEVEL = 071400 | 124446 |
| | ME2_THRUST_LEVEL = 071400 | 124446 |
| | ME3_THRUST_LEVEL = 071400 | 124446 |
| MPS INH(1) = 1 | ME1_INH_LIM_CNTL = 104000 | 014416 |
| MPS INH(2) = 1 | ME2_INH_LIM_CNTL = 104000 | 014416 |
| MPS INH(3) = 1 | ME3_INH_LIM_CNTL = 104000 | 014416 |
| MPS ENA(1) = 1 | ME1_ENA_LIM_CNTL = 104400 | 005732 |
| MPS ENA(2) = 1 | ME2_ENA_LIM_CNTL = 104400 | 005732 |
| MPS ENA(3) = 1 | ME3_ENA_LIM_CNTL = 104400 | 005732 |
| MESTRTENA = 1 | ME1_ST_ENA_CMD = 107400 | 062442 |
| MESTRTENA = 1 | ME2_ST_ENA_CMD = 107400 | 062442 |
| MPSTRTENA = 1 | ME3_ST_ENA_CMD = 107400 | 062442 |
| MESTRTCMD(1) = 1 | ME1_ST_CMD = 100400 | 116572 |
| MESTRTCMD(2) = 1 | ME2_ST_CMD = 100400 | 116572 |
| MPSTRTCMD(3) = 1 | ME3_ST_CMD = 100400 | 116572 |
| MESH DNENA(1) = 1 | ME1_SHTDN_ENA_CMD = 105000 | 036246 |
| MESH DNENA(2) = 1 | ME2_SHTDN_ENA_CMD = 105000 | 036246 |
| MESH DNENA(3) = 1 | ME3_SHTDN_ENA_CMD = 105000 | 036246 |
| MESH DNCMD(1) = 1 | ME1_SHTDN_CMD = 116000 | 060100 |
| MESH DNCMD(2) = 1 | ME2_SHTDN_CMD = 116000 | 060100 |
| MESH DNCMD(3) = 1 | ME3_SHTDN_CMD = 116000 | 060100 |
| MPS_LO2_DUMP_START = 1 | ME1_LO2_DUMP = 110400 | 127544 |

| Table 4.8.2-1.SSME SOP Command Processing | | | |
|---|----------------|----------|--------|
| Input Command | Output Command | | |
| | CMD | | BCH |
| MPS_LH2_DUMP_START = 1 | ME2_LO2_DUMP | = 110400 | 127544 |
| | ME3_LO2_DUMP | = 110400 | 127544 |
| | ME1_LH2_DUMP | = 111000 | 114030 |
| | ME2_LH2_DUMP | = 111000 | 114030 |
| | ME3_LH2_DUMP | = 111000 | 114030 |
| MPS_LO2_DUMP_STOP = 1 | ME1_TERM_SEQ | = 110000 | 136660 |
| | ME2_TERM_SEQ | = 110000 | 136660 |
| | ME3_TERM_SEQ | = 110000 | 136660 |
| MPS_LH2_DUMP_STOP = 1 | ME1_TERM_SEQ | = 110000 | 136660 |
| | ME2_TERM_SEQ | = 110000 | 136660 |
| | ME3_TERM_SEQ | = 110000 | 136660 |
| ME_DCU_SW 1 | ME1_DCU_SW | = 115400 | 016154 |
| ME_DCU_SW 2 | ME2_DCU_SW | = 115400 | 016154 |
| ME_DCU_SW 3 | ME3_DCU_SW | = 115400 | 016154 |

4.8.2.2 Overview

In normal operation, the SSME SOP Principal Function is to perform the following:

- a. Monitoring of the engine status indications, data-path fail indicators and command path fail indications, and major component fail from the three EIU's for user functions and dedicated displays
- b. Processing of the engine start enable, start, DCU switchover, shutdown enable, shutdown, dump, throttle, and limit control commands from the user functions to the three EIU's
- c. Processing of the engine shutdown commands and shutdown phase indications for user functions
- d. Processing of the status override and the master reset commands occur between the SSME SOP and the EIU's exclusively. These Execute commands stay within the EIU and do not interface with the SSME controller, so there are no controller output commands or BCH codes required.

The capability shall exist to bypass the SSME SOP for certain ground test configurations. Under these circumstances the SSME SOP will only set the Engine Ready Indicator for each engine. The SSME SOP will then return control to the calling executive program.

The SSME SOP principal function will be processed at the 25-Hz rate during Major Modes 101, 102, 103, 104, 601, and 602. The interfaces are indicated on the functional block diagram in Figure 4.8.2-1. The input and output parameters are shown in Table 4.8.2-1.

The engine data monitoring will be performed prior to redundant set launch sequence and SSME OPS.

Table 4.8.2-2.GPC Engine Status Word

| BIT 0 LOAD STATUS | | BIT 8, 9, 10, 11, 12, 13 PHASE/MODE (Cont) | |
|-------------------------------------|---|--|------------------------------|
| 1 | IN MEMORY LOAD CONDITION | 010011 | START PREP/PURGE SEQ NO. 3 |
| 0 | NOT IN MEMORY LOAD CONDITION | 010100 | START PREP/PURGE SEQ NO. 4 |
| BIT 1, 2 COMMAND STATUS | | 010101 | START PREP/SPARE |
| 00 | NO NEW COMMAND SINCE LAST STATUS/ RECORDER CHANNEL TRANSMISSION | 010110 | START PREP/ENGINE READY |
| 01 | COMMAND REJECTED (NOT VALIDATED BY BCH OR VOTING) | 010111 | START PREP/SPARE |
| 10 | COMMAND REJECTED (INCOMPATIBLE WITH CURRENT OPERATING MODE OR NOT IN TABLE OF COMMANDS) | 011000 | NOT USED |
| 11 | COMMAND ACCEPTED | 011001 | START/START INITIATION |
| BIT 3, 4, 5 CHANNEL STATUS | | 011010 | START/MCP BUILDUP |
| 000 | ALL CHANNELS OK | 011011 | START/ELECTRONIC LOCKUP |
| 001 | MESSAGE ERROR, CHANNEL 1 | 011100 | START/HYDRAULIC LOCKUP |
| 010 | MESSAGE ERROR, CHANNEL 2 | 011101 | START/SPARE |
| 011 | MESSAGE ERROR, CHANNELS 1 & 2 | 011110 | START/SPARE |
| 100 | MESSAGE ERROR, CHANNEL 3 | 011111 | START/SPARE |
| 101 | MESSAGE ERROR, CHANNELS 1 & 3 | 100000 | NOT USED |
| 110 | MESSAGE ERROR, CHANNELS 2 & 3 | 100001 | MAINSTAGE/NORMAL CONTROL |
| 111 | MESSAGE ERROR, CHANNELS 1, 2, & 3 | 100010 | MAINSTAGE/SPARE |
| BIT 6 FRT STATUS | | 100011 | MAINSTAGE/ELECTRONIC LOCKUP |
| 0 | NORMAL OPERATION | 100100 | MAINSTAGE/HYDRAULIC LOCKUP |
| 1 | FRT | 100101 | MAINSTAGE/SPARE |
| BIT 7 LIMIT CONTROL | | 100110 | MAINSTAGE/SPARE |
| 0 | INHIBIT | 100111 | MAINSTAGE/SPARE |
| 1 | ENABLE | 101000 | NOT USED |
| BIT 8, 9, 10, 11, 12, 13 PHASE/MODE | | 101001 | SHUTDOWN/THROTTLE TO MPL |
| 000000 | NOT USED | 101010 | SHUTDOWN/MPL TO ZERO MCP |
| 000001 | NOT USED | 101011 | SHUTDOWN/PROP. VALVES CLOSED |
| 000010 | NOT USED | 101100 | SHUTDOWN/FAIL SAFE PNEUMATIC |
| 000011 | NOT USED | 101101 | SHUTDOWN SPARE |
| 000100 | NOT USED | 101110 | SHUTDOWN SPARE |
| 000101 | NOT USED | 101111 | SHUTDOWN SPARE |
| 000110 | NOT USED | 110000 | NOT USED |
| 000111 | NOT USED | 110001 | POST-SHUTDOWN/STANDBY |
| 001000 | NOT USED | 110010 | POST-SHUTDOWN/OXIDIZER DUMP |
| 001001 | GROUND CHECKOUT/STANDBY | 110011 | POST_SHUTDOWN/FUEL DUMP |
| 001010 | GROUND CHECKOUT/SPARE | 110100 | POST-SHUTDOWN/SPARE |
| 001011 | GROUND CHECKOUT/SPARE | 110101 | POST-SHUTDOWN/SPARE |
| 001100 | GROUND CHECKOUT/COMPONENT CHECKOUT | 110110 | POST-SHUTDOWN/SPARE |
| 001101 | GROUND CHECKOUT/SPARE | 110111 | POST-SHUTDOWN/TERMINATE SEQ |
| 001110 | GROUND CHECKOUT/SPARE | 111000 | NOT USED |
| 001111 | GROUND CHECKOUT/SPARE | 111001 | SPARE |
| 010000 | NOT USED | 111010 | SPARE |
| 010001 | START PREP/PURGE SEQ NO. 1 | 111011 | SPARE |
| 010010 | START PREP/PURGE SEQ NO. 2 | 111100 | SPARE |
| | | 111101 | SPARE |
| | | 111110 | SPARE |
| | | 111111 | SPARE |
| | | BIT 14, 15 SELF-TEST STATUS | |
| | | 00 | NOT USED |
| | | 01 | ENGINE OK |
| | | 10 | MAJOR COMPONENT FAILED |
| | | 11 | ENGINE LIMIT EXCEEDED |

4.8.2.3 Detail Requirements

4.8.2.3.0 Special Ground Checkout Processing

The SSME SOP will monitor the SSME SOP BYPASS INDICATOR from the Vehicle Utility (VU) OPS 9 Launch Sequence Processor to determine if normal SSME SOP operations are to be performed or if SSME SOP operations are to be bypassed. If normal operations are required, the SSME SOP will proceed with Recycle Processing as defined in Section 4.8.2.3.1. If a bypass is required, as would be the case for certain TCDT operations, the SSME SOP will set the Engine Ready indicator for each engine and then return control to the calling program.

Monitor the following:

- (a) SSME SOP BYPASS INDICATOR (V90X0114X)

If the SSME SOP BYPASS INDICATOR = 1, then set the following:

- (1) MPS E-1 ENG READY IND (V95X1182X)
(2) MPS E-2 ENG READY IND (V95X1183X)
(3) MPS E-3 ENG READY IND (V95X1184X)

and return control to the calling program.

4.8.2.3.1 Recycle Processing

The SSME SOP will monitor the SSME SOP RECYCLE FLAG from the RS launch sequence to determine when to reinitialize the SOP.

Monitor the following:

- (a) SSME SOP RECYCLE FLAG V90X8668X

If the SSME SOP RECYCLE FLAG = 1, then terminate the following:

- (1) ME-1 CHANNEL FAIL FLAG V95X1236X
(2) ME-2 CHANNEL FAIL FLAG V95X1237X
(3) ME-3 CHANNEL FAIL FLAG V95X1238X

and perform the following function:

- (4) Reinitialize the SSME SOP internal flags and counters.

4.8.2.3.2 Commfault Processing

On each cycle, prior to performing the main engine status data processing of paragraph 4.8.2.3.3, the following test shall be performed:

Monitor the following signals:

| | | |
|-----|----------------------------------|-----------|
| (a) | EIU 1/P1 Data Status (HFE input) | V91X3009X |
| (b) | EIU 1/P4 Data Status (HFE input) | V91X2852X |
| (c) | EIU 2/P1 Data Status (HFE input) | V91X3012X |
| (d) | EIU 2/P4 Data Status (HFE input) | V91X2856X |
| (e) | EIU 3/P1 Data Status (HFE input) | V91X3015X |
| (f) | EIU 3/P4 Data Status (HFE input) | V91X2860X |

For each signal path indicating a commfault, the last previous noncommfaulted input will be used for any further processing.

4.8.2.3.3 Main Engine Status Data Processing.

The SSME SOP will monitor and process the following status data from the three EIU's:

1. Main engine data identification words and main engine time reference word for data-path fail indications
2. Main engine status word data for command-path fail indications, channel fail indications, limit control status, phase and mode indications, and self-test status
3. Main engine chamber pressure data for percent of chamber pressure

Table 4.8.2-2 provides the general engine status word format and binary code indications. The processing of the main engine status data will be provided in the following subsections. The SSME SOP will monitor both the primary and secondary data channels from each EIU. The data-path failure processing function will determine which data channel will be processed during a minor cycle (Section 4.8.2.3.4). Once a channel is selected, the SSME SOP will process the engine status data (Subsections 4.8.2.3.5 and 4.8.2.3.6) and chamber pressure (Subsection 4.8.2.3.7) from the selected data channel only.

4.8.2.3.4 Data-Path Failure Processing.

The SSME SOP will monitor both the primary and secondary data channels from each EIU. The main engine identification and time reference words for each data channel will be processed to determine which data set (if either) will be processed during that processing cycle. These same data words will be processed to generate PAD DATA-PATH FAIL, DCU-SW, and FLIGHT DATA PATH FAIL indications for each EIU as follows:

1. Engine data identification words (data words 1 and 2) are 16-bit complements. These data words will be exclusively "OR'd" together to generate a miscompare indication as follows:
 - a. If $A + B = 16$ bits binary "1," then DATA_ID = 0 (no miscompare)
 - b. if $A + B \neq 16$ bits binary "1," then DATA_ID = 1 (miscompare)

where

A = Identification word 1

B = Identification word 2

DATA ID = Identification miscompare identification

2. Engine time reference data word will be compared with the previous time reference to generate an update fail indication as follows:
 - a. If $\text{TIME_REF} \neq \text{P_TIME_REF}$, then $\text{DATA_TIME} = 0$ (update data)
 - b. If $\text{TIME_REF} = \text{P_TIME_REF}$, then $\text{DATA_TIME} = 1$ (old data)

where

TIME_REF = Current time reference data

P_TIME_REF = Previous cycle time reference data

DATA_TIME = Time data update fail indication

The SSME SOP will process on a single engine basis the channel identification and time reference data words. The primary channel will be processed as follows:

1. If DATA_ID_P and $\text{DATA_TIME_P} = 0$, then $\text{ME}(i) \text{ P_FAIL} = 0$ (primary channel good)
2. If DATA_ID_P or $\text{DATA_TIME_P} = 1$, then $\text{ME}(i) \text{ P_FAIL} = 1$ (primary channel failed)

where

DATA_ID_P = Primary channel data identification miscompare

DATA_TIME_P = Primary channel time data update fail

$\text{ME}(i) \text{ P_FAIL}$ = Primary channel failure

If $\text{ME}(i) \text{ P_FAIL} = 1$, transfer the secondary channel data (6 words) into the location which provides for downlisted SSME data (6 words).

The secondary channel data will be processed as follows:

1. If DATA_ID_S and $\text{DATA_TIME_S} = 0$, then $\text{ME}(i) \text{ S_FAIL} = 0$ (secondary channel good)
2. If DATA_ID_S or $\text{DATA_TIME_S} = 1$, then $\text{ME}(i) \text{ S_FAIL} = 1$ (secondary channel failed)

where

DATA_ID_S = Secondary channel data identification miscompare

DATA_TIME_S = Secondary channel time data update fail

ME(i) S_FAIL = Secondary channel failure

The primary and secondary fail flags are set to zero at the beginning of each pass.

Prior to SRB ignition, if either ME(i) P_FAIL = 1 for two consecutive passes, or ME(i) S_FAIL = 1 for two consecutive passes, set PAD_DATA_PATH_FAIL = 1.

Note: The number of passes to set PAD_DATA_PATH_FAIL should be less than the number of passes to set DCU SW. This avoids the possibility of lift-off on DCU B data.

Engine status data and chamber pressure will be processed from the primary channel if it is valid; otherwise, process the secondary channel if it is valid. If neither is valid, provide previous cycle's data to user functions and proceed to command processing (Subsection 4.8.2.3.8).

1. If both ME(i) P_FAIL = 1 and ME(i) S_FAIL = 1 for four consecutive cycles, set DCU SW = 1 and DCU_SW_IND = 1
2. If DCU_SW_IND = 1 and ME(i) P_FAIL = 1 and ME(i) S_FAIL = 1 for DATA_FAIL successive cycles, set and latch FLIGHT DATA PATH FAIL = 1
3. If ME(i) P_FAIL = 1 and ME(i) S_FAIL = 1 for two consecutive cycles or MESHDN = 1 or MESHDNENA = 1 or MESHND CMD = 1, set ME_X TVC SERVO OVRD CMD = 1

After SRB ignition, the secondary data need not be processed unless the primary channel fail is set.

Change the EIU Downlink Source. These commands change the source of the 60 kilobit downlink data. These are execute commands for the EIU only. The Status Override command switches the OI (Operational Instrumentation) data stream from the primary data path to the secondary data path. The Master Reset command switches the OI data stream from the secondary data channel back to the primary data channel.

1. If P_FAIL = 1 (primary channel failed) and S_FAIL = 0 (secondary channel good) for DL_DATA_SW (K-LOAD) number of successive cycles, then issue the Status Override Command to the EIU one time only.
2. If the Status Override Command has been issued, and the P_FAIL = 0 (primary channel good) for DL_DATA_SW (K-LOAD) number of successive cycles, then issue the Master Reset Command to the EIU one time only.

The Status Override and Master Reset command processing shall be performed whenever the appropriate conditions occur.

4.8.2.3.5 Command-Path Failure Processing.

The SSME SOP will monitor the main engine status word command status and channel status data from each EIU (Table 4.8.2-2) to generate command-path and channel fail indications. Command Path Failure processing does not apply to the status override and master reset commands. These are EIU execute commands and are not transferred to the SSME controller.

