

# Space Program Operations Contract

---

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

### INERTIAL MEASUREMENT UNIT SUBSYSTEM OPERATING PROGRAM

Prepared by The Boeing Company  
Space Exploration

Under Subcontract 6000132079, PDRD P1433q

December 14, 2007

DRD 1.4.3.3-q

Contract NNJ06VA01C



**STS 83-0013-34**  
**December 14, 2007**

This page intentionally left blank.



**STS 83-0013-34**

**SPACE SHUTTLE ORBITER OPERATIONAL LEVEL C  
FUNCTIONAL SUBSYSTEM SOFTWARE  
REQUIREMENTS  
GUIDANCE, NAVIGATION, AND CONTROL PART E  
INERTIAL MEASUREMENT UNIT  
SUBSYSTEM OPERATING PROGRAM**

**Issue Date: December 14, 2007**

**NASA Contract No. NNJ06VA01C, DRD 1.4.3.3-q  
USA Subcontract 6000132079, PDRD P1433q  
WBS 2.4.3.2**

**The Boeing Company  
Space Exploration**

This page intentionally left blank.

Prepared by  
**/s/ C. Bergman**

---

C. Bergman  
FSSR Documentation

**/s/ M. Reves**

---

M. Reves

G4.38 IMU INT PROC

Approved by

**/s/ D. Owen**

---

D. Owen, Product Manager  
Flight Software Requirements & Verification  
Flight Systems & Software Engineering

**/s/ D. Yang**  
**for J. Pendergrass**

---

J. Pendergrass

G4.208 IMU ON-ORB A/CAL  
G5.1 ORB IMU ALIGN

Approved by

**/s/ D. Bateman**

---

D. Bateman, Manager  
FSSR Documentation  
Flight Systems & Software Engineering

This page intentionally left blank.

## **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.

This page intentionally left blank.



**DOCUMENT CHANGE RECORD**

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

<b>DOCUMENT CHANGE RECORD</b>			
<b>Issue and Date</b>	<b>Change Summary/Effectivity</b>		
OI-34 Release December 14, 2007	This baseline release for effectivity OI-34 and subs includes:		
	<u>CR</u>	<u>OI</u>	<u>Title</u>
	93017G	33	Baseline RSS99D0100 with Expanded Downlist
	93160B	32	Year End Roll Over (YERO) Reset
	93175	32	Expand Effectivity of SCR 93160B

This page intentionally left blank.

**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.

<b>CHANGE REQUEST SUMMARY</b>			
<b>Paragraph</b>	<b>CR No.</b>	<b>OI</b>	<b>CR Title</b>
N/A	93175	32	Expand Effectivity of SCR 93160B
1.3-1.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.1.4	93160B	32	Year End Roll Over (YERO) Reset
4.5.4.1.1-1.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.1.1-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.2.2-1.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.2.2-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.3.4-1.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.3.4-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.5.1.1-1.(T)	93160B	32	Year End Roll Over (YERO) Reset
	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.5.1.1-2.(T)	93090E	33	Bearing Displays
4.5.4.6.1-1.(T)	93160B	32	Year End Roll Over (YERO) Reset
	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.6.1-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.6.1-3.(T)	93160B	32	Year End Roll Over (YERO) Reset
4.5.4.7.1-1.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.7.1-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.8.1-1.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist
4.5.4.8.1-2.(T)	93017G	33	Baseline RSS99D0100 with Expanded Downlist

This page intentionally left blank.

## Table of Contents

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
<b>1.0</b>	<b>INTRODUCTION.....</b>	<b>1</b>
1.1	PURPOSE .....	1
1.2	SCOPE.....	1
1.3	ORGANIZATION .....	1
<b>2.0</b>	<b>APPLICABLE DOCUMENTS.....</b>	<b>5</b>
2.1	LEVEL A DOCUMENTS .....	5
2.2	LEVEL B DOCUMENTS.....	5
2.3	LEVEL C DOCUMENTS.....	5
2.4	ICD DOCUMENTS.....	6
<b>3.0</b>	<b>OVERVIEW .....</b>	<b>7</b>
3.1	OPERATIONAL FLIGHT PROGRAM.....	7
3.2	IMPLEMENTATION CONSTRAINTS .....	7
3.2.1	Timing.....	7
<b>4.0</b>	<b>INERTIAL MEASUREMENT UNIT SOP.....</b>	<b>9</b>
4.1	REQUIREMENTS OVERVIEW .....	9
4.1.1	IMU Functional Overview .....	9
4.1.2	IMU SOP Functional Overview .....	19
4.1.3	Modules Summary.....	21
4.1.3.1	Module Cross-Reference. ....	23
4.1.4	Processing Sequences.....	25
4.1.5	Processing Rates and General Requirements.....	28
4.1.6	Computational and Coding Considerations .....	29
4.2	FUNCTIONAL REQUIREMENTS TRACEABILITY .....	29
4.3	DOCUMENTED REQUIREMENTS PRECEDENCE.....	32
4.4	PARAMETER INITIALIZATION .....	33