Before SRB ignition, if the command status data (bits 1 and 2) indicates a new command, then channel status data (bits 3, 4, and 5) will be monitored. Command status data (bits 1 and 2) will be monitored, for purposes of command path failure processing, after SRB IGNITION CMD FLAG (V90X8377X) and continue until the SSME SOP is descheduled.

Engine command status data (bits 1 and 2 of each engine status word) will be monitored and compared with the command status indications from the previous two cycles and the command output flags from the previous three cycles for that engine to generate a command fail flag. The command output flag will indicate if a new engine command was generated in a previous cycle. The engine command status bits will be processed as shown in Table 4.8.2-3. NOTE: The status override and the master reset commands are not engine transfer commands therefore, no command output flag is required.

The SSME SOP shall maintain the command status from the present and previous two cycles as well as the command output flags from the previous three cycles. These indications shall be compared to generate the command fail flag. The command fail flag shall be set to the “1” state (command failed) for the following as shown in Table 4.8.2-4.

The command fail flag shall be initialized to zero, and shall be set to zero when the command status $T_0 = 2$, and previous output T_1, T_2 or $T_3 = 1$.

1. Before SRB ignition, when the engine command status data, (bits 1 and 2 of the engine status word) indicates a new command, engine channel status data (bits 3, 4, and 5) will be monitored to generate a channel fail flag. The channel fail flag will be set for the engine if a “1” is detected in either bit 3, 4 or 5.
2. GPC engine channel status bits 3, 4, and 5 will not be processed post-SRB ignition.

| Table 4.8.2-3.Command Status Processing | | |
|--|---|---------------------|
| ENGINE COMMAND STATUS DATA BITS GPC | | COMMAND STATUS FLAG |
| 1 | 2 | |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 2 |
| NOTE: 0 = no new command 1 = command rejected 2 = command accepted | | |

| Table 4.8.2-4. Command Fail Flag | | | | | | | | |
|--|----------------|----------------|-----------------------|----------------|----------------|-------------------------|--|--|
| COMMAND STATUS FLAG* | | | COMMAND OUTPUT FLAG** | | | COMMAND FAIL FLAG | | |
| T ₀ | T ₁ | T ₂ | T ₁ | T ₂ | T ₃ | | | |
| 1 | – | – | – | – | – | 1 | | |
| 2 | – | – | 0 | 0 | 0 | 1 | | |
| 0 | 0 | 0 | – | – | 1 | 1 | | |
| *0 = no new command 1 = command rejected 2 = command accepted **0 = no new command 1 = new command transmitted T ₀ = current cycle T ₁ = one cycle old T ₂ = two cycles old T ₃ = three cycles old | | | | | | | | |

4.8.2.3.6 Engine Status Word Processing

The SSME SOP will monitor the selected primary or secondary engine status word (Table 4.8.2-2) from the three EIU's for the following indications:

1. Phase/Mode status – Bits 8, 9, 10, 11, 12, and 13 indicate phase and mode status. The code of bits 8, 9, and 10 indicates the phase status and will be processed before bits 11, 12, and 13. Bits 11, 12, and 13 indicate the mode status during a specific phase. The following processing will apply to Engine Phase Bits 8, 9, and 10 during post–SRB ignition:
 - a. Shutdown phase output flag shall be set when for three or more consecutive passes:
 - (1) Phase Bits 8, 9, and 10 indicate shutdown phase and
 - (2) The current time in the main engine time reference word is less than 1.48 seconds.
 - b. Post–shutdown phase output flag shall be set when for three or more consecutive passes:
 - (1) Phase Bits 8, 9, and 10 indicate post–shutdown phase and
 - (2) The current time in the main engine time reference word is less than 1.48 seconds when Phase Bits 8, 9, and 10 indicate shutdown phase.

(Table 4.8.2–6 provides the binary code phase/mode indications and the phase and mode output flag indications.)

2. Self–Test Status – Bits 14 and 15 of the engine status word indicate self–test status and will be processed as follows:

| Table 4.8.2-5. Self-Test Status | | | | |
|---------------------------------|----|------------------------|----------------------|-----------------------|
| Engine Status Word Bits | | Self Test Output Flags | | |
| 14 | 15 | Engine OK | Major Component Fail | Engine Limit Exceeded |
| 0 | 0 | Not used | Not used | Not used |
| 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 |

4.8.2.3.7 Main Engine Chamber Pressure Data Processing

The SSME SOP will monitor main engine chamber pressure data from each of the main engines and perform data compensation to convert the measured data from psi to engineering units (percent of chamber pressure). The general compensation equations will be as follows:

$$YC = YM C + K$$

where

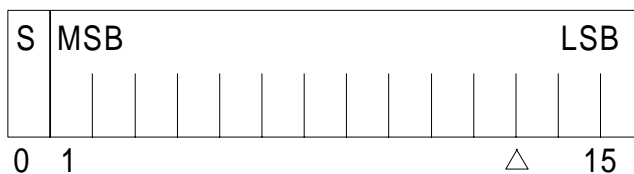
YC = Compensation engine chamber pressure (%)

YM = Measured engine chamber pressure (psia)

C = Compensation scale factor (% psia)

K = Compensation bias (%)

Format as depicted below:



Key: S = Sign bit
MSB = Most significant bit
LSB = Least significant bit
Δ = Fractional binary point

Fixed point half-word operand format

4.8.2.3.8 Main Engine Command Processing

The SSME SOP will process and convert GNC user function commands for the three main engines into two 16-bit words for output to the EIU's. The two 16-bit words will consist of a 16-bit command word and a 16-bit associated BCH code command word. The EIU removes the LSB of the BCH code command word and combines the two command words into a packed 31-bit word for use by the SSME. Table 4.8.2-1 provides the general octal equivalent of the binary/BCH format conversions for the following transfer commands:

1. Start enable commands will be processed to generate start enable commands to all three main engines. When the start enable command flag indicates the "1" state (enable start), the SSME SOP will generate the corresponding binary/BCH commands to all three EIU's.
2. Start commands will be processed to generate start commands to all three main engines. When the start command flag for an engine indicates the "1" state (start commanded), the SSME SOP will generate the corresponding binary/BCH command to that EIU.
3. Limit control enable commands will be processed on an engine basis. When the limit control enable command for an engine indicates the "1" state (enable limit control), the SSME SOP will generate the corresponding binary/BCH command to the appropriate EIU.
4. Limit control inhibit commands will be processed on an engine basis. When the limit control inhibit command for an engine indicates a "1" state (inhibit limit control), the SSME SOP will generate the corresponding binary/BCH command to the appropriate EIU.
5. Throttle settings will be processed to generate thrust level commands to all three main engines. When a specific throttle setting has been commanded, the SSME SOP will generate the corresponding binary/BCH command to all three EIU's.
6. Shutdown enable commands will be processed on an engine basis. When the shutdown enable command for an engine indicates the "1" state (enable shutdown), the SSME SOP will generate the corresponding binary/BCH command to the appropriate EIU.
7. Shutdown commands will be processed on an engine basis. When the shutdown command for an engine indicates the "1" state (shutdown commanded), the SSME SOP will generate the corresponding binary/BCH command to the appropriate EIU.
8. Switch VDT will be processed on a single engine basis. When the DCU-SW command for an engine indicates the "1" state (switchover commanded), the SSME SOP will generate the corresponding binary/BCH command to the appropriate EIU.
9. Oxidizer dump start command will be processed to generate oxidizer dump commands to all three main engines. When the oxidizer dump start command indicates a "1" state (dump oxidizer), the SSME SOP will generate the corresponding binary/BCH commands to all three EIU's.
10. Fuel dump start command will be processed to generate fuel dump commands to all three main engines. When the fuel dump start command indicates a "1" state (dump fuel), the SSME SOP will generate the corresponding binary/BCH commands to all three EIU's.

11. Oxidizer dump stop command and fuel dump stop command will be processed to generate terminate sequence commands to all three main engines. When either the oxidizer dump or the fuel dump stop command indicates the “1” state (stop dump), the SSME SOP will generate the corresponding binary/BCH commands to all three EIU’s.

The command output flag to be used in Section 4.8.2.3.5 will be set on an engine basis on the first transmission of any new command to that engine. When no new command to an engine has been processed, the output command flag will be set to the “zero” state. Only one transfer command to the EIU will be transmitted per minor cycle.

The order of priority of user function commands on a single engine basis is as follows:

- Shutdown enable
- Shutdown
- DCU-SW
- Limit control inhibit
- Limit control enable
- Throttle settings
- Start enable
- Start
- Oxidizer dump start
- Oxidizer dump stop
- Fuel dump stop
- Fuel dump start

The SSME SOP output function will issue the command associated with the highest priority request and then set the request to zero. Prior to SRB ignition each command must be transmitted to the EIU only one time, and then the output buffer must be set to zero unless an output request is pending. After SRB ignition, each command must be transmitted only one time to the output buffer and the I/O profile will continuously send the command to the EIU until replaced by another command to the output buffer.

| Table 4.8.2-6.Phase Mode Processing | | | | | | | |
|-------------------------------------|---|----|---|--|-----------------------|-----------------------|--|
| Engine Status Word Bits* | | | Phase Output Flags | Engine Status Word Bits* | | | Mode Output Flags |
| 8 | 9 | 10 | | 11 | 12 | 13 | |
| 0 | 1 | 0 | Shutdown Phase = 0 Post-shutdown Phase = 0 | 0 0 0 1 1 | 0 1 1 0 1 | 1 0 1 0 0 | Engine Ready = 0 Engine Ready = 0 Engine Ready = 0 Engine Ready = 0 Engine Ready = 1 |
| 0 | 1 | 1 | Shutdown Phase = 0 Post-shutdown Phase = 0 | 0 0 0 1 | 0 1 1 0 | 1 0 1 0 | Electronic Lockup = 0 Hydraulic Lockup = 0 Electronic Lockup = 0 Hydraulic Lockup = 0 Electronic Lockup = 1 Hydraulic Lockup = 0 Electronic Lockup = 0 Hydraulic Lockup = 1 |
| 1 | 0 | 0 | Shutdown Phase = 0 Post-shutdown Phase = 0 | 0 0 1 | 0 1 0 | 1 1 0 | Electronic Lockup = 0 Hydraulic Lockup = 0 Electronic Lockup = 1 Hydraulic Lockup = 0 Electronic Lockup = 0 Hydraulic Lockup = 1 |
| 1 | 0 | 1 | Shutdown Phase = 1 Post-shutdown Phase = 0 | No mode processing required during this phase No mode processing required during this phase | | | |
| 1 | 1 | 0 | Shutdown Phase = 0 Post-shutdown Phase = 1 | No mode processing required during this phase No mode processing required during this phase | | | |

* Bit combinations not shown are either not used or spare. See Table 4.8.2-2 GPC Engine Status Word.

4.8.2.3.9 EIU Command Processing

Commands to the Engine Interface Unit (EIU) are either transfer commands or execute commands. Transfer commands cause the transfer of data from the General Purpose Computer (GPC) through the EIU to the Main Engine (ME) controllers (refer to section 4.8.2.3.8.) Execute commands have three categories: the response command, the data request (BITE and Return commands) and the operational state (Status Override and the Master Reset commands). The response command transfers Main Engine (ME) controller data words from the EIU to the GPC. The BITE command transfers the BITE data from the EIU to the GPC. The return command transmits the received command word back to the GPC with an inverted sync pattern. The status override command causes the EIU to select the secondary OI data for transmission. The master reset command clears out flags in the GPC bite, OI bite, and switches the OI data stream from the secondary data path to the primary data path. The SSME SOP will issue the execute commands to the EIU's one time only. These execute commands are for the EIU and are not transferred to the main engine controller. For EIU timing requirements refer to SS-P-0002-170 "CPDS SS System Level A Software Requirements" section 4.4.2.

1. The status override command will be processed on a single engine basis. When the status override request for an engine indicates the "1" state (status override requested), the SSME SOP will generate the status override command to the appropriate EIU.
2. The master reset command will be processed on a single engine basis. When the master reset request for an engine indicates the "1" state (master reset requested), the SSME SOP will generate the master reset command to the appropriate EIU.

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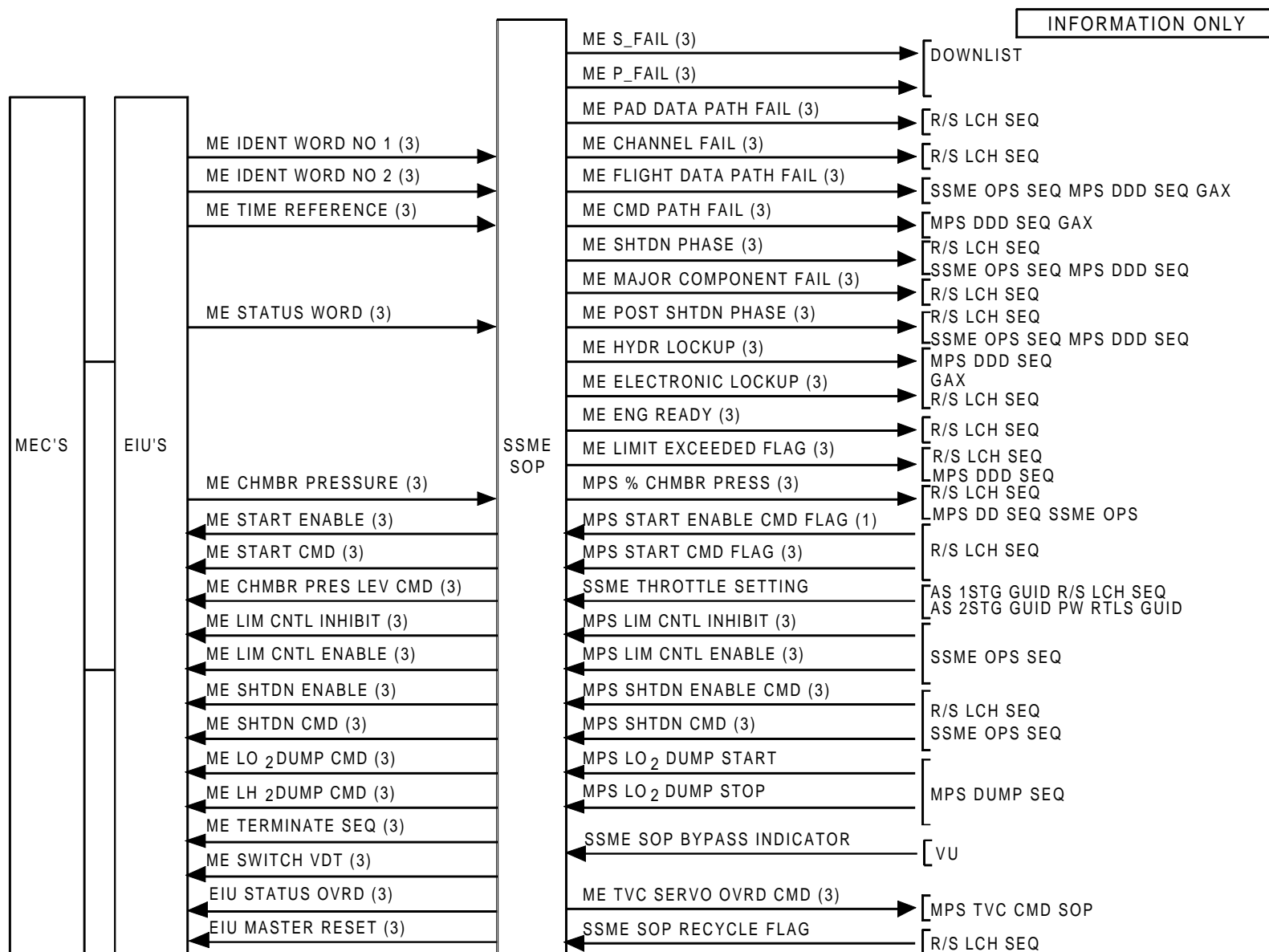


FIGURE 4.8.2-1. SSME SOP Functional Block Diagram

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INFORMATION ONLY

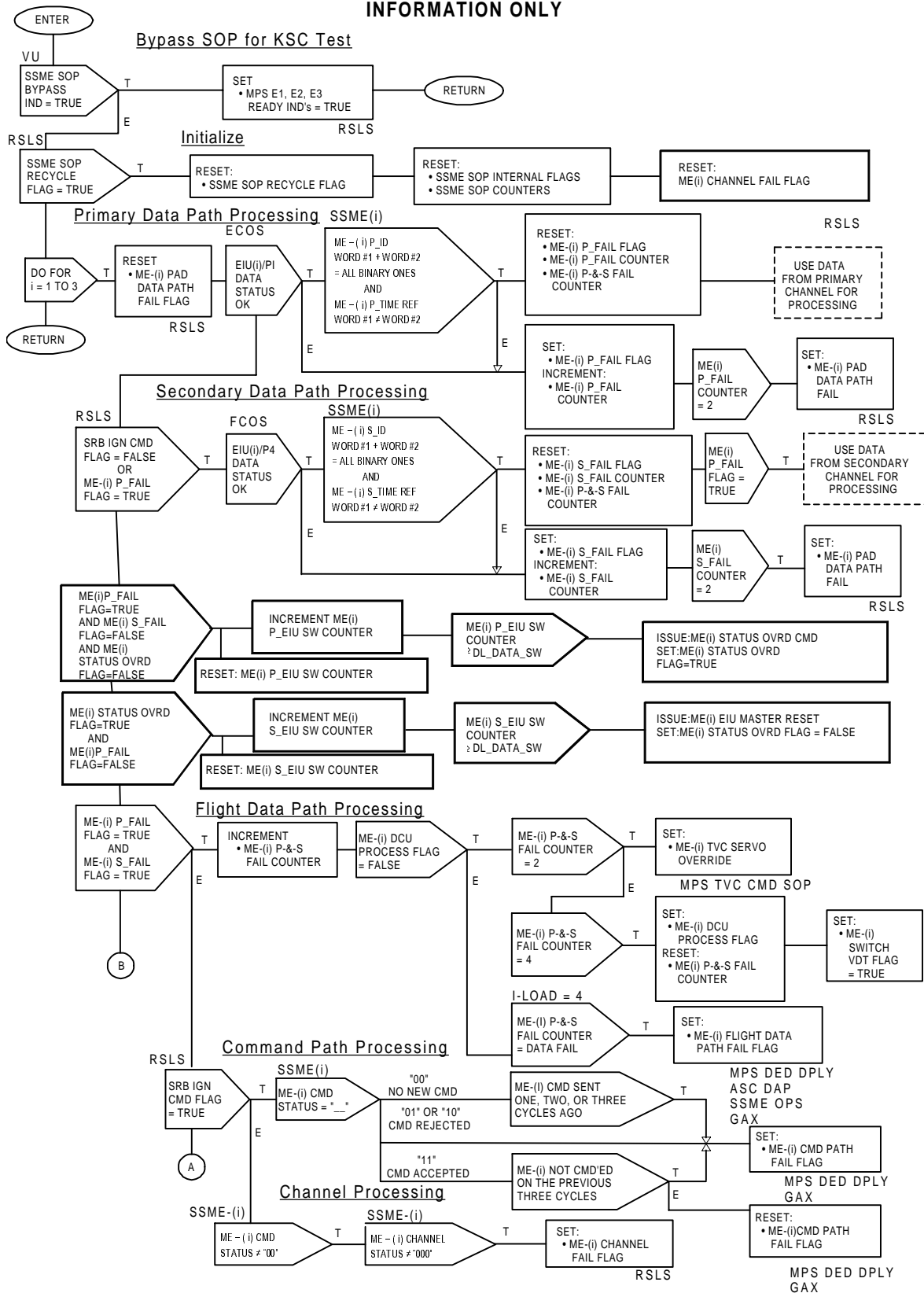


FIGURE 4.181.(1) Space Shuttle Main Engine SOP (1 of 3)

INFORMATION ONLY

Main Engine Status and Chamber Pressure

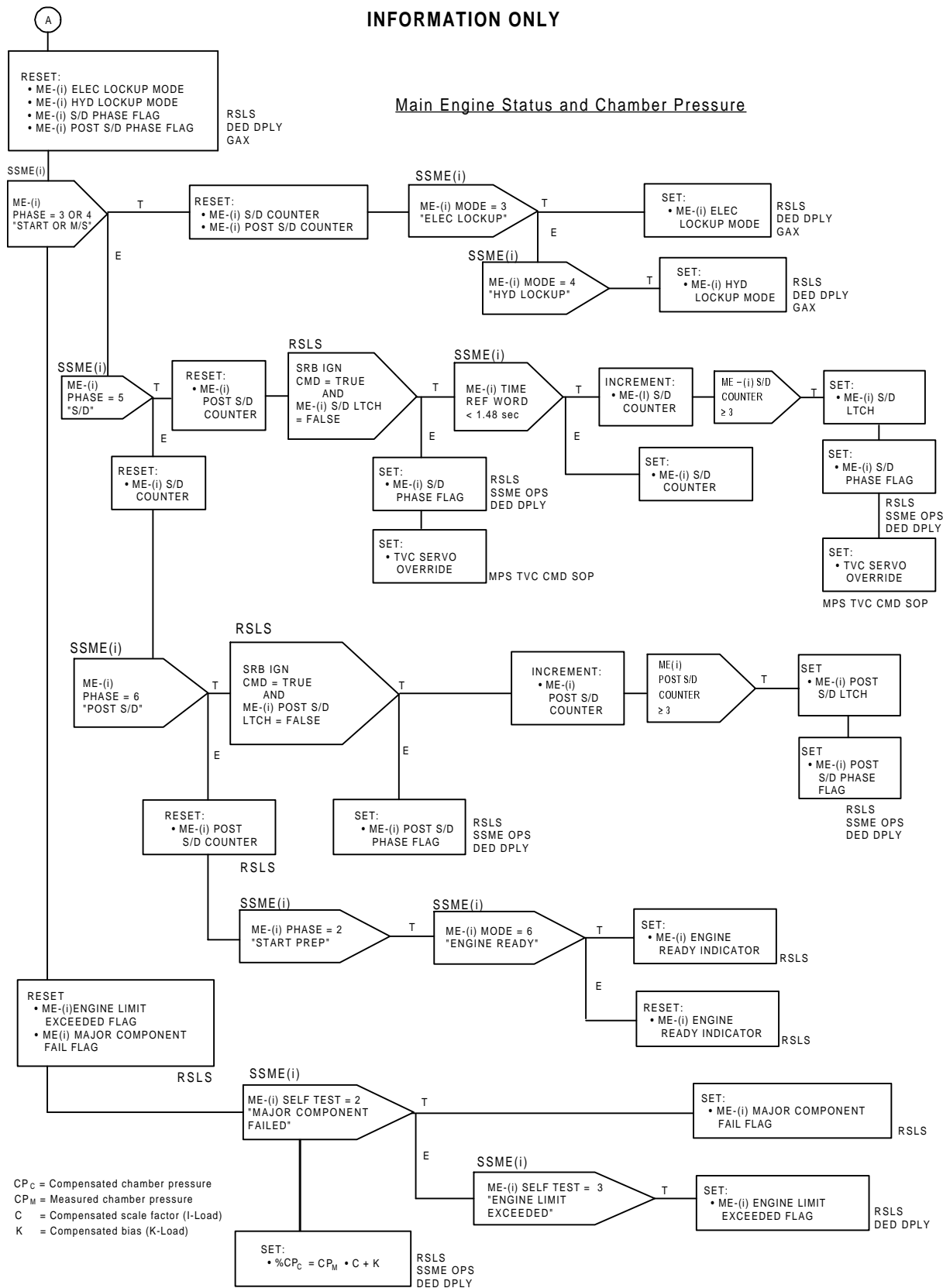


FIGURE 4.181.(2) Space Shuttle Main Engine SOP (2 of 3)

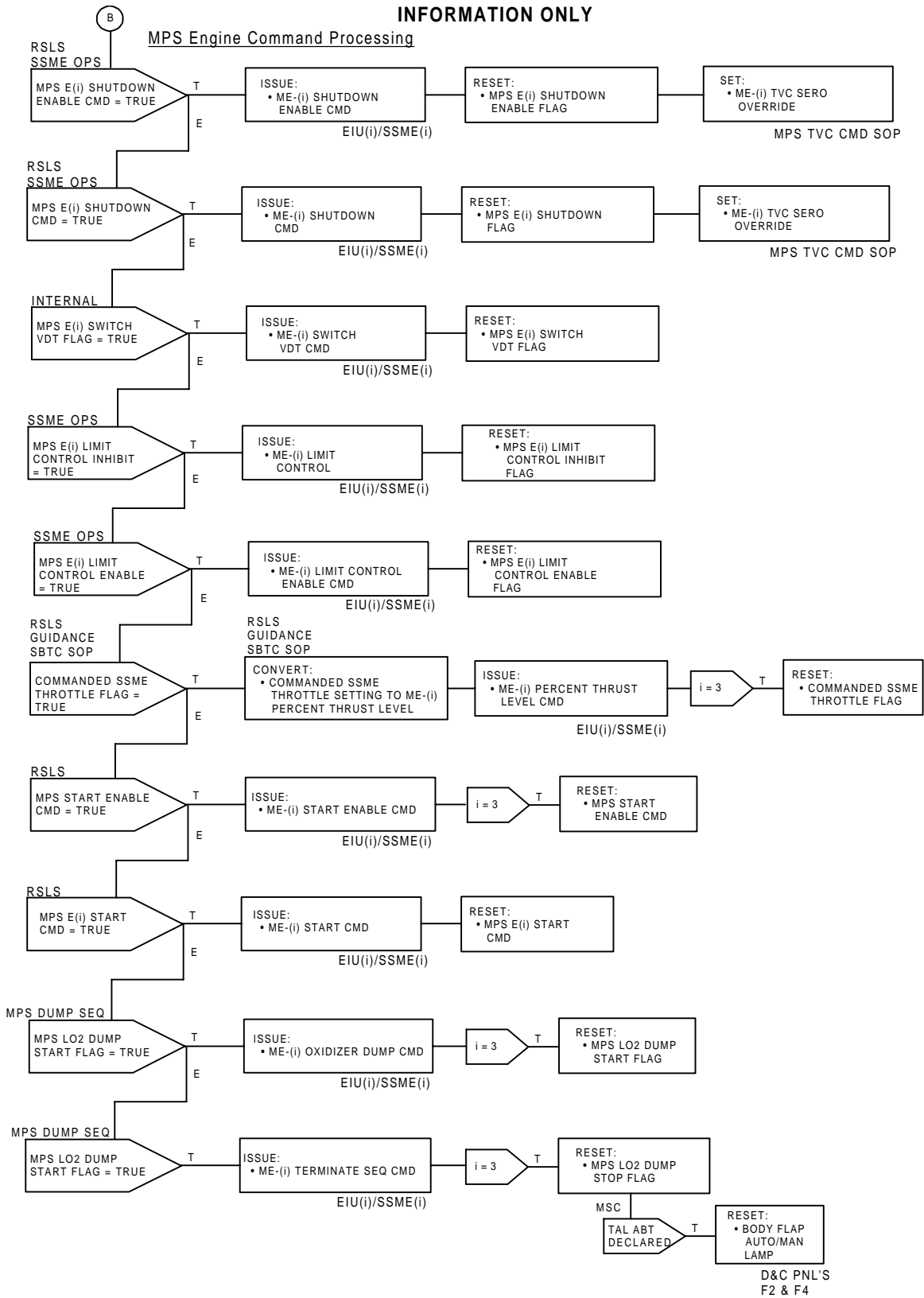


FIGURE 4.181.(3) Space Shuttle Main Engine SOP (3 of 3)

TABLE 4.8.2.4-1. INPUT FUNCTIONAL PARAMETERS FOR SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|---------------------|------------|---------------------------------|---------------|-------------|--------------|------------------|---------|-------------|
| BYPASS_SSME_SOP_IND | V90X0114X | SSME SOP BYPASS INDICATOR | VU | EVENT | BD | | 93017G | * |
| K_CMD | V90U1948CA | COMMANDED SSME THROTTLE SETTING | ASC 2STG GUID | PCT | | | 93017G | * |
| K_CMD | V90U1948CB | COMMANDED SSME THROTTLE SETTING | ASC 1STG GUID | PCT | | | 93017G | * |
| K_CMD | V90U1948CC | COMMANDED SSME THROTTLE SETTING | PW RTLS GUID | PCT | | | 93017G | * |
| K_CMD | V90U1948CD | COMMANDED SSME THROTTLE SETTING | R/S LCH SEQ | PCT | | | | |
| K_CMD | V90U1948CE | COMMANDED SSME THROTTLE SETTING | SBTC SOP | PCT | | | 93012D | |
| K_CMD | V90U1948CF | COMMANDED SSME THROTTLE SETTING | PW CONT GUID | PCT | | | 93017G | * |
| ME1_STATUS | E41M1003P | ME-1 ENGINE STATUS WORD | DW 3 | EIU 1 | HMD | | 93017G | * |
| ME2_STATUS | E41M2003P | ME-2 ENGINE STATUS WORD | DW 3 | EIU 2 | HMD | | 93017G | * |
| ME3_STATUS | E41M3003P | ME-3 ENGINE STATUS WORD | DW 3 | EIU 3 | HMD | | 93017G | * |
| MESHDNCMD (1) | V90X8370XA | MPS E1 SHUTDOWN CMD | | R/S LCH SEQ | | | | |
| MESHDNCMD (1) | V90X8370XB | MPS E1 SHUTDOWN CMD | | SSME OPS | | | | |
| MESHDNCMD (2) | V90X8371XA | MPS E2 SHUTDOWN CMD | | R/S LCH SEQ | | | | |
| MESHDNCMD (2) | V90X8371XB | MPS E2 SHUTDOWN CMD | | SSME OPS | | | | |
| MESHDNCMD (3) | V90X8372XA | MPS E3 SHUTDOWN CMD | | R/S LCH SEQ | | | | |
| MESHDNCMD (3) | V90X8372XB | MPS E3 SHUTDOWN CMD | | SSME OPS | | | | |
| MESHDNENA (1) | V90X8367XA | MPS E1 SHUTDOWN ENABLE CMD | | R/S LCH SEQ | | | | |
| MESHDNENA (1) | V90X8367XB | MPS E1 SHUTDOWN ENABLE CMD | | SSME OPS | | | | |
| MESHDNENA (2) | V90X8368XA | MPS E2 SHUTDOWN ENABLE CMD | | R/S LCH SEQ | | | | |
| MESHDNENA (2) | V90X8368XB | MPS E2 SHUTDOWN ENABLE CMD | | SSME OPS | | | | |
| MESHDNENA (3) | V90X8369XA | MPS E3 SHUTDOWN ENABLE CMD | | R/S LCH SEQ | | | | |
| MESHDNENA (3) | V90X8369XB | MPS E3 SHUTDOWN ENABLE CMD | | SSME OPS | | | | |
| MESTRTCMD (1) | V90X8358X | MPS E1 START CMD FLAG | | R/S LCH SEQ | | | | |
| MESTRTCMD (2) | V90X8359X | MPS E2 START CMD FLAG | | R/S LCH SEQ | | | | |
| MESTRTCMD (3) | V90X8360X | MPS E3 START CMD FLAG | | R/S LCH SEQ | | | | |
| MESTRTENA | V90X8361X | MPS START ENABLE CMD FLAG | | R/S LCH SEQ | | | | |
| MPS_ENA (1) | V90X8573X | MPS E1 LIMIT CNTL ENA | | SSME OPS | | | | |
| MPS_ENA (2) | V90X8574X | MPS E2 LIMIT CNTL ENA | | SSME OPS | | | | |
| MPS_ENA (3) | V90X8575X | MPS E3 LIMIT CNTL ENA | | SSME OPS | | | | |
| MPS_INH (1) | V90X8570X | MPS E1 LIMIT CNTL INH | | SSME OPS | | | | |
| MPS_INH (2) | V90X8571X | MPS E2 LIMIT CNTL INH | | SSME OPS | | | | |
| MPS_INH (3) | V90X8572X | MPS E3 LIMIT CNTL INH | | SSME OPS | | | | |
| MPS_LO2_DUMP_START | V90X8301X | MPS LO2 DUMP START | | MPS DUMP | | | 89598A | |
| MPS_LO2_DUMP_STOP | V90X8302X | MPS LO2 DUMP STOP | | MPS DUMP | | | | |
| R/S_AUTO_SEQ_START | V99X8803X | LPS GO FOR AUTO SEQUENCE START | | LPS | | | 89599C | |
| SRB_IGNITION_CMD | V90X8377X | SRB IGNITION CMD FLAG | | R/S LCH SEQ | | | | |
| | E41J1200B | ME-1 STD BIT PATTERN | DW 1 | EIU 1 | BMD | | 92937A | |
| | E41J1320B | ME-1 ENGINE NUMBER | DW 1 | EIU 1 | BMD | | 92937A | |
| | E41J1321B | ME-1 IMAGE STD BIT PATTERN | DW 2 | EIU 1 | BMD | | 93017G | * |
| | E41J1367B | ME-1 IMAGE ENGINE NUMBER | DW 2 | EIU 1 | BMD | | 93017G | * |
| | E41J1503B | ME-1 PROGRAM CONFIG | DW1 | EIU 1 | BMD | | 90457A | |
| | E41J1506B | ME-1 IMAGE PROGRAM CONFIG | DW2 | EIU 1 | BD | | 93017G | * |
| | E41J1508B | ME-1 COMMAND STATUS | DW3 | EIU 1 | BMD | | 93017G | * |
| | E41J1509B | ME-1 CHANNEL STATUS | DW3 | EIU 1 | BMD | | 93017G | * |
| | E41J1512B | ME-1 PHASE IN EFFECT | DW3 | EIU 1 | BMD | | 93017G | * |
| | E41J1513B | ME-1 OPERATING MODE | DW3 | EIU 1 | BMD | | 93017G | * |