## Table of Contents

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
4.5	DETAILED REQUIREMENTS AND FORMULATIONS .....	37
4.5.1	IMU Minor Cycle Processing Modules.....	37
4.5.1.1	IMU BITE Processing (IMU_BITE).....	38
4.5.1.2	Accelerometer Processing (ACP_ACUM).....	45
4.5.1.3	Resolver Processing (RES_PROC).....	52
4.5.1.4	Gyro Torque Processing (GYO_TORQ).....	65
4.5.1.5	IMU BITE Summary (BITE_SUM) .....	69
4.5.2	IMU Major Cycle Processing Modules.....	74
4.5.2.1	Accelerometer Pulse Compensation (ACP_COMP).....	74
4.5.2.2	Gyro Compensation (GYO_COMP). .....	83
4.5.2.3	Accelerometer Pulse Transformation (ACP_TRSF). .....	88
4.5.2.4	Reference NWU-to-Cluster Transformation Update (T_UPDATE). .....	94
4.5.2.5	Torque Rate Transformation (TOR_TRSF).....	97
4.5.2.6	Large Angle Torquing (LAT_FUNC). .....	100
4.5.2.7	Least Squares Fit (LSF_FILR). .....	112
4.5.2.8	Navigation Base-to-Cluster Transformation (TNB_CL).....	119
4.5.2.9	Cluster-to-Cluster Relative Rate Computation (CL_CLRATE).....	124
4.5.2.10	Sinusoidal Excess Rate (SINE_EXRTE). .....	129
4.5.2.11	IMU Uplink Interface (IMU_UPLINK). .....	132
4.5.2.12	Redundant Gyro Monitor Compensation (RGM_COMP).....	134
4.5.3	Support Modules .....	139
4.5.3.1	Display Support (DISP_SUP). .....	139
4.5.4	IMU SOP Submodes .....	152
4.5.4.1	IMU Terminate/Idle Processing (TERM/IDLE). .....	152
4.5.4.1.1	Parameter Tables for IMU TERM/IDLE Processing.....	154
4.5.4.2	Initial Attitude Determination. ....	176

## Table of Contents

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
4.5.4.2.1	IMU Attitude Determination (IMU_ATT).....	176
4.5.4.2.2	Parameter Tables for IMU Attitude Determination. ....	185
4.5.4.3	IMU Hangar Calibration Modules. ....	217
4.5.4.3.1	Hangar Calibration A (HANG_CALA). ....	219
4.5.4.3.2	Hangar Calibration B (HANG_CALB).....	258
4.5.4.3.3	Hangar Calibration C (HANG_CALC).....	273
4.5.4.3.4	Parameter Tables for IMU Ground Calibrations.....	277
4.5.4.4	IMU Preflight Calibration Modules. ....	347
4.5.4.4.1	Preflight Callibration A (PFLT_CALA). ....	348
4.5.4.5	IMU Preflight Alignment. ....	369
4.5.4.5.1	Gyrocompass Alignment (GC_ALIGN). ....	369
4.5.4.5.1.1	Parameter Tables for IMU Gyrocompass Alignment. ....	387
4.5.4.5.2	Gyrocompass Alignment 1 (GC_ALIGN1). ....	429
4.5.4.6	IMU INERTIAL Submode Requirements. ....	444
4.5.4.6.1	Parameter Tables for IMU Inertial Processing.....	446
4.5.4.7	IMU On-Orbit Alignment (IMU_ORBIT_AL).....	478
4.5.4.7.1	Parameter Tables for IMU On-Orbit Alignment. ....	494
4.5.4.8	Platform Positioning (PLAT_POS).....	521
4.5.4.8.1	Parameter Tables for IMU Platform Positioning. ....	522
<b>5.0</b>	<b>SUPPLEMENTARY MATERIAL.....</b>	<b>547</b>
5.1	COORDINATE SYSTEM SUMMARY .....	547
<b>APPENDIX R</b>	<b>CHANGE AUTHORIZATION REFERENCES .....</b>	<b>557</b>
R.1	CR REFERENCE SUMMARY .....	557
R.2	HISTORICAL CHANGE REQUEST SUMMARY.....	560

This page intentionally left blank.