TABLE 4.8.2.4-1. INPUT FUNCTIONAL PARAMETERS FOR SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|--------|-----------------------|--------|-------|-----------|---------|---------|-------|
| E41J1514B | ME-1 | SELF TEST STATUS | DW3 | EIU 1 | BMD | | 93017G | * |
| E41J2200B | ME-2 | STD BIT PATTERN | DW 1 | EIU 2 | BMD | | 92937A | |
| E41J2320B | ME-2 | ENGINE NUMBER | DW 1 | EIU 2 | BMD | | 92937A | |
| E41J2321B | ME-2 | IMAGE STD BIT PATTERN | DW 2 | EIU 2 | BMD | | 93017G | * |
| E41J2367B | ME-2 | IMAGE ENGINE NUMBER | DW 2 | EIU 2 | BMD | | 93017G | * |
| E41J2503B | ME-2 | PROGRAM CONFIG | DW1 | EIU 2 | BMD | | 90457A | |
| E41J2506B | ME-2 | IMAGE PROGRAM CONFIG | DW2 | EIU 2 | BD | | 93017G | * |
| E41J2508B | ME-2 | COMMAND STATUS | DW3 | EIU 2 | BMD | | 93017G | * |
| E41J2509B | ME-2 | CHANNEL STATUS | DW3 | EIU 2 | BMD | | 93017G | * |
| E41J2512B | ME-2 | PHASE IN EFFECT | DW3 | EIU 2 | BMD | | 93017G | * |
| E41J2513B | ME-2 | OPERATING MODE | DW3 | EIU 2 | BMD | | 93017G | * |
| E41J2514B | ME-2 | SELF TEST STATUS | DW3 | EIU 2 | BMD | | 93017G | * |
| E41J3200B | ME-3 | STD BIT PATTERN | DW 1 | EIU 3 | BMD | | 92937A | |
| E41J3320B | ME-3 | ENGINE NUMBER | DW 1 | EIU 3 | BMD | | 92937A | |
| E41J3321B | ME-3 | IMAGE STD BIT PATTERN | DW 2 | EIU 3 | BMD | | 93017G | * |
| E41J3367B | ME-3 | IMAGE ENGINE NUMBER | DW 2 | EIU 3 | BMD | | 93017G | * |
| E41J3503B | ME-3 | PROGRAM CONFIG | DW1 | EIU 3 | BMD | | 90457A | |
| E41J3506B | ME-3 | IMAGE PROGRAM CONFIG | DW2 | EIU 3 | BD | | 93017G | * |
| E41J3508B | ME-3 | COMMAND STATUS | DW3 | EIU 3 | BMD | | 93017G | * |
| E41J3509B | ME-3 | CHANNEL STATUS | DW3 | EIU 3 | BMD | | 93017G | * |
| E41J3512B | ME-3 | PHASE IN EFFECT | DW3 | EIU 3 | BMD | | 93017G | * |
| E41J3513B | ME-3 | OPERATING MODE | DW3 | EIU 3 | BMD | | 93017G | * |
| E41J3514B | ME-3 | SELF TEST STATUS | DW3 | EIU 3 | BMD | | 93017G | * |
| E41M1001P | ME-1 | IDENT WORD NO 1 | DW01 | EIU 1 | HMD | | 89218B | |
| E41M1002P | ME-1 | IDENT WORD NO 2 | DW 2 | EIU 1 | HMD | | 93017G | * |
| E41M2001P | ME-2 | IDENT WORD NO 1 | DW01 | EIU 2 | HMD | | 89218B | |
| E41M2002P | ME-2 | IDENT WORD NO 2 | DW 2 | EIU 2 | HMD | | 93017G | * |
| E41M3001P | ME-3 | IDENT WORD NO 1 | DW01 | EIU 3 | HMD | | 89218B | |
| E41M3002P | ME-3 | IDENT WORD NO 2 | DW 2 | EIU 3 | HMD | | 93017G | * |
| E41P1023B | ME-1 | MCC PRESSURE (AVG) | DW 6 | EIU 1 | PSIA | HXS | 93017G | * |
| E41P2023B | ME-2 | MCC PRESSURE (AVG) | DW 6 | EIU 2 | PSIA | HXS | 93017G | * |
| E41P3023B | ME-3 | MCC PRESSURE (AVG) | DW 6 | EIU 3 | PSIA | HXS | 93017G | * |
| E41W1004B | ME-1 | TIME REFERENCE | DW 4 | EIU 1 | HXU | | 93017G | * |
| E41W2004B | ME-2 | TIME REFERENCE | DW 4 | EIU 2 | HXU | | 93017G | * |
| E41W3004B | ME-3 | TIME REFERENCE | DW 4 | EIU 3 | HXU | | 93017G | * |
| E41X1502B | ME-1 | VDT SOURCE | DW 1 | EIU 1 | BD | | 92937A | |
| E41X1505B | ME-1 | IMAGE VDT SOURCE | DW 2 | EIU 1 | BD | | 93017G | * |
| E41X1507B | ME-1 | MEM LOAD MODE ENBL | DW3 | EIU 1 | BD | | 93017G | * |
| E41X1510B | ME-1 | FRT MODULE IN CNTRL | DW3 | EIU 1 | BD | | 93017G | * |
| E41X1511B | ME-1 | LIMIT CNTRL ENBL | DW3 | EIU 1 | BD | | 93017G | * |
| E41X2502B | ME-2 | VDT SOURCE | DW 1 | EIU 2 | BD | | 92937A | |
| E41X2505B | ME-2 | IMAGE VDT SOURCE | DW 2 | EIU 2 | BD | | 93017G | * |
| E41X2507B | ME-2 | MEM LOAD MODE ENBL | DW3 | EIU 2 | BD | | 93017G | * |
| E41X2510B | ME-2 | FRT MODULE IN CNTRL | DW3 | EIU 2 | BD | | 93017G | * |
| E41X2511B | ME-2 | LIMIT CNTRL ENBL | DW3 | EIU 2 | BD | | 93017G | * |
| E41X3502B | ME-3 | VDT SOURCE | DW 1 | EIU 3 | BD | | 92937A | |

TABLE 4.8.2.4-1. INPUT FUNCTIONAL PARAMETERS FOR SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | SOURCE | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|---------------------------|--------|-------------|--------------|------------------|---------|-------------|
| | E41X3505B | ME-3 IMAGE VDT SOURCE | DW 2 | EIU 3 | BD | | 93017G | * |
| | E41X3507B | ME-3 MEM LOAD MODE ENBL | DW3 | EIU 3 | BD | | 93017G | * |
| | E41X3510B | ME-3 FRT MODULE IN CNTRL | DW3 | EIU 3 | BD | | 93017G | * |
| | E41X3511B | ME-3 LIMIT CNTRL ENBL | DW3 | EIU 3 | BD | | 93017G | * |
| | V90X8668X | SSME SOP RECYCLE FLAG | | R/S LCH SEQ | | | | |
| | V91X2852X | EIU1/P4 DATA STATUS (HFE) | | FCOS | | | | |
| | V91X2856X | EIU2/P4 DATA STATUS (HFE) | | FCOS | | | | |
| | V91X2860X | EIU3/P4 DATA STATUS (HFE) | | FCOS | | | | |
| | V91X3009X | EIU1/P1 DATA STATUS (HFE) | | FCOS | | | | |
| | V91X3012X | EIU2/P1 DATA STATUS (HFE) | | FCOS | | | | |
| | V91X3015X | EIU3/P1 DATA STATUS (HFE) | | FCOS | | | | |

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

TABLE 4.8.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-------------------|------------|-----------------------------------|--|-------|-----------|---------|---------|-------|
| DCU_SW(1) | V95X1220X | ME-1 SWITCH VDT | EIU 1 | | | | | |
| DCU_SW(2) | V95X1221X | ME-2 SWITCH VDT | EIU 2 | | | | | |
| DCU_SW(3) | V95X1222X | ME-3 SWITCH VDT | EIU 3 | | | | | |
| ME1_CH_PRESS_FDBK | V95U1186C | MPS E-1 PERCENT CH PRESS | MPS D/D SEQ R/S LCH SEQ SSME OPS | PCT | | | | |
| ME1_ENA_LIM_CNTL | E41K1211B | ME-1 LIMIT CONTROL ENABLE CMD | EIU 1 | | BMD | | | |
| ME1_INH_LIM_CNTL | E41K1210B | ME-1 LIMIT CONTROL INHIBIT CMD | EIU 1 | | BMD | | | |
| ME1_LH2_DUMP | E41K1220B | ME-1 FUEL DUMP CMD | EIU 1 | | | | | |
| ME1_LO2_DUMP | E41K1219BA | ME-1 OXIDIZER DUMP CMD | EIU 1 | | | | | |
| ME1_SHTDN_CMD | E41K1204B | ME-1 SHUTDOWN CMD | EIU 1 | | BMD | | | |
| ME1_SHTDN_ENA_CMD | E41K1212B | ME-1 SHUTDOWN ENABLE CMD | EIU 1 | | BMD | | | |
| ME1_ST_CMD | E41K1203B | ME-1 START CMD | EIU 1 | | BMD | | | |
| ME1_ST_ENA_CMD | E41K1217B | ME-1 START ENABLE CMD | EIU 1 | | BMD | | | |
| ME1_TERM_SEQ | E41K1218BA | ME-1 TERMINATE SEQUENCE CMD | EIU 1 | | | | | |
| ME1_THRUST_LEVEL | E41K1201B | ME-1 MAIN CHAMBER PRESS LEVEL CMD | EIU 1 | PCT | | | | |
| ME2_CH_PRESS_FDBK | V95U1187C | MPS E-2 PERCENT CH PRESS | MPS D/D SEQ R/S LCH SEQ SSME OPS | PCT | | | | |
| ME2_ENA_LIM_CNTL | E41K2211B | ME-2 LIMIT CONTROL ENABLE CMD | EIU 2 | | BMD | | | |
| ME2_INH_LIM_CNTL | E41K2210B | ME-2 LIMIT CONTROL INHIBIT CMD | EIU 2 | | BMD | | | |
| ME2_LH2_DUMP | E41K2220B | ME-2 FUEL DUMP CMD | EIU 2 | | | | | |
| ME2_LO2_DUMP | E41K2219BA | ME-2 OXIDIZER DUMP CMD | EIU 2 | | | | | |
| ME2_SHTDN_CMD | E41K2204B | ME-2 SHUTDOWN CMD | EIU 2 | | BMD | | | |
| ME2_SHTDN_ENA_CMD | E41K2212B | ME-2 SHUTDOWN ENABLE CMD | EIU 2 | | BMD | | | |
| ME2_ST_CMD | E41K2203B | ME-2 START CMD | EIU 2 | | BMD | | | |
| ME2_ST_ENA_CMD | E41K2217B | ME-2 START ENABLE CMD | EIU 2 | | BMD | | | |
| ME2_TERM_SEQ | E41K2218BA | ME-2 TERMINATE SEQUENCE CMD | EIU 2 | | | | | |
| ME2_THRUST_LEVEL | E41K2201B | ME-2 MAIN CHAMBER PRESS LEVEL CMD | EIU 2 | PCT | | | | |
| ME3_CH_PRESS_FDBK | V95U1188C | MPS E-3 PERCENT CH PRESS | MPS D/D SEQ R/S LCH SEQ SSME OPS | PCT | | | | |
| ME3_ENA_LIM_CNTL | E41K3211B | ME-3 LIMIT CONTROL ENABLE CMD | EIU 3 | | BMD | | | |
| ME3_INH_LIM_CNTL | E41K3210B | ME-3 LIMIT CONTROL INHIBIT CMD | EIU 3 | | BMD | | | |
| ME3_LH2_DUMP | E41K3220B | ME-3 FUEL DUMP CMD | EIU 3 | | | | | |
| ME3_LO2_DUMP | E41K3219BA | ME-3 OXIDIZER DUMP CMD | EIU 3 | | | | | |
| ME3_SHTDN_CMD | E41K3204B | ME-3 SHUTDOWN CMD | EIU 3 | | BMD | | | |
| ME3_SHTDN_ENA_CMD | E41K3212B | ME-3 SHUTDOWN ENABLE CMD | EIU 3 | | BMD | | | |
| ME3_ST_CMD | E41K3203B | ME-3 START CMD | EIU 3 | | BMD | | | |
| ME3_ST_ENA_CMD | E41K3217B | ME-3 START ENABLE CMD | EIU 3 | | BMD | | | |
| ME3_TERM_SEQ | E41K3218BA | ME-3 TERMINATE SEQUENCE CMD | EIU 3 | | | | | |
| ME3_THRUST_LEVEL | E41K3201B | ME-3 MAIN CHAMBER PRESS LEVEL CMD | EIU 3 | PCT | | | | |
| MEPSTSHDN(1) | V95X1160X | MPS E1 POST-SHUTDOWN PHASE | MPS D/D SEQ R/S LCH SEQ SSME OPS | | | | | |

TABLE 4.8.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|--------------------------|-----------|----------------------------------|--|-------|--------------|------------------|---------|-------------|
| MEPSTSHDN(2) | V95X1161X | MPS E2 POST-SHUTDOWN PHASE | MPS D/D SEQ R/S LCH SEQ SSME OPS | | | | | |
| MEPSTSHDN(3) | V95X1162X | MPS E3 POST-SHUTDOWN PHASE | MPS D/D SEQ R/S LCH SEQ SSME OPS | | | | | |
| MESHDN(1) | V95X1155X | MPS E1 SHUTDOWN PHASE | MPS D/D SEQ R/S LCH SEQ SSME OPS | | | | | |
| MESHDN(2) | V95X1156X | MPS E2 SHUTDOWN PHASE | MPS D/D SEQ R/S LCH SEQ SSME OPS | | | | | |
| MESHDN(3) | V95X1157X | MPS E3 SHUTDOWN PHASE | MPS D/D SEQ R/S LCH SEQ SSME OPS | | | | | |
| ME_CMD_PATH_FAIL(1) | V95X1202X | ME-1 COMMAND PATH FAIL FLAG | DL FMT 21/1 GAX MPS D/D SEQ | | BD | | 93017G | * |
| ME_CMD_PATH_FAIL(2) | V95X1203X | ME-2 COMMAND PATH FAIL FLAG | DL FMT 21/1 GAX MPS D/D SEQ | | BD | | 93017G | * |
| ME_CMD_PATH_FAIL(3) | V95X1204X | ME-3 COMMAND PATH FAIL FLAG | DL FMT 21/1 GAX MPS D/D SEQ | | BD | | 93017G | * |
| ME_ELEC_LOCKUP(1) | V95X1194X | ME-1 ELECTRONIC LOCKUP MODE FLAG | GAX MPS D/D SEQ R/S LCH SEQ | | | | | |
| ME_ELEC_LOCKUP(2) | V95X1195X | ME-2 ELECTRONIC LOCKUP MODE FLAG | GAX MPS D/D SEQ R/S LCH SEQ | | | | | |
| ME_ELEC_LOCKUP(3) | V95X1196X | ME-3 ELECTRONIC LOCKUP MODE FLAG | GAX MPS D/D SEQ R/S LCH SEQ | | | | | |
| ME_FLT_DATA_PATH_FAIL(1) | V95X1150X | ME-1 FLIGHT DATA PATH FAIL FLAG | ASC DAP GAX MPS D/D SEQ | | | | 90243C | |
| ME_FLT_DATA_PATH_FAIL(2) | V95X1151X | ME-2 FLIGHT DATA PATH FAIL FLAG | ASC DAP GAX MPS D/D SEQ | | | | 90243C | |
| ME_FLT_DATA_PATH_FAIL(3) | V95X1152X | ME-3 FLIGHT DATA PATH FAIL FLAG | ASC DAP GAX MPS D/D SEQ | | | | 90243C | |

TABLE 4.8.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-------------------|-----------|----------------------------------|-----------------------------------|-------|-----------|---------|---------|-------|
| ME_HYD_LOCKUP (1) | V95X1198X | ME-1 HYDRAULIC LOCKUP MODE FLAG | GAX MPS D/D SEQ R/S LCH SEQ | | | | | |
| ME_HYD_LOCKUP (2) | V95X1199X | ME-2 HYDRAULIC LOCKUP MODE FLAG | GAX MPS D/D SEQ R/S LCH SEQ | | | | | |
| ME_HYD_LOCKUP (3) | V95X1200X | ME-3 HYDRAULIC LOCKUP MODE FLAG | GAX MPS D/D SEQ R/S LCH SEQ | | | | | |
| ME_LIM_EX (1) | V95X1190X | ME-1 ENGINE LIMIT EXCEEDED FLAG | MPS D/D SEQ R/S LCH SEQ | | | | 89672A | |
| ME_LIM_EX (2) | V95X1191X | ME-2 ENGINE LIMIT EXCEEDED FLAG | MPS D/D SEQ R/S LCH SEQ | | | | 89672A | |
| ME_LIM_EX (3) | V95X1192X | ME-3 ENGINE LIMIT EXCEEDED FLAG | MPS D/D SEQ R/S LCH SEQ | | | | 89672A | |
| ME_READY (1) | V95X1182X | MPS E-1 ENG READY IND | R/S LCH SEQ | | | | | |
| ME_READY (2) | V95X1183X | MPS E-2 ENG READY IND | R/S LCH SEQ | | | | | |
| ME_READY (3) | V95X1184X | MPS E-3 ENG READY IND | R/S LCH SEQ | | | | | |
| | E41K1265B | ME-1 65 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1266B | ME-1 66 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1267B | ME-1 67 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1268B | ME-1 68 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1269B | ME-1 69 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1270B | ME-1 70 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1271B | ME-1 71 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1272B | ME-1 72 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1273B | ME-1 73 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1274B | ME-1 74 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1275B | ME-1 75 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1276B | ME-1 76 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1277B | ME-1 77 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1278B | ME-1 78 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1279B | ME-1 79 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1280B | ME-1 80 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1281B | ME-1 81 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1282B | ME-1 82 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1283B | ME-1 83 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1284B | ME-1 84 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1285B | ME-1 85 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1286B | ME-1 86 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1287B | ME-1 87 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1288B | ME-1 88 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1289B | ME-1 89 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1290B | ME-1 90 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1291B | ME-1 91 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| | E41K1292B | ME-1 92 PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |

TABLE 4.8.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|----------|--------------------------|-------------|-------|--------------|------------------|---------|-------------|
| E41K1293B | ME-1 93 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1294B | ME-1 94 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1295B | ME-1 95 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1296B | ME-1 96 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1297B | ME-1 97 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1298B | ME-1 98 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1299B | ME-1 99 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1300B | ME-1 100 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1301B | ME-1 101 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1302B | ME-1 102 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1303B | ME-1 103 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1304B | ME-1 104 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1305B | ME-1 105 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1306B | ME-1 106 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1307B | ME-1 107 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1308B | ME-1 108 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K1309B | ME-1 109 | PERCENT THRUST LEVEL CMD | EIU 1 | | BMD | | 89598A | |
| E41K2265B | ME-2 65 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2266B | ME-2 66 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2267B | ME-2 67 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2268B | ME-2 68 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2269B | ME-2 69 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2270B | ME-2 70 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2271B | ME-2 71 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2272B | ME-2 72 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2273B | ME-2 73 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2274B | ME-2 74 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2275B | ME-2 75 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2276B | ME-2 76 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2277B | ME-2 77 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2278B | ME-2 78 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2279B | ME-2 79 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2280B | ME-2 80 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2281B | ME-2 81 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2282B | ME-2 82 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2283B | ME-2 83 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2284B | ME-2 84 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2285B | ME-2 85 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2286B | ME-2 86 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2287B | ME-2 87 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2288B | ME-2 88 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2289B | ME-2 89 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2290B | ME-2 90 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2291B | ME-2 91 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2292B | ME-2 92 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| E41K2293B | ME-2 93 | PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |

TABLE 4.8.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|-----------|-----------------------------------|-------------|-------|-----------|---------|---------|-------|
| | E41K2294B | ME-2 94 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2295B | ME-2 95 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2296B | ME-2 96 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2297B | ME-2 97 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2298B | ME-2 98 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2299B | ME-2 99 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2300B | ME-2 100 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2301B | ME-2 101 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2302B | ME-2 102 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2303B | ME-2 103 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2304B | ME-2 104 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2305B | ME-2 105 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2306B | ME-2 106 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2307B | ME-2 107 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2308B | ME-2 108 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K2309B | ME-2 109 PERCENT THRUST LEVEL CMD | EIU 2 | | BMD | | 89598A | |
| | E41K3265B | ME-3 65 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3266B | ME-3 66 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3267B | ME-3 67 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3268B | ME-3 68 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3269B | ME-3 69 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3270B | ME-3 70 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3271B | ME-3 71 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3272B | ME-3 72 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3273B | ME-3 73 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3274B | ME-3 74 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3275B | ME-3 75 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3276B | ME-3 76 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3277B | ME-3 77 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3278B | ME-3 78 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3279B | ME-3 79 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3280B | ME-3 80 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3281B | ME-3 81 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3282B | ME-3 82 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3283B | ME-3 83 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3284B | ME-3 84 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3285B | ME-3 85 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3286B | ME-3 86 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3287B | ME-3 87 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3288B | ME-3 88 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3289B | ME-3 89 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3290B | ME-3 90 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3291B | ME-3 91 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3292B | ME-3 92 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3293B | ME-3 93 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| | E41K3294B | ME-3 94 PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |

TABLE 4.8.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|--------------------|---------------------------|-----------------|-------|--------------|------------------|---------|-------------|
| E41K3295B | ME-3 95 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3296B | ME-3 96 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3297B | ME-3 97 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3298B | ME-3 98 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3299B | ME-3 99 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3300B | ME-3 100 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3301B | ME-3 101 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3302B | ME-3 102 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3303B | ME-3 103 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3304B | ME-3 104 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3305B | ME-3 105 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3306B | ME-3 106 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3307B | ME-3 107 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3308B | ME-3 108 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| E41K3309B | ME-3 109 | PERCENT THRUST LEVEL CMD | EIU 3 | | BMD | | 89598A | |
| V72K0717X | EIU 1 | STATUS OVERRIDE CMD | EIU 1 | | BMD | | 92419C | |
| V72K0718X | EIU 1 | MASTER RESET CMD | EIU 1 | | BMD | | 92419C | |
| V72K0737X | EIU 2 | STATUS OVERRIDE CMD | EIU 2 | | BMD | | 92419C | |
| V72K0738X | EIU 2 | MASTER RESET CMD | EIU 2 | | BMD | | 92419C | |
| V72K0757X | EIU 3 | STATUS OVERRIDE CMD | EIU 3 | | BMD | | 92419C | |
| V72K0758X | EIU 3 | MASTER RESET CMD | EIU 3 | | BMD | | 92419C | |
| V90M2996P | CGPB_ME_STAT\$(1:) | | DL FMT 21/1 | | | | 93017G | * |
| V90M2997P | CGPB_ME_STAT\$(2:) | | DL FMT 21/1 | | | | 93017G | * |
| V90M2998P | CGPB_ME_STAT\$(3:) | | DL FMT 21/1 | | | | 93017G | * |
| V95X1217X | ME-1 | PAD DATA PATH FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1218X | ME-2 | PAD DATA PATH FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1219X | ME-3 | PAD DATA PATH FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1230X | ME-1 | MAJOR COMPONENT FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1231X | ME-2 | MAJOR COMPONENT FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1232X | ME-3 | MAJOR COMPONENT FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1236X | ME-1 | CHANNEL FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1237X | ME-2 | CHANNEL FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1238X | ME-3 | CHANNEL FAIL FLAG | R/S LCH SEQ | | | | | |
| V95X1240X | ME-1 | TVC SERVO OVRD | MPS TVC CMD SOP | | | | | |
| V95X1241X | ME-2 | TVC SERVO OVRD | MPS TVC CMD SOP | | | | | |
| V95X1242X | ME-3 | TVC SERVO OVRD | MPS TVC CMD SOP | | | | | |
| V95X1894X | ME1 | P_FAIL | DL FMT 21/1 | | BD | | 93017G | * |
| V95X1895X | ME2 | P_FAIL | DL FMT 21/1 | | BD | | 93017G | * |
| V95X1896X | ME3 | P_FAIL | DL FMT 21/1 | | BD | | 93017G | * |
| V95X1897X | ME1 | S_FAIL | DL FMT 21/1 | | BD | | 93017G | * |
| V95X1898X | ME2 | S_FAIL | DL FMT 21/1 | | BD | | 93017G | * |
| V95X1899X | ME3 | S_FAIL | DL FMT 21/1 | | BD | | 93017G | * |

TABLE 4.8.2.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM SPACE SHUTTLE MAIN ENGINE SOP (G4.181)

| FSSR NAME | M/S ID | NOMENCLATURE | DESTINATION | UNITS | DATA TYPE | P R E C | LAST CR | R E V |
|-----------|--------|--------------|-------------|-------|-----------|------------------|---------|-------------|
|-----------|--------|--------------|-------------|-------|-----------|------------------|---------|-------------|

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 4.8.2.4-3. SPACE SHUTTLE MAIN ENGINE SOP (G4.181) I-LOADS

| FSSR NAME | MSID | ENG UNITS | DT | PR | D | S | PR FCTN | MC | CAT | LAST CR | R E V |
|-----------|-----------|-----------|----|----|---|---|---------|----|-----|---------|-------------|
| CPRESS(1) | V97U3979C | PCT/PSIA | F | S | L | C | G4.181 | 00 | ZFZ | 92013B | |
| CPRESS(2) | V97U3980C | PCT/PSIA | F | S | L | C | G4.181 | 00 | ZFZ | 92013B | |
| CPRESS(3) | V97U3981C | PCT/PSIA | F | S | L | C | G4.181 | 00 | ZFZ | 92013B | |
| DATA_FAIL | V97U4151C | ND | F | S | D | P | G4.181 | 00 | ZSZ | 90007G | |

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

TABLE 4.8.2.4-4. SPACE SHUTTLE MAIN ENGINE SOP (G4.181) K-LOADS

| FSSR NAME DESCRIPTION | MSID | MC | KLOAD VALUE | ENG UNITS | DT | P R | S | PR FCTN | LAST CR | R E V |
|--------------------------|-----------|----|-------------|-----------|----|--------|---|---------|---------|-------------|
| DL_DATA_SW | V99U6963C | 00 | +10 | CYCLES | I | S | C | G4.181 | 92419C | |
| KPRESS(1) | V97U4090C | 00 | +0.0 | E+00 PCT | F | S | P | G4.181 | 29551B | |
| KPRESS(2) | V97U4091C | 00 | +0.0 | E+00 PCT | F | S | P | G4.181 | 29551B | |
| KPRESS(3) | V97U4092C | 00 | +0.0 | E+00 PCT | F | S | P | G4.181 | 29551B | |

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

TABLE 4.8.2.4-5. SPACE SHUTTLE MAIN ENGINE SOP (G4.181) 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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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 |
| | 92955A | 32 | Expand Effectivity of PASS-only RTF SCRs to Include OI-32 |
| | 92958A | 32 | Expand Effectivity of PASS/BFS RTF SCRs to Include OI-32 |
| | 92973 | 32 | Reassign Effectivity of SCRs 92542D & 92743D to OI-32 |
| | 92976 | 32 | Reassign Effectivity of SCR 92755B to OI-32 |
| | 92979 | 32 | Reassign Effectivity of SCR 92820B to OI-32 |
| | 92990 | 32 | Reassign Effectivity of SCRs 92861B & 92914B to OI-32 |
| | 92991 | 32 | Reassign Effectivity of SCR 92870A to OI-32 |
| | 92996 | 32 | Reassign Effectivity of SCR 92937A to OI-32 |
| 1.3-1.(T) | 92103A | 26B | FSSR Parameter Table Upgrade |
| 3.2.5 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.1-1.(T) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.1-2.(T) | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.1.1.3 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92213D | 29 | MPS LO2 Geyser Prevention |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.1.1.4-1.(T) | 92025B | 26B | Onorbit TACAN Deletion |
| | 92067D | 27 | Three String GPS Capability |
| | 92206B | 28 | Elimination of PASS/BFS Timing Skew for Ascent Target Calculations |
| | 92253 | 28 | Rescind Implementation of SCR 92206B in OI-28 |
| | 92213D | 29 | MPS LO2 Geyser Prevention |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|-------|--|
| Paragraph | CR No. | OI | CR Title |
| 4.1.1.4-2.(T) | 92319C | 29 | Elimination of PASS/BFS Timing Skew for Ascent Target Calculations |
| | 92458A | 30 | ET Separation Channelization Clean-Up |
| | 92522D | 30 | Overhaul MEDS Composite Flight Instrument Display |
| | 93090E | 33 | Bearing Displays |
| | 92157 | 28 | IDD Clarification to Remove Blanks from FSSR Names |
| | 92206B | 28 | Elimination of PASS/BFS Timing Skew for Ascent Target Calculations |
| | 92253 | 28 | Rescind Implementation of SCR 92206B in OI-28 |
| | 92213D | 29 | MPS LO2 Geyser Prevention |
| | 92319C | 29 | Elimination of PASS/BFS Timing Skew for Ascent Target Calculations |
| | 92522D | 30 | Overhaul MEDS Composite Flight Instrument Display |
| 4.1.1.4-3.(T) | 93064D | 32 | Errata Issue Clean-Up Part II |
| | 92314 | 27 | RSLs I-Load Re-Categorization |
| | 92213D | 29 | MPS LO2 Geyser Prevention |
| 4.1.2 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.1.2.3 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.1.2.4-1.(T) | 92909A | 30/32 | ET Camera Power Control Commands |
| | 92950 | 32 | G/C Steer Roll Bias Ramp at PPD or MECO |
| 4.1.3.4-1.(T) | 90847D | 27 | Pass Three String GPS Downlist Requirements |
| | 92309 | 29 | C-BAND Transponder Downlist Requirements |
| | 92755B | 32 | SRB CRD Downlist Requirements |
| | 92939C | 32 | SRB Camera System Measurements |
| | 93001C | 33 | LO2 & LH2 Prevalve Timer Modification |
| 4.2.1.3 | 90991 | 26 | Continuous Issuing of Shutdown Enable/Shutdown |
| | 91056C | 26 | LO2 Tank Step Pressurization |
| | 91073A | 26 | LO2 Step Pressurization Modification |
| | 92055A | 26 | LO2 Pressurization Documentation Only |
| | 92060 | 26 | Clarification of Requirements for Terminating Shutdown Requests |
| | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92670D | 30 | Abort Improvements to Improve TAL Performance |
| | 92542D | 32 | Deletion of LO2 Step Pressurization CMDS |
| | 92743D | 32 | MPS LH2 Prevalve Timer Changes |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|------------------|---|
| Paragraph | CR No. | OI | CR Title |
| 4.2.1.4-1.(T) | 91056C | 26 | LO2 Tank Step Pressurization |
| | 91051K | 26B | Streamlined Shuttle GPS Capability |
| | 92025B | 26B | Onorbit TACAN Deletion |
| | 92067D | 27 | Three String GPS Capability |
| | 90704F | 28 | DAP Hotstick Downmode Alert and Message |
| | 92208C | 28 | GPS Issues for Correction on OI-28 |
| | 92225A | 29 | ET SEP Switch Default to Auto on a TAL Abort |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert |
| | 92355B | 29 | GPC Major Mode to MEDS |
| | 92404B | 29 | Preserve MECO Vi, Altitude, & Altitude Rate in MM104 |
| | 92578B | 29 | Correction for ET SEP Switch Default |
| | 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 |
| | 92670D | 30 | Abort Improvements to Improve TAL Performance |
| | 92542D | 32 | Deletion of LO2 Step Pressurization CMDS |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 93090E | 33 | Bearing Displays | |
| 4.2.1.4-2.(T) | 91056C | 26 | LO2 Tank Step Pressurization |
| | 92055A | 26 | LO2 Pressurization Documentation Only |
| | 92306A | 28 | Orbiter Window Protection |
| | 92542D | 32 | Deletion of LO2 Step Pressurization CMDS |
| | 92950 | 32 | G/C Steer Roll Bias Ramp at PPD or MECO |
| | 93012D | 32 | PASS 6X TRAJ Display Enhancement |
| | 93087E | 33 | RTLS ET Separation Improvements |
| 4.2.1.4-3.(T) | 91056C | 26 | LO2 Tank Step Pressurization |
| | 92670D | 30 | Abort Improvements to Improve TAL Performance |
| | 92542D | 32 | Deletion of LO2 Step Pressurization CMDS |
| | 92743D | 32 | MPS LH2 Prevalve Timer Changes |
| 4.2.2.2 | 92306A | 28 | Orbiter Window Protection |
| 4.2.2.3 | 92306A | 28 | Orbiter Window Protection |
| | 92902 | 30/32 | New MSIDs for ET SEP CAMERA CMDs |
| 4.2.2.4-1.(T) | 93023D | 32 | OI-32 Remote Control Orbiter Capability |

| Table R.1-1. CR Reference Summary | | | | |
|-----------------------------------|---------------|--------|---|--|
| Paragraph | CR No. | OI | CR Title | |
| 4.2.2.4-2.(T) | 93090E | 33 | Bearing Displays | |
| | 92306A | 28 | Orbiter Window Protection | |
| | 92902 | 30/32 | New MSIDs for ET SEP CAMERA CMDs | |
| | 93012D | 32 | PASS 6X TRAJ Display Enhancement | |
| | 93064D | 32 | Errata Issue Clean-Up Part II | |
| 4.2.2.4-3.(T) | 92306A | 28 | Orbiter Window Protection | |
| | 92443 | 28 | Doc-Only Correction for CR 92306A | |
| 4.2.3.2 | 92458A | 30 | ET Separation Channelization Clean-Up | |
| 4.2.3.3 | 92458A | 30 | ET Separation Channelization Clean-Up | |
| | 92902 | 30/32 | New MSIDs for ET SEP CAMERA CMDs | |
| 4.2.3.4-1.(T) | 92820B | 32 | SRB Power Deadface | |
| | 93012D | 32 | PASS 6X TRAJ Display Enhancement | |
| | 93064D | 32 | Errata Issue Clean-Up Part II | |
| | 93087E | 33 | RTLS ET Separation Improvements | |
| | 90704F | 28 | DAP Hotstick Downmode Alert and Message | |
| | 92208C | 28 | GPS Issues for Correction on OI-28 | |
| | 92225A | 29 | ET SEP Switch Default to Auto on a TAL Abort | |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert | |
| | 92355B | 29 | GPC Major Mode to MEDS | |
| | 92404B | 29 | Preserve MECO Vi, Altitude, & Altitude Rate in MM104 | |
| | 92578B | 29 | Correction for ET SEP Switch Default | |
| | 92458A | 30 | ET Separation Channelization Clean-Up | |
| | 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 | |
| | 92619A | 30 | Correction CR for CR 92522D | |
| | 92676B | 30 | CR 92522D / CR 92619A Correction CR | |
| | 92542D | 32 | Deletion of LO2 Step Pressurization CMDS | |
| | 93023D | 32 | OI-32 Remote Control Orbiter Capability | |
| | 93064D | 32 | Errata Issue Clean-Up Part II | |
| | 93090E | 33 | Bearing Displays | |
| | 4.2.3.4-2.(T) | 92157 | 28 | IDD Clarification to Remove Blanks from FSSR Names |
| | | 92458A | 30 | ET Separation Channelization Clean-Up |

Table R.1-1. CR Reference Summary

| Paragraph | CR No. | OI | CR Title | |
|---------------|---------------|--------|--|--|
| 4.2.3.4-3(T) | 92355B | 29 | GPC Major Mode to MEDS | |
| | 92902 | 30/32 | New MSIDs for ET SEP CAMERA CMDs | |
| | 92909A | 30/32 | ET Camera Power Control Commands | |
| | 93012D | 32 | PASS 6X TRAJ Display Enhancement | |
| | 93064D | 32 | Errata Issue Clean-Up Part II | |
| | 93090E | 33 | Bearing Displays | |
| | 91013D | 26 | Convert Second Stage Trim K-Loads to I-Loads | |
| | 93087E | 33 | RTLS ET Separation Improvements | |
| | 4.2.3.4-4.(T) | 92458A | 30 | ET Separation Channelization Clean-Up |
| | | 91013D | 26 | Convert Second Stage Trim K-Loads to I-Loads |
| 4.2.3.4-5.(T) | 91013D | 26 | Convert Second Stage Trim K-Loads to I-Loads | |
| 4.2.4.2 | 90914C | 28 | Delay MOV MPS Dump/FRCS Dump at MM602 | |
| | 92256B | 28 | MPS Dump Sequence Doc Changes | |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert | |
| | 92317B | 29 | Monitoring of MPS Backup LH2 Valve Switch Closed | |
| | 92515B | 30 | Make RTLS_LO_F_D_DELAY an I-Load and Delete GRTLS LO2 Inhibit Option | |
| 4.2.4.3 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR | |
| | 90914C | 28 | Delay MOV MPS Dump/FRCS Dump at MM602 | |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert | |
| | 92317B | 29 | Monitoring of MPS Backup LH2 Valve Switch Closed | |
| | 92515B | 30 | Make RTLS_LO_F_D_DELAY an I-Load and Delete GRTLS LO2 Inhibit Option | |
| 4.2.4.4-1.(T) | 92902 | 30/32 | New MSIDs for ET SEP CAMERA CMDs | |
| | 92909A | 30/32 | ET Camera Power Control Commands | |
| | 91051K | 26B | Streamlined Shuttle GPS Capability | |
| | 90724D | 28 | OPS 6 Entry ECAL Automation | |
| | 90914C | 28 | Delay MOV MPS Dump/FRCS Dump at MM602 | |
| | 92157 | 28 | IDD Clarification to Remove Blanks from FSSR Names | |
| | 92225A | 29 | ET SEP Switch Default to Auto on a TAL Abort | |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert | |
| | 92317B | 29 | Monitoring of MPS Backup LH2 Valve Switch Closed | |
| | 92355B | 29 | GPC Major Mode to MEDS | |
| | 92389C | 29 | Spiral HAC in TAEM Area Navigation | |
| | 92909A | 30/32 | ET Camera Power Control Commands | |
| | 93090E | 33 | Bearing Displays | |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|--|--|
| Paragraph | CR No. | OI | CR Title |
| 4.2.4.4-2.(T) | 92902 | 30/32 | New MSIDs for ET SEP CAMERA CMDs |
| 4.2.4.4-3.(T) | 90914C | 28 | Delay MOV MPS Dump/FRCS Dump at MM602 |
| | 92515B | 30 | Make RTLS_LO_F_D_DELAY an I-Load and Delete GRTLS LO2 Inhibit Option |
| 4.2.4.4-4.(T) | 90914C | 28 | Delay MOV MPS Dump/FRCS Dump at MM602 |
| | 92515B | 30 | Make RTLS_LO_F_D_DELAY an I-Load and Delete GRTLS LO2 Inhibit Option |
| 4.3.1.1 | 91014E | 26 | OMS Assist Performance Enhancement Burn |
| | 92077A | 26 | SERC Protection on Initiation of an OMS Performance Enhancement Burn |
| | 92391B | 29 | Erroneous Aft RCS Dump Duration (Post-MECO)-DR109227 Fix |
| | 92653B | 30 | 3E/O Blue SERC and -Z Burn RCS Jet Failure (DR 109221 Fix) |
| 4.3.1.2 | 92148D | 27 | OI-27 Sequencing Fssr Documentation Only CR |
| | 92198A | 28 | SERC OMS/RCS Interconnect Delay |
| | 92365A | 29 | Change TAL Post-MECO ARCS 4+X OMS Propellant Settling Burn |
| | 92391B | 29 | Erroneous Aft RCS Dump Duration (Post-MECO)-DR109227 Fix |
| | 92504G | 30 | Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions |
| | 92653B | 30 | 3E/O Blue SERC and -Z Burn RCS Jet Failure (DR 109221 Fix) |
| 4.3.1.3 | 93012D | 32 | PASS 6X TRAJ Display Enhancement |
| | 91014E | 26 | OMS Assist Performance Enhancement Burn |
| | 91075B | 26 | CR 91014E Documentation Cleanup CR |
| | 92044C | 26 | Cleanup of CR91014E - OMS Performance Enhancement |
| | 92077A | 26 | SERC Protection on Initiation of an OMS Performance Enhancement Burn |
| | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92175D | 28 | Uplink Second State I-Loads |
| | 92198A | 28 | SERC OMS/RCS Interconnect Delay |
| | 92365A | 29 | Change TAL Post-MECO ARCS 4+X OMS Propellant Settling Burn |
| 92391B | 29 | Erroneous Aft RCS Dump Duration (Post-MECO)-DR109227 Fix | |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|-----|--|
| Paragraph | CR No. | OI | CR Title |
| 4.3.1.4-1.(T) | 92504G | 30 | Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions |
| | 92653B | 30 | 3E/O Blue SERC and -Z Burn RCS Jet Failure (DR 109221 Fix) |
| | 92672B | 30 | Correction to CR 92504G |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| | 91075B | 26 | CR 91014E Documentation Cleanup CR |
| | 92044C | 26 | Cleanup of CR 91014E - OMS Performance Enhancement |
| | 92077A | 26 | SERC Protection on Initiation of an OMS Performance Enhancement Burn |
| | 91051K | 26B | Streamlined Shuttle GPS Capability |
| | 92025B | 26B | Onorbit TACAN Deletion |
| | 92067D | 27 | Three String GPS Capability |
| | 90724D | 28 | OPS 6 Entry ECAL Automation |
| | 90914C | 28 | Delay MOV MPS Dump/FRCS Dump at MM602 |
| | 92175D | 28 | Uplink Second Stage I-Loads |
| | 92198A | 28 | SERC OMS/RCS Interconnect Delay |
| | 92208C | 28 | GPS Issues for Correction on OI-28 |
| | 92306A | 28 | Orbiter Window Protection |
| | 92225A | 29 | ET SEP Switch Default to Auto on a TAL Abort |
| | 92355B | 29 | GPC Major Mode to MEDS |
| | 92364D | 29 | Just-In-Time Flight Design (JITFD) I-Load Uplink Expansion |
| | 92389C | 29 | Spiral HAC in TAEM Area Navigation |
| | 92392C | 29 | Doc-Only Corrections for OI-29 CRs 92329E, 92364D, and 92369B |
| | 92404B | 29 | Preserve MECO Vi, Altitude, & Altitude Rate in MM104 |
| | 92578B | 29 | Correction for ET SEP Switch Default |
| | 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 |
| | 92672B | 30 | Correction to CR 92504G |
| | 92542D | 32 | Deletion of LO2 Step Pressurization CMDS |
| | 92950 | 32 | G/C Steer Roll Bias Ramp at PPD or MECO |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|--|--|
| Paragraph | CR No. | OI | CR Title |
| 4.3.1.4-2.(T) | 93012D | 32 | PASS 6X TRAJ Display Enhancement |
| | 93025B | 32 | Single Engine Throttle Back for NPSP Protection |
| | 93087E | 33 | RTLS ET Separation Improvements |
| | 93090E | 33 | Bearing Displays |
| | 92235B | 27 | Fix AOA Propellant Wasting Calculation |
| 4.3.1.4-3.(T) | 93064D | 32 | Errata Issue Clean-Up Part II |
| | 91014E | 26 | OMS Assist Performance Enhancement Burn |
| | 92044C | 26 | Cleanup of CR 91014E - OMS Performance Enhancement |
| | 92198A | 28 | SERC OMS/RCS Interconnect Delay |
| 4.3.1.4-3.(T) | 92364D | 29 | Just-In-Time Flight Design (JITFD) I-Load Uplink Expansion |
| | 93025B | 32 | Single Engine Throttle Back for NPSP Protection |
| 4.3.2.2 | 92861B | 32 | OMS Crossfeed Valve Open Indication Failed Off |
| | 92914B | 32 | OMS Crossfeed Valve Open Indication Failed Off Enhancement |
| 4.3.2.3 | 93105 | 33 | Remove Extraneous Code for OMS XFD Mask Enhancement-SCR 92914B |
| | 92861B | 32 | OMS Crossfeed Valve Open Indication Failed Off |
| | 92914B | 32 | OMS Crossfeed Valve Open Indication Failed Off Enhancement |
| 4.3.2.4-1.(T) | 93105 | 33 | Remove Extraneous Code for OMS XFD Mask Enhancement-SCR 92914B |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert |
| | 92861B | 32 | OMS Crossfeed Valve Open Indication Failed Off |
| 4.3.3.3 | 93093A | 32 | OMS Crossfeed B Valve Mask Correction |
| | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.3.3.4-1.(T) | 92902 | 30/32 | New MSIDs for ET SEP CAMERA CMDs |
| | 92067D | 27 | Three String GPS Capability |
| | 92208C | 28 | GPS Issues for Correction on OI-28 |
| | 92225A | 29 | ET SEP Switch Default to Auto on a TAL Abort |
| | 92355B | 29 | GPC Major Mode to MEDS |
| | 92389C | 29 | Spiral HAC in TAEM Area Navigation |
| | 92404B | 29 | Preserve MECO Vi, Altitude, & Altitude Rate in MM104 |
| | 92522D | 30 | Overhaul MEDS Composite Flight Instrument Display |
| 92542D | 32 | Deletion of LO2 Step Pressurization CMDS | |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|-------|---|
| Paragraph | CR No. | OI | CR Title |
| | 93090E | 33 | Bearing Displays |
| 4.3.3.4-2.(T) | 92902 | 30/32 | New MSIDs for ET SEP CAMERA CMDs |
| 4.4-1.(T) | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.4-2.(T) | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.4-4.(T) | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.4-5.(T) | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.4.1.1 | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.4.1.3 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92210 | 28 | Allow for Vent Door Single Motor Operations |
| | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.4.1.4-1.(T) | 91051K | 26B | Streamlined Shuttle GPS Capability |
| | 92025B | 26B | Onorbit TACAN Deletion |
| | 92067D | 27 | Three String GPS Capability |
| | 90724D | 28 | OPS 6 Entry ECAL Automation |
| | 90914C | 28 | Delay MOV MPS Dump/FRCS Dump at MM602 |
| | 92208C | 28 | GPS Issues for Correction on OI-28 |
| | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| | 92225A | 29 | ET SEP Switch Default to Auto on a TAL Abort |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert |
| | 92355B | 29 | GPC Major Mode to MEDS |
| | 92389C | 29 | Spiral HAC in TAEM Area Navigation |
| | 92404B | 29 | Preserve MECO Vi, Altitude, & Altitude Rate in MM104 |
| | 92522D | 30 | Overhaul MEDS Composite Flight Instrument Display |
| | 92909A | 30/32 | ET Camera Power Control Commands |
| | 92542D | 32 | Deletion of LO2 Step Pressurization CMDS |
| | 93090E | 33 | Bearing Displays |
| 4.4.1.4-2.(T) | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.5.1 | 92350A | 29 | Fails OPS/Fail Safe SSME Repositioning for Drag Chute |
| 4.5.1.3 | 92350A | 29 | Fails OPS/Fail Safe SSME Repositioning for Drag Chute |
| 4.5.1.4-1.(T) | 91051K | 26B | Streamlined Shuttle GPS Capability |
| | 92067D | 27 | Three String GPS Capability |
| | 90724D | 28 | OPS 6 Entry ECAL Automation |
| | 92350A | 29 | Fails OPS/Fail Safe SSME Repositioning for Drag Chute |
| | 92355B | 29 | GPC Major Mode to MEDS |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|----|--|
| Paragraph | CR No. | OI | CR Title |
| | 92389C | 29 | Spiral HAC in TAEM Area Navigation |
| | 92404B | 29 | Preserve MECO Vi, Altitude, & Altitude Rate in MM104 |
| | 93090E | 33 | Bearing Displays |
| 4.6.1.2 | 93093A | 32 | OMS Crossfeed B Valve Mask Correction |
| 4.6.1.3 | 93093A | 32 | OMS Crossfeed B Valve Mask Correction |
| 4.6.1.4-2.(T) | 93093A | 32 | OMS Crossfeed B Valve Mask Correction |
| 4.6.3-1.(T) | 89464G | 29 | RCS PVT Sensor Change |
| | 92336 | 29 | RCS Propellant Transducer Limits |
| 4.6.3-2.(T) | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.6.3-3.(T) | 89464G | 29 | RCS PVT Sensor Change |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.6.3-4.(T) | 89464G | 29 | RCS PVT Sensor Change |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.6.3-5.(T) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92518 | 29 | RCS Quantity Monitor Sequence - FICS Related Doc Only Change |
| 4.6.3-6.(T) | 92518 | 29 | RCS Quantity Monitor Sequence - FICS Related Doc Only Change |
| 4.6.3.3 | 89464G | 29 | RCS PVT Sensor Change |
| 4.6.3.4-1.(T) | 89464G | 29 | RCS PVT Sensor Change |
| 4.6.3.4-2.(T) | 92354 | 27 | Delete Erroneous TLM Destinations |
| | 92157 | 28 | IDD Clarification to Remove Blanks from FSSR Names |
| 4.6.4.4-1.(T) | 89464G | 29 | RCS PVT Sensor Change |
| | 92225A | 29 | ET SEP Switch Default to Auto on a TAL Abort |
| | 92355B | 29 | GPC Major Mode to MEDS |
| | 92578B | 29 | Correction for ET SEP Switch Default |
| | 93090E | 33 | Bearing Displays |
| 4.7.2.1 | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.2.2 | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.2.3 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| | 92509C | 29 | Correction CR for Forward RCS Interconnect System (FICS) |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|----|---|
| Paragraph | CR No. | OI | CR Title |
| 4.7.2.4-1.(T) | 93064D | 32 | Errata Issue Clean-Up Part II |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert |
| | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.2.4-2.(T) | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.6.4-1.(T) | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.7.6.4-2.(T) | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.7.9 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.7.9.1 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.9.2 | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.9.3 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.9.4-1.(T) | 92870A | 32 | Correct Update Capability for OMS/RCS Quantity Gauging |
| | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.9.4-2.(T) | 92870A | 32 | Correct Update Capability for OMS/RCS Quantity Gauging |
| | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.9.4-3.(T) | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.9.4-4.(T) | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.7.9.4-5.(T) | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.8.1-1.(T) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.8.1-2.(T) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.8.1-3.(T) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92458A | 30 | ET Separation Channelization Clean-Up |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.8.1-4.(T) | 92458A | 30 | ET Separation Channelization Clean-Up |
| | 93064D | 32 | Errata Issue Clean-Up Part II |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|----|---|
| Paragraph | CR No. | OI | CR Title |
| 4.8.1.1 | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92820B | 32 | SRB Power Deadface |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.8.1.2 | 92820B | 32 | SRB Power Deadface |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.8.1.4 | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.8.1.4-1.(T) | 92157 | 28 | IDD Clarification to Remove Blanks from FSSR Names |
| | 92458A | 30 | ET Separation Channelization Clean-Up |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.8.1.4-2.(T) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.8.2-1.(F) | 92101A | 27 | SSME Channel Fail Documentation Only |
| | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92341B | 29 | Addition of Primary and Secondary Data Fail Flags to the Downlist |
| | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| 4.8.2-3.(T) | 92101A | 27 | SSME Channel Fail Documentation Only |
| 4.8.2-4.(T) | 92101A | 27 | SSME Channel Fail Documentation Only |
| 4.8.2-5.(T) | 92101A | 27 | SSME Channel Fail Documentation Only |
| 4.8.2-6.(T) | 92101A | 27 | SSME Channel Fail Documentation Only |
| 4.8.2.1 | 90919C | 26 | Selective Bypass of SSME SOP For KSC Testing |
| 4.8.2.2 | 90919C | 26 | Selective Bypass of SSME SOP for KSC Testing |
| | 92101A | 27 | SSME Channel Fail Documentation Only |
| | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| | 90919C | 26 | Selective Bypass of SSME SOP for KSC Testing |
| 4.8.2.3.0 | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| 4.8.2.3.1 | 92613 | 29 | Eliminate EIU Master Reset at Launch Recycle |
| | 92341B | 29 | Addition of Primary and Secondary Data Fail Flags to the Downlist |
| 4.8.2.3.4 | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| | 92101A | 27 | SSME Channel Fail Documentation Only |
| | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| 4.8.2.3.5 | 92101A | 27 | SSME Channel Fail Documentation Only |
| | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| 4.8.2.3.6 | 92101A | 27 | SSME Channel Fail Documentation Only |
| 4.8.2.3.7 | 92101A | 27 | SSME Channel Fail Documentation Only |
| 4.8.2.3.8 | 92060 | 26 | Clarification of Requirements for Terminating Shutdown Requests |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|-------|--|
| Paragraph | CR No. | OI | CR Title |
| 4.8.2.3.9 | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| 4.8.2.4-1.(T) | 90919C | 26 | Selective Bypass of SSME SOP for KSC Testing |
| | 91013D | 26 | Convert Second Stage Trim K-Loads to I-Loads |
| | 92670D | 30 | Abort Improvements to Improve TAL Performance |
| 4.8.2.4-2.(T) | 92341B | 29 | Addition of Primary and Secondary Data Fail Flags to the Downlist |
| | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| 4.8.2.4-3.(T) | 92013B | 26 | SSME Ref Chamber Press Block II |
| 4.8.2.4-4.(T) | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| 4.70.(F) | 90914C | 28 | Delay MOV MPS Dump/FRCS Dump at MM602 |
| | 92316B | 29 | Automating 2nd MPS Vacuum Inert |
| 4.70.(1)(F) | 92317B | 29 | Monitoring of MPS Backup LH2 Valve Switch Closed |
| | 92515B | 30 | Make RTLS_LO_F_D_DELAY an I-Load and Delete GRTLS LO2 Inhibit Option |
| 4.70.(2)(F) | 92909A | 30/32 | ET Camera Power Control Commands |
| | 92515B | 30 | Make RTLS_LO_F_D_DELAY an I-Load and Delete GRTLS LO2 Inhibit Option |
| 4.70.(4)(F) | 92515B | 30 | Make RTLS_LO_F_D_DELAY an I-Load and Delete GRTLS LO2 Inhibit Option |
| 4.70.(5)(F) | 92515B | 30 | Make RTLS_LO_F_D_DELAY an I-Load and Delete GRTLS LO2 Inhibit Option |
| | 92909A | 30/32 | ET Camera Power Control Commands |
| 4.101(F) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| 4.114.(F) | 92870A | 32 | Correct Update Capability for OMS/RCS Quantity Gauging |
| | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92213D | 29 | MPS LO2 Geyser Prevention |
| 4.114.(5)(F) | 92522D | 30 | Overhaul MEDS Composite Flight Instrument Display |
| 4.115.(F) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92306A | 28 | Orbiter Window Protection |
| 4.116.(2)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| | 92820B | 32 | SRB Power Deadface |
| 4.116.(3)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(4)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|-------|---|
| Paragraph | CR No. | OI | CR Title |
| 4.116.(5)(F) | 93012D | 32 | PASS 6X TRAJ Display Enhancement |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| | 93087E | 33 | RTLS ET Separation Improvements |
| | 92458A | 30 | ET Separation Channelization Clean-Up |
| | 92909A | 30/32 | ET Camera Power Control Commands |
| 4.116.(6)(F) | 93087E | 33 | RTLS ET Separation Improvements |
| | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(7)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(8)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(9)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(10)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(11)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(12)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(13)(F) | 92458A | 30 | ET Separation Channelization Clean-Up |
| 4.116.(4)(F) | 93064D | 32 | Errata Issue Clean-Up Part II |
| | 93087E | 33 | RTLS ET Separation Improvements |
| 4.116.(5)(F) | 93087E | 33 | RTLS ET Separation Improvements |
| 4.161.(F) | 92210 | 28 | Allow for Vent Door Single Motor Operations |
| | 92224D | 29 | Deletion of Vent Doors 4 & 7 Software |
| 4.165.(F) | 90991 | 26 | Continuous Issuing of Shutdown Enable/Shutdown |
| | 91056C | 26 | LO2 Tank Step Pressurization |
| | 91073A | 26 | LO2 Step Pressurization Modification |
| | 92055A | 26 | LO2 Pressurization Documentation Only |
| | 92060 | 26 | Clarification of Requirements for Terminating Shutdown Requests |
| | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.165.(1)(F) | 92743D | 32 | MPS LH2 Prevalve Timer Changes |
| | 93012D | 32 | PASS 6X TRAJ Display Enhancement |
| | 93001C | 33 | LO2 & LH2 Prevalve Timer Modification |
| 4.165.(2)(F) | 92743D | 32 | MPS LH2 Prevalve Timer Changes |
| | 93012D | 32 | PASS 6X TRAJ Display Enhancement |
| 4.165.(3)(F) | 93001C | 33 | LO2 & LH2 Prevalve Timer Modification |
| | 92743D | 32 | MPS LH2 Prevalve Timer Changes |
| | 93012D | 32 | PASS 6X TRAJ Display Enhancement |
| | 93001C | 33 | LO2 & LH2 Prevalve Timer Modification |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|----|--|
| Paragraph | CR No. | OI | CR Title |
| 4.165.(4)(F) | 92542D | 32 | Deletion of LO2 Step Pressurization CMDS |
| | 92743D | 32 | MPS LH2 Prevalve Timer Changes |
| 4.165.(8)(F) | 92743D | 32 | MPS LH2 Prevalve Timer Changes |
| 4.165.(9)(F) | 92670D | 30 | Abort Improvements to Improve TAL Performance |
| 4.165.(9A)(F) | 92670D | 30 | Abort Improvements to Improve TAL Performance |
| 4.165.(12)(F) | 93012D | 32 | PASS 6X TRAJ Display Enhancement |
| 4.165.(1)(F) | 93001C | 33 | LO2 & LH2 Prevalve Timer Modification |
| 4.165.(2)(F) | 93001C | 33 | LO2 & LH2 Prevalve Timer Modification |
| 4.165.(3)(F) | 93001C | 33 | LO2 & LH2 Prevalve Timer Modification |
| 4.181.(F) | 90919C | 26 | Selective Bypass of SSME SOP for KSC Testing |
| | 92101A | 27 | SSME Channel Fail Documentation Only |
| | 92419C | 29 | SSME SOP Switch of EIU Downlink Source |
| 4.181.(1)(F) | 92613 | 29 | Eliminate EIU Master Reset at Launch Recycle |
| 4.182.(F) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.184.(F) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.184.(1)(F) | 92861B | 32 | OMS Crossfeed Valve Open Indication Failed Off |
| 4.184.(2)(F) | 92861B | 32 | OMS Crossfeed Valve Open Indication Failed Off |
| 4.184.(4A)(F) | 92861B | 32 | OMS Crossfeed Valve Open Indication Failed Off |
| | 92914B | 32 | OMS Crossfeed Valve Open Indication Failed Off Enhancement |
| | 93105 | 33 | Remove Extraneous Code for OMS XFD Mask Enhancement-SCR 92914B |
| 4.184.(5)(F) | 92861B | 32 | OMS Crossfeed Valve Open Indication Failed Off |
| 4.185.(F) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.185.(2) (F) | 93093A | 32 | OMS Crossfeed B Valve Mask Correction |
| 4.185.(4) (F) | 93093A | 32 | OMS Crossfeed B Valve Mask Correction |
| 4.192.(F) | 91014E | 26 | OMS Assist Performance Enhancement Burn |
| | 91075B | 26 | CR 91014E Documentation Cleanup CR |
| | 92044C | 26 | Cleanup of CR 91014E - OMS Performance Enhancement |
| | 92077A | 26 | SERC Protection on Initiation of an OMS Performance Enhancement Burn |
| | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 92198A | 28 | SERC OMS/RCS Interconnect Delay |
| | 92391B | 29 | Erroneous Aft RCS Dump Duration (Post-MECO)-DR109227 Fix |