## List of Tables

<b><u>TABLE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
1.3-1.	Parameter Element Description .....	2
4.1.3-1.	IMU SOP Module Summary.....	22
4.1.3.1-1.	Modules Vs. Submodes.....	23
4.1.3.1-2.	Modules Vs. OPS Sequences .....	24
4.1.3.1-3.	IMU Submodes Vs. OPS Sequences.....	25
4.1.4-1.	IMU SOP Ground Sequences.....	27
4.1.5-1.	IMU SOP Processing Rates .....	29
4.2-1.	IMU SOP Requirements Traceability .....	30
4.2-2.	IMU SOP FSSR/PRD Correlation .....	32
4.4-1.	Initial Parameters Updated for Subsequent Submodes or OPS Sequences.....	34
4.4-2.	Computed Parameters for Use in Subsequent Submodes or OPS Sequences .....	36
4.4-3.	Initial Parameters Updated by Uplink/Initialization.....	36
4.5.1.1-1.	IMU_BITE Inputs .....	40
4.5.1.1-2.	IMU_BITE Outputs.....	41
4.5.1.2-1.	ACP_ACUM Inputs .....	47
4.5.1.2-2.	ACP_ACUM Outputs.....	48
4.5.1.3-1.	RES_PROC Inputs.....	57
4.5.1.3-2.	RES_PROC Outputs .....	59
4.5.1.4-1.	GYO_TORQ Inputs .....	66
4.5.1.4-2.	GYO_TORQ Outputs.....	67
4.5.1.5-1.	BITE_SUM Inputs .....	71

## List of Tables

<b><u>TABLE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.1.5-2.	BITE_SUM Outputs.....	72
4.5.2.1-1.	ACP_COMP Inputs.....	77
4.5.2.1-2.	ACP_COMP Outputs .....	80
4.5.2.2-1.	GYO_COMP Inputs .....	85
4.5.2.2-2.	GYO_COMP Outputs .....	86
4.5.2.3-1.	ACP_TRSF Inputs .....	90
4.5.2.3-2.	ACP_TRSF Outputs.....	91
4.5.2.4-1.	T_UPDATE Inputs.....	95
4.5.2.4-2.	T_UPDATE Outputs .....	95
4.5.2.5-1.	TOR_TRSF Inputs .....	98
4.5.2.5-2.	TOR_TRSF Outputs .....	98
4.5.2.6-1.	LAT_FUNC Inputs .....	105
4.5.2.6-2.	LAT_FUNC Outputs.....	106
4.5.2.7-1.	LSF_FILR Input.....	115
4.5.2.7-2.	LSF_FILR Output.....	116
4.5.2.8-1.	TNB_CL Inputs .....	121
4.5.2.8-2.	TNB_CL Outputs.....	122
4.5.2.9-1	CL_CLRATE Inputs .....	125
4.5.2.9-2.	CL_CLRATE Outputs.....	126
4.5.2.10-1.	SINE_EXRTE Inputs .....	130
4.5.2.10-2.	SINE_EXRTE Outputs .....	130

**List of Tables**

<b><u>TABLE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.2.11-1.	IMU_UPLINK Inputs.....	133
4.5.2.11-2.	IMU_UPLINK Outputs .....	134
4.5.2.12-1.	RGM_COMP Inputs .....	136
4.5.2.12-2.	RGM_COMP Outputs.....	137
4.5.3.1-1.	DISP_SUP Inputs.....	144
4.5.3.1-2.	DISP_SUP Outputs .....	148
4.5.4.1.1-1.	INPUT FUNCTIONAL PARAMETERS FOR IMU TERMINATE/IDLE PROCESSING (V4.11C).....	155
4.5.4.1.1-2.	OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C).....	160
4.5.4.1.1-3.	IMU TERMINATE/IDLE PROCESSING (V4.11C) I-LOADS .....	171
4.5.4.1.1-4.	IMU TERMINATE/IDLE PROCESSING (V4.11C) K-LOADS.....	172
4.5.4.1.1-5.	IMU TERMINATE/IDLE PROCESSING (V4.11C) CONSTANTS.....	173
4.5.4.2.1-1.	IMU_ATT Inputs .....	180
4.5.4.2.1-2.	IMU_ATT Outputs.....	180
4.5.4.2.2-1.	INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10).....	186
4.5.4.2.2-2.	OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10).....	194
4.5.4.2.2-3.	IMU ATTITUDE DETERMINATION (V4.10) I-LOADS .....	211
4.5.4.2.2-4.	IMU ATTITUDE DETERMINATION (V4.10) K-LOADS .....	212
4.5.4.2.2-5.	IMU ATTITUDE DETERMINATION (V4.10) CONSTANTS .....	213