| Table R.1-1. CR Reference Summary | | | |
|-----------------------------------|--------|----|---|
| Paragraph | CR No. | OI | CR Title |
| 4.192.(1)(F) | 92365A | 29 | Change TAL Post-MECO ARCS 4+X OMS Propellant Settling Burn |
| | 92653B | 30 | 3E/O Blue SERC and -Z Burn RCS Jet Failure (DR 109221 Fix) |
| 4.192.(2)(F) | 92504G | 30 | Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions |
| 4.192.(3)(F) | 92672B | 30 | Correction to CR 92504G |
| | 92504G | 30 | Alleviate ET Recontact For RTLS 2EO Yellow and Orange Regions |
| 4.192.(4) (F) | 92672B | 30 | Correction to CR 92504G |
| | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.192.(5) (F) | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.192.(6) (F) | 93064D | 32 | Errata Issue Clean-Up Part II |
| 4.212.(F) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.212.(1)(F) | 92320D | 29 | Software Changes for Forward RCS Interconnect System (FICS) |
| | 92509C | 29 | Correction CR for Forward RCS Interconnect System (FICS) |
| 4.215.(F) | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| 4.228.(F) | 92350A | 29 | Fails OPS/Fail Safe SSME Repositioning for Drag Chute |
| | 92148D | 27 | OI-27 Sequencing FSSR Documentation Only CR |
| | 93064D | 32 | Errata Issue Clean-Up Part II |

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 |
| 02166 | | OFT GNC Entry Functions Update |
| 02173A | | Abort Mode Reselection (G021) |
| 02313A | | SRB MON FCN/SEL Filter/SRB Sep Seq |
| 02340D | | Attitude Data, IMU Data |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|--|
| CR No. | OI | CR Title |
| 02449D | | Add OFT Contingency Abort Rqt |
| 02486B | | SRB TVD Fdir Activation/Deactivation |
| 02607A | | Update to D&C Book II |
| 12008 | | Reduce SSME Rate |
| 12019 | | Stand FSSR Principal Funct |
| 12028B | | SSME Operations Sequence |
| 12033A | | Abort Control Seq |
| 12034 | | OMS Engine Firing Seq Rev |
| 12037A | | Abort OMS/RCS Interconnect |
| 12045 | | OMS to RCS Gaging Revisions |
| 12046A | | OMS to OMS Crossfeed Seq |
| 12047 | | Vent Door Sequence |
| 12071A | | Mnvr Execute (6.35 and 6.46) Display Changes |
| 12073A | | OMS/RCS Conn |
| 12074A | | ET Separation Sequence Revision |
| 12075 | | Hyd Sys Lnd Gear Isol Vlv |
| 12076A | | RCS Propellant Crossfeed |
| 12077A | | MPS Dump Sequence Revision |
| 12078A | | SRB MDM Data Acquisition |
| 12119 | | On Orb I/O Updt |
| 12112 | | GAX-Annunciation Rewrite |
| 12137 | | OMS/OMS Conn, RCS/RCS Xfeed Rate Chg |
| 12160A | | RS Launch Seq Rev (4.114) |
| 12161 | | SRB Sep Sequence Revision |
| 12162 | | RCS Quantity Monitor |
| 12190D | | ASC/RTLS Guid, PFG Mode Team |
| 12217 | | SRB and ET Sep Seq Rate Reduction |
| 12218C | | Aero Actuator Command Sop |
| 12239 | | GPC/SSME Data Fetch |
| 12240 | | MEC SOP Documentation Chg |
| 12241 | | SSME SOP Documentation Chg |
| 12248 | | GAX-Rate Table Update |
| 12270A | | Block Updt to OPS 3 |
| 12313C | | Addition of TLM Reqmts |
| 12316 | | GNC Switch RM Proc Rate Red |
| 12336 | | I-Ld OFT Miss and LRU Dep |
| 12337 | | I-Ld OFT Des Dep Parm |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|---------------------------------------|
| CR No. | OI | CR Title |
| 12411B | | OMS Engine FDI Simplification |
| 12414C | | R/S Lch Seq and SSME SOP Rev |
| 12442A | | Integrated Ent Nav, Asc Nav, and Orb |
| 12443 | | I-Load for Entry FACI |
| 12449B | | Vent Door Control Seq |
| 12455 | | SSME SOP Switch of EIU 60 Kbps Output |
| 12473B | | RCS Quan Monitor |
| 12480B | | SSME Operations Seq |
| 12481A | | MPS Dump Seq |
| 12482A | | ET Separation Seq |
| 12483B | | SRB Separation Seq |
| 12484A | | MPS Dedicated Display Drive Seq |
| 12491 | | OMS Fire Seq |
| 12494 | | OMS to RCS Gaging |
| 12495 | | OMS to OMS Xfeed and Reconfiguration |
| 12496 | | RCS |
| 12497 | | OMS/RCS Connect Seq |
| 12508 | | Hydraulics |
| 12510 | | Peg Time-to-Go and Thrust Integral |
| 12523 | | SRB Separation Inhibit |
| 12586 | | Integrated Signal Interfaces |
| 12639 | | Backup SRB Pwr Additions to MEC |
| 12644C | | Launch Seq Command Code Update |
| 12658A | | Ascent Displays Updt |
| 12672C | | Jan Seq Mode Team Make Work |
| 12673A | | Redundant Set Launch Seq |
| 12691A | | MPS Helium Redesign |
| 12699A | | Addition of Fast Sep Mode |
| 12704B | | Relocation of MPS Actuator Port Ch |
| 12716A | | Mnvr Exec Display Reformat |
| 12722 | | Manual Open Vent Doors During Entry |
| 12745 | | Deletion of OMS/OMS Interconnect Seq |
| 12771A | | Principal Function Deletions |
| 12826A | | Vent Door Control Update |
| 12836 | | RCS RCS Xfeed and Reconfiguration |
| 12868A | | I-Load Chg to Reflect Mode Team |
| 12881A | | Abort Vent Door |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|--|
| CR No. | OI | CR Title |
| 12896A | | Et Sep Seq Cleanup |
| 12897A | | MPS Dump Seq LOX and LH2 Inlet Press |
| 12901 | | Orbit OMS/RCS Interconnect Seq |
| 12928A | | SSME OPS Seq |
| 12938A | | XXXXXX Traj IDD |
| 12942A | | MPS TVC Actuator Bypass/Override |
| 12977 | | OMS Fire Seq Corrections |
| 12981D | | On Orbit Flight Control |
| 12993 | | I-Load FACI |
| 12994 | | I-Loads OFT-1 FACI U/D |
| 12997 | | ET Fast Sep (MEC SOP Impacts) |
| 19016 | | Seq Interface Cleanup |
| 19039C | | Ascent/Entry Structural PTI's |
| 19040 | | Maneuver Exec Doc Cleanup |
| 19048 | | SRB TVC RST/OVRD Scheduling |
| 19053A | | SRB Separation Seq Lash Up |
| 19060C | | Vent Door Seq |
| 19061A | | Fast Sep Chg to GRTLS FSSR |
| 19066B | | Correct and Define MECO Accuracy Rqmt |
| 19068A | | Main Engine Shut Down Switch Rm |
| 19081 | | MPS Ded Dis Drive Seq Mod |
| 19091B | | OMS/RCS Conn Fault Checks |
| 19092 | | OMS Fire Seq Commfault Checks |
| 19097A | | Addition To M Pad (I-Load) |
| 19100 | | FSSR Update |
| 19103A | | Abort Cont Seq Make Work Changes (Contingency Abort) |
| 19107C | | MM 102/3 Engine Out Moding Prevention |
| 19108A | | OMS to RCS Gaging Constants |
| 19142A | | Backup to MECO Confirmed |
| 19147 | | ET Sep Seq Commfault Processing |
| 19148 | | SSME SOP Commfault Processing |
| 19149 | | SSME OPS Commfault Processing |
| 19163A | | RSLs Cleanup |
| 19165 | | RCS Qty Mon (4.102) |
| 19173 | | RS Lch Seq I-Load Chg |
| 19176 | | RTLS Abort Mps Dump Term Software |
| 19208A | | OMS/RCS Additions To D/L |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|---|
| CR No. | OI | CR Title |
| 19222 | | ET Sep Switch Default and Override Pos |
| 19224B | | SSME OPS Prevalve I-Load |
| 19232 | | R/S Launch Sequence Additions for FRF |
| 19237 | | Flt Accel Safety Cutoff System (FASCOS) |
| 19238 | | R/S Lch Actuator Port Checks Mod |
| 19239 | | Fast Sep for MM 601 |
| 19240 | | Fast Sep I-Loads |
| 19300 | | FSSR Update II |
| 19358 | | Delete ET Sep IDD |
| 19371A | | FSSR SD 76-SH-0026A I-Load |
| 19404A | | Vent Door Seq |
| 19412 | | SRB Ign Delay I-Load |
| 19416A | | OMS/RCS I/C Repress Function Mod STS-2 |
| 19420 | | ET Sep Doc Change |
| 19440 | | MPS Fuel Dump Logic Correction |
| 19455 | | Measurement Attribute Corrections |
| 19464 | | Incorrect BCH Code |
| 19475 | | SSME SOP Documentation Chg |
| 19476 | | R/S Lch Seq Clarification |
| 19496 | | GPC Cmd Priority to SSME |
| 19500 | | FSSR Update 3 |
| 19507 | | Vent Door Seq on Orbit/Entry I-Load |
| 19532A | | ET SRB Seq/Umb Retract Time-Delay Chg |
| 19533A | | Addition of "C" Cmd to LO2 and LH2 Feedline Relief S/O Valve Close Commands |
| 19534A | | Addition of "C" Cmd to LH2 RTLS Man Repress Open Cmds MEC Non-Critical Comm |
| 19541 | | MEC Non-Critical Command Constraints |
| 19553C | | Crew Override of OMS Targets Via Item Entry (STS-2) |
| 19558 | | SSME SOP FASCOS Change |
| 19598A | | ATVC Deadface Requirements in SRB Sep Seq |
| 19623B | | Removal of 30% Chamber Pressure Interlock on Prevalve Close Commands |
| 19626 | | I-Load Correction |
| 19632 | | Incorrect Bch Code Specified for GPC to EIU Command Words |
| 19651 | | R/S Lch Seq Recycle I-Load |
| 19657 | | OMS Burn After RCS Roll Control |
| 19659 | | Vent Door Sequence |

Table R.2-1. Historical Change Request Summary

| CR No. | OI | CR Title |
|--------|----|--|
| 19664 | | Abort Control Seq Continuation of Intact OMS Dump |
| 19665 | | Abort Control Seq Continuation of Intact OMS Dump |
| 19681A | | Software Changes to Accommodate LO2 Low Level Sensor Relocation |
| 19686A | | FRF I-Load |
| 19698A | | RCS Quantity Monitor (STS-2 & Subs) |
| 19713 | | Make Work Correction CR 19280 and CR 12899A |
| 19736 | | Make Work Lashup of GRTLS DAP Reqmts to CR 19239 (MM 601 Fast Sep) |
| 19738A | | RCS Quantity Monitor Sequence Algorithm Constants and I-Load Values |
| 19770A | | ET Sep Seq Changes for Fast Sep after RTLS MECO |
| 19800 | | Update OMS/RCS Gaging Scale Factor |
| 19823A | | Vent Door Sequence Commands Termination |
| 19824A | | ET Umbilical Doors Command on Change only Sequence Termination |
| 19827A | | -Z Maneuver Initiation Modification |
| 19836 | | Close OMS TK ISO Valves for RTLS (OPS Single Point Failure) |
| 19837A | | AFT Compt RTLS Helium Purge |
| 19844 | | STS-1 RTLS Propellant Burn Time I-Load Changes |
| 19853A | | Fast Sep I-Load for ME LH2 Prevalve |
| 19857B | | Upp I-Load Req Change Agree with Implementation |
| 19893A | | Seq FSSR I-Load Symbolic Name Change |
| 19900 | | FSSR Update No. 5 |
| 19922 | | R/S Launch Seq 90% Check I-Load Change |
| 19923 | | Mod to CR 19664 - Abort Sequence, STS-2 OMS Fuel Quantity Commfault Monitoring |
| 19946A | | STS-1 Vent Door I-Loads |
| 19958A | | Ascent Flight Control Documentation Clean Up |
| 19964 | | SSME Command Path Failure (STS-1) |
| 19970 | | Deletion Of KI-Scale Factor 1 Flag |
| 19973 | | OMS Left/Right and OMS/RCS Valve Miscompare Reset |
| 19998A | | SSME Stagger Start |
| 29022 | | Reduction of LOX Residuals for Engine Out Low Level Shutdown |
| 29025B | | Pre-SRB Ignition Monitoring of FASCOS |
| 29037 | | Relocate LO2 Low Level Sensor |
| 29049 | | FRF I-Load Changes |
| 29081 | | Vent Door Sequence, Correction to CR 19823A |
| 29095 | | SSME SOP Command Change |
| 29099B | | Post MECO RCS Dump During RTLS |
| 29106B | | EIU 60 Kbps Output Switch |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|--|
| CR No. | OI | CR Title |
| 29119B | | SRB Sequence I-Load Update |
| 29142B | | Mpad I-Load Update No. 4 for STS-1 Cycle 3 |
| 29154B | | STS-1 RTLS Propellant Burn Time I-Load Change |
| 29162A | | I-Load Changes 'Owner Audit' |
| 29192 | | Vent Door Command Stagger Time for |
| 29207 | | Modification of CR 19998A |
| 29211 | | SSME Limit Control Inhibit/Enable (STS-2) |
| 29216 | | OMS/RCS Downlist Requirements Update |
| 29323A | | Computer CG Trim and Ign Press |
| 29328A | | Fast Sep Lw Lvl Sen ARM 601 |
| 29333B | | I-Load Changes Resulting from Owners Audit |
| 29343 | | Reset Event Time Start Flag |
| 29377 | | Vent Door Status and Override Words |
| 29378A | | OMS Valve Miscompare Message Cleanup |
| 29405A | | MPS Prevalve Oper to Preclude Possible Hardware Damage |
| 29429 | | MPS LH2 Feedline Press Relief |
| 29433 | | RCS Quantity Monitor Update |
| 29457 | | SSME Stagger Start Tolerance |
| 29471B | | HFE Overrun Definition |
| 29480B | | MEC SOP Non-Critical Cmds Init |
| 29481A | | SSME Chamber Pressure |
| 29503A | | RTLS ET Sep |
| 29548B | | Eng Timer for Thrust OK (I-Load) |
| 29551B | | I-Load Scrub - Seq |
| 29552B | | SRB Ign Time Delay |
| 29562 | | MPS TVC Ovrdr for Pre SRB FTS |
| 29574A | | Launch Seq Abort Logic STS-1 |
| 29582 | | RTLS Helium Purge I-Load |
| 29597A | | Delete I-Loads: ET Sep |
| 29603A | | SSME Downlist Data |
| 29607A | | MPS LH2 Low Level Delays |
| 29619A | | Calculation of Countdown Time |
| 29664 | | Latch ME-X TVC Servo Ovrdr Cmd |
| 29668A | | Cmd Path Fail |
| 29675 | | SSME Stagger Start TOL |
| 29720 | | Fast Sep/MM103/Two SSME Fail |
| 29725 | | AOA I-Load Title Correction |

Table R.2-1. Historical Change Request Summary

| CR No. | OI | CR Title |
|--------|----|--|
| 29737A | | Aft Comp/OMS Pod AOA Helium Purge |
| 29749B | | LPS Command Processing |
| 29762A | | Att Proc IDD Clean Up |
| 29775 | | Selective Inhibit of SSME S/D for Data Fail |
| 29783 | | SRB Sep Back-up Cue Time I-Load |
| 29793 | | ET Umbilical Door Closure |
| 29797C | | LH2 Dump Via Fill/Drain Valve |
| 29800 | | FSSR Update 8 |
| 29851 | | Delete CR 29211C – SSME Lim Cntl |
| 29855B | | HPOTP Overspeed at MECO |
| 29870C | | Add GMTLO to Downlist |
| 29872 | | Clean-up of CR 29552B |
| 29877B | | MPS Entry Helium Purge |
| 29879 | | Trans DAP Rate and Att D/B I-Load |
| 29880 | | ET Fast Sep I-Load Change |
| 29883 | | MPS LO2 Low Lvl Cutoff Delay |
| 29891A | | RTLS OMS Prop Dump I-Load Changes |
| 29943A | | CRT Time to Go to SRB Ign (Supersedes 29421) |
| 29970C | | Vent Door Purge Command Term |
| 29987 | | Post MECO RCS Dump-RTLS |
| 29996A | | Correct CR 29720 – Fast Sep/MM103 |
| 39000 | | FSSR Update 9 |
| 39022 | | LPS – Resume Count Command |
| 39065A | | LOX Low Level Cutoff Delay |
| 39079 | | LO2 Prevalve MECO I/L Change |
| 39080 | | FRF Throttle Cmd |
| 39091E | | Backup MECO Confirmed |
| 39103A | | OMS RTLS Prop Dump |
| 39110A | | Add LO2 Prevalve Close Cmds |
| 39137D | | SSME Fail Messages |
| 39220A | | OMS RTLS Prop Dump |
| 39244A | | MEC SOP ET Tumble |
| 39253A | | SSME Cmd Path Fail Check |
| 39261 | | RTLS Purge Initiation |
| 39265 | | RCS Qty Monitor Documentation |
| 39323A | | STS-2 Cycle 1 MPAD Abort I/L |
| 39326 | | ET Door Latch Cmd Reset |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|----------------------------------|
| CR No. | OI | CR Title |
| 39328B | | Delete FRF Requirements |
| 39358A | | RCS Qty Monitor Update I/L |
| 39370 | | RCS Qty Monitor Update |
| 39394 | | MPS LO2 Prevalve Cmds to RSLs |
| 39400 | | FSSR Update No. 10/R18 and R19 |
| 39401 | | Transatlantic Abort Landing |
| 39430 | | Latch Main Engine Safing Cmds |
| 39447C | | Single SSME OMS Press |
| 39452D | | LPS Control—SRB RSC Safe Cond |
| 39470A | | SRB Sep Seq and MEC SOP Doc |
| 39475A | | Delete MECO HE Injection Cmds |
| 39477 | | Launch Vent Door Sequence |
| 39478 | | OMS/RCS Connect Prior To RRA |
| 39492A | | Delete FASCOS Logic |
| 39503 | | SSME & SB Posn—Aborted Launch |
| 39520 | | Delete HE Vlv Ck—OMS Fire Seq |
| 39530F | | STS Cycle 2 I—Loads |
| 39564 | | Third LO2 LI Cutoff Timer |
| 39575 | | LO2 Low Level Cutoff Mod |
| 39579A | | Clarify RCS/RCS Xfeed and Recon |
| 39585 | | STS—2 Cycles 2 Rtls Dump I/L |
| 39612 | | Elim of SRP—Sep—Mode Flag |
| 39614 | | SRB Stagger Start Constant |
| 39624 | | Prevent Early Gear Deploy |
| 39630 | | OMS Dump Time for Updated CGC |
| 39651 | | TAL Abort Pre MECO Burn |
| 39681A | | Fast Sep in MM 103/I—Load Change |
| 39694 | | ORB OMS/RCS Conn Reprss Flag |
| 39718A | | SRB Ignition/Separation Cmd |
| 39721B | | Enable Gear Deploy at 800 FPS |
| 39732B | | Abort Downmode in MM 103 |
| 39846 | | RTLS OMS Prop Dump Delay |
| 39848A | | Delete Auto Recycle—SSME Sop |
| 39850 | | December Baseline |
| 39851A | | SRB TVC FDIR at ME Start |
| 39863C | | Countdown Hold/Abort Ind |
| 39877 | | LH2 LI Cutoff Documentation |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|--------------------------------|
| CR No. | OI | CR Title |
| 39964 | | Abort Control OMS on Time |
| 39965 | | RTLS Post MECO 4 + X Control |
| 39968A | | LO2/LH2 Dump Time Reduction |
| 39977 | | MECO Documentation Cleanup |
| 59019A | | HE ISO Vlv Open Cmd Terminate |
| 59077 | | Pad Data Path Fail |
| 59112B | | ET Umb Door/RCS Xfeed Cntl |
| 59126H | | RCS Xfeed MCA Optimization |
| 59216 | | RTLS LO2 Low Level—SSME = 104% |
| 59217C | | Vent Door Entry Config |
| 59224 | | Data Path Fail Flag Check |
| 59273C | | Abt Cont Seq—Select Intercnct |
| 59274 | | LO2 Bleed Vlv Close Time I/L |
| 59276 | | MPS Dump SW Nomenclature |
| 59329A | | Vent Door Cmd and FDBK Monitor |
| 59335A | | OV-099 RCS Qty Mon Update |
| 59337 | | RCS Qty Mon I-Loads Update |
| 59368 | | Vent Door Sequence Command |
| 59384 | | SRB Sep Time Delay for Abort |
| 59397 | | Bias Computation RCS Qty Mon |
| 59414A | | Event Times Reset at MECO |
| 59418 | | Post MECO NZ RCS Control |
| 59432A | | Inhibit FDI for SSME TVC Act |
| 59442B | | MEC Redesign |
| 59470 | | Bypass LO2 Ovbd Bleed Vlv Ck |
| 59610 | | PTM LO2 Low Level I/L |
| 59631 | | STS-9 Cy 1 Asc Abort I-Loads |
| 59654 | | Correct CR 28378A—OMS Vlv Msg |
| 59689A | | Correct CR 39863—D/L Vent Door |
| 59722 | | Event Timer Flag Post MECO |
| 59753A | | MEC Redesign MSID Changes |
| 59754C | | MCA Optimization MSID Changes |
| 59765 | | Latch RCS Qty Down Arrow |
| 59824 | | Clarify NZ Limit Processing |
| 59935 | | Delete Flag from ET Sep Seq |
| 59957 | | I-Load Scrub: Vent Door |
| 59973 | | I-Load Scrub: MPS |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|--|
| CR No. | OI | CR Title |
| 59996E | | LO2 ECO Sensor |
| 69063 | | SSME SOP Crit Pair Exception |
| 69074 | | SRB_SEP_ARM_BUFFER Assignment |
| 69159A | | Correct CR 59217C in MM 304 |
| 69177 | | CR 59077 Cleanup |
| 69184A | | MPS Low Level Time Delays |
| 69220F | | Centaur Abort Dump |
| 69482A | | Delete Prevalve Anti-Slam SW |
| 69555A | | TAL/RTLS Weather Alternate |
| 69600D | | OMS Guidance Improvements |
| 69635B | | Correct CR 59273C |
| 69684B | | ZFE Category Change |
| 69780B | | Delays OV-102 Unique RCS I/LS |
| 69919 | | LH2 Dump for RTLS |
| 69931B | | Staggered SSME Shtdn Priority (Superseded 69525) |
| 69951 | | Del SRB Pwr Off after SRB Sep |
| 69995D | | Dump LOX/LH2 Residuals |
| 79010 | | Dump LO2 Residuals |
| 79028 | | RCS Qty Mon—Doc only Fix |
| 79067 | | Modified RTLS LO2 Dump |
| 79079B | | Modified 7 Dump |
| 79134E | | OMS Burn in MM 304 |
| 79157 | | S/W Fix for Hyd Brake Lockup |
| 79190D | | Override Display Update |
| 79209B | | FWC SRB Timing |
| 79302 | | CR 69635B Corrections |
| 79304B | | OPS 3 Dump Clean Up |
| 79406A | | Override Display Clean Up |
| 79465A | | Vent Door Seq Software Rqmts (Superseded 79291) |
| 79469 | | Documentation Cleanup for CR 69995D |
| 79497 | | OMS Burntime Bias/SF |
| 79498 | | OMS Burn Time Bias |
| 79499 | | FSSR Update No. 5 STS 83-0026A |
| 79643A | | OMS Dump with 3 SSME's Failed |
| 79701A | | Cont ME Shutdn Cmd for Pad Abt |
| 79721 | | OMS Burn Time Bias Factor |
| 79797A | | OMS/RCS Intct Timer Fix |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|--|
| CR No. | OI | CR Title |
| 79928 | | Authorized Sequencer K-load Changes |
| 79933F | | Vent Door Seq Scrub CR |
| 79935H | | SRB RGA Rechannelization |
| 79964F | | RCS Reg Fail Protect Seq |
| 79971D | | Abort/Interconnect Flag Fix |
| 79972 | | Interconnect Timer Fix |
| 79973 | | Pad Data Path Fail Criteria |
| 79987D | | SRB Sep Seq-MDM Failures |
| 79992B | | STS 83-0026A Level C FSSR Sequencing Requirement |
| 79997A | | Intcon MPS Helium Pad Abort |
| 89108A | | Erroneous Eng Phase Flag Fix |
| 89140E | | Centaur Requirements Deletion |
| 89142B | | NZ Limit for MM304 OMS Dump |
| 89149B | | 8A Version of CR 79596C |
| 89150H | | Abort Control Seq Scrub |
| 89154B | | Dump Item Display Cleanup |
| 89157A | | SSME Limit Exceedance Pad Abort |
| 89165H | | MPS Feed Disc Latch Logic |
| 89185A | | Abt OMS/RCS Intrent Mode Trans |
| 89193D | | Abt Cntr Seq/Override Lashup |
| 89201A | | Main Eng Shutdown Indication |
| 89210B | | Smart Interconnect |
| 89229G | | Terminate OMS Dump Post-MECO |
| 89237 | | OMS/RCS I/C Doc Change |
| 89238 | | Zero Thrust Auto Dump Start |
| 89239B | | Cleanup of CR 89210B |
| 89246A | | Cleanup for CR 79964F |
| 89278A | | LH2 Prevalve Timer for Fast Sep |
| 89287A | | SSME OPS Scrub |
| 89313A | | Close LH2 Recirc Disc Vlv for Pad Abort |
| 89319C | 21 | I-Load Character Constraint |
| 89320 | | OMS/RCS I/C Doc Change |
| 89325B | | Low Lvl Snsr MOW Sgl Snsr Dis |
| 89348B | | MM103 Fast Sep Correction |
| 89349A | | Prevlv Closure for Pad Abort |
| 89352C | | Aft Manifold Jet Inh Reset Delay |
| 89354G | 20 | ET Umb Door Close TAL Abort |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|--|
| CR No. | OI | CR Title |
| 89355C | | Scrub Outboard Fill/Drain LCC from RSLs |
| 89369B | | PD3 Safing for Inflt Shutdown |
| 89389B | | SSME Continuous Commands |
| 89399B | | Post MECO LH2 Vent |
| 89400G | 22 | MPS LO2 Ovbd Bleed Valve Sensor Monitor |
| 89436A | | Lg Hyd Isol Vlv Open Cmd Time |
| 89456A | | FSSR 26 Errata/Doc Cleanup |
| 89465C | | MPS LH2 Dump RTLS Contingency |
| 89479 | | Contingency Dump Post-MECO Manual Start |
| 89505B | | Modify MPS MECO Helium Interconnect |
| 89705 | | Post MECO OMS NZ Termination Correction |
| 89809B | | CR 89505B Cleanup |
| 89810 | | Correction for 89150H |
| 89819 | | QD Failure Protection for RSLs Abort |
| 89846B | | CR 89809B Cleanup |
| 89875A | | Cleanup to CR 89819 |
| 89931 | 20 | Add RCS Display (Spec 23) to OPS 1 |
| 89944H | 24 | PFS/BFS Vent Door Sequence Enhancements |
| 89956A | | Abort Control Seq Corrections |
| 89968A | | 25 MS Timing Req for MEC Non-Crit Cmds |
| 89981A | 20 | Add Downlist Req For LPS Orbiter Doors |
| 89986H | 22 | OPS-1 IMU Alignment |
| 89990E | 21 | Single Engine Auto Contingency Abort |
| 89991E | 21 | Entry SSME Repositioning (for Drag Chute) |
| 90007G | 23 | MPS Dump Enhancements |
| 90023A | 20 | GN&C Checkout Configuration |
| 90054A | | Entry FCS Errata |
| 90102D | 21 | LDG Gear Extension Isolation Valve |
| 90114B | 21 | Abort Sequencing Redesign |
| 90120B | | Update Guidance Downmode Rqmts |
| 90122E | 22 | TAL DROOP Control |
| 90151A | 22 | Maintain Block 2 Controller DC Power |
| 90185A | 20 | Add CR Field to FSSR I/O Tables |
| 90188 | | Change Engine Start Time Computation |
| 90204A | 22 | Change OMS I-Loads to K-Loads |
| 90243C | 22 | Second Stage Auto Recognition of Second Engine Out |
| 90247 | 22 | Dual Abort Mode Timers for SRB Sep |

| Table R.2-1. Historical Change Request Summary | | |
|--|----|--|
| CR No. | OI | CR Title |
| 90248E | 22 | MPS 14 Inch Feedline Disconnect Valves |
| 90271 | 20 | Close RCS Helium Valves Based on High Tank Outlet Pressure |
| 90277A | | ET Sep Sequence Cleanup |
| 90443A | 22 | Re-Order RSLs Steps to Allow Earlier Platform Release |
| 90457A | 21 | SSME Blk 2 VDT Nomenclature |
| 90460 | 22 | SSME OPS Doc Cleanup |
| 90476F | 25 | Wraparound Yaw Jet System W/PTI Effector |
| 90482B | 22 | Documentation Cleanup for CR 90248E |
| 90532 | 22 | Delete SRB Sep Moding Flag from Downlist |
| 90540B | 23 | QHE2 02 I-Load to K-Load Conversion |
| 90576A | 21 | Cleanup of CR 89990E, Single Engine Auto Contingency Abort |
| 90583A | 20 | Quick LH2 Dump for RTLS |
| 90590 | 20 | Isolate LH2 4" Recirc Line from LH2 System During Entry |
| 90612A | 22 | Change Disconnect Flag from I-Load to K-Load |
| 90658B | 23 | MPS Dump; SSME Nozzle Position Cleanup |
| 90690A | 24 | Deletion of EQTN MSID Column from K-Load FSSR Tables |
| 90705H | 25 | 3 Engines Out Auto Contingency |
| 90726C | 24 | MPS 14 Inch Disconnect D/L Deletion and Nomenclature Change |
| 90748 | 23 | Interconnect Delay Timer Documentation Cleanup - DR 106662 |
| 90753A | 24 | Delete BFS Unreferenced Variables in Req-DR106275 |
| 90774 | 24 | Constants Names Clarification |
| 90790 | 24 | Add Memory Configuration to the FSSR I-Load Tables |
| 90814C | 24 | Add Description of Database Generated FSSR Parameter Tables |
| 90837G | 24 | Automatic Post Contact Firing Sequence |
| 90839 | 25 | 3 Engine Out LO2 Prevalve Closure |
| 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 |
| 91011 | 23 | Remove Pressurized HE Purge from Nominal LH2 MPS Dump |
| 91036B | 25 | Corrections and Cleanup to CR 90705H: 3 Engines Out Auto Contingency |
| 91066D | 25 | Standardize the FSSR Correlation Tables |
| 91078A | 25 | Document Vent Door Software Constraint |
| 92027B | 25 | TDMS-2 Required FSSR Changes |

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