**List of Tables**

<b><u>TABLE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.4.3-1.	Hanger Calibration A Parameters.....	217
4.5.4.3-2.	Hanger Calibration B Parameters.....	218
4.5.4.3-3.	Hanger Calibration C Parameters.....	218
4.5.4.3.1-1.	HANG_CALA Inputs.....	229
4.5.4.3.1-2.	HANG_CALA Outputs .....	233
4.5.4.3.1-3.	HANG_CALA Cluster Positions.....	238
4.5.4.3.1-4.	HANG_CALA Parameters Vs. Required Positions and Time.....	239
4.5.4.3.2-1.	HANG_CALB Inputs .....	263
4.5.4.3.2-2.	HANG_CALB Outputs .....	265
4.5.4.3.2-3.	HANG_CALB Calibration Parameter Update Equations .....	268
4.5.4.3.3-1.	HANG_CALC Inputs.....	276
4.5.4.3.3-2.	HANG_CALC Outputs .....	277
4.5.4.3.4-1.	INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A).....	278
4.5.4.3.4-2.	OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS .....	285
4.5.4.3.4-3.	INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS.....	328
4.5.4.3.4-4.	INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) K-LOADS .....	338
4.5.4.3.4-5.	INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) CONSTANTS .....	345
4.5.4.4-1.	Preflight Calibration A Parameters.....	347

## List of Tables

<b><u>TABLE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.4.4.1-1.	PFLT_CALA Position Angles.....	353
4.5.4.4.1-2.	PFLT_CALA Inputs.....	353
4.5.4.4.1-3.	PFLT_CALA Outputs.....	356
4.5.4.5.1-1.	GC_ALIGN Input .....	376
4.5.4.5.1-2.	GC_ALIGN Output.....	378
4.5.4.5.1.1-1.	INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11).....	388
4.5.4.5.1.1-2.	OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11).....	398
4.5.4.5.1.1-3.	IMU GYROCOMPASS ALIGNMENT (V4.11) I-LOADS.....	423
4.5.4.5.1.1-4.	IMU GYROCOMPASS ALIGNMENT (V4.11) K-LOADS .....	424
4.5.4.5.1.1-5.	IMU GYROCOMPASS ALIGNMENT (V4.11) CONSTANTS .....	425
4.5.4.5.2-1.	GC_ALIGN1 Inputs .....	434
4.5.4.5.2-2.	GC_ALIGN1 Outputs .....	436
4.5.4.6.1-1.	INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38).....	447
4.5.4.6.1-2.	OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38).....	458
4.5.4.6.1-3.	INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38) I-LOADS .....	475
4.5.4.6.1-4.	INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38) K-LOADS.....	476

**List of Tables**

<b><u>TABLE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.4.6.1-5.	INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38) CONSTANTS.....	477
4.5.4.7-1.	On-Orbit Alignment Options.....	486
4.5.4.7-2.	IMU_ORBITAL_AL Inputs.....	487
4.5.4.7-3.	IMU_ORBITAL_AL Outputs.....	488
4.5.4.7.1-1.	INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208).....	495
4.5.4.7.1-2.	OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208).....	503
4.5.4.7.1-3.	INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) I-LOADS.....	515
4.5.4.7.1-4.	INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) K-LOADS.....	516
4.5.4.7.1-5.	INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) CONSTANTS.....	517
4.5.4.8-1.	PLAT_POS Inputs.....	522
4.5.4.8-2.	PLAT_POS Outputs.....	522
4.5.4.8.1-1.	INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B).....	523
4.5.4.8.1-2.	OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B).....	531
4.5.4.8.1-3.	IMU PLATFORM POSITIONING (V4.11B) I-LOADS.....	541
4.5.4.8.1-4.	IMU PLATFORM POSITIONING (V4.11B) K-LOADS.....	542

**List of Tables**

<b><u>TABLE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.4.8.1-5.	IMU PLATFORM POSITIONING (V4.11B) CONSTANTS .....	543
R.1-1.	CR Reference Summary.....	557
R.2-1.	Historical Change Request Summary .....	560

This page intentionally left blank.



## List of Figures

<b><u>FIGURE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.1.1-1.(1)	IMU_BITE Flow Diagram (Sheet 1 of 3).....	42
4.5.1.1-1.(2)	IMU_BITE Flow Diagram (Sheet 2 of 3).....	43
4.5.1.1-1.(3)	IMU_BITE Flow Diagram (Sheet 3 of 3).....	44
4.5.1.2-1.(1)	ACP_ACUM Flow Diagram (Sheet 1 of 3).....	49
4.5.1.2-1.(2)	ACP_ACUM Flow Diagram (Sheet 2 of 3).....	50
4.5.1.2-1.(3)	ACP_ACUM Flow Diagram (Sheet 3 of 3).....	51
4.5.1.3-1.(1)	RES_PROC Flow Diagram (Sheet 1 of 4).....	61
4.5.1.3-1.(2)	RES_PROC Flow Diagram (Sheet 2 of 4).....	62
4.5.1.3-1.(3)	RES_PROC Flow Diagram (Sheet 3 of 4).....	63
4.5.1.3-1.(4)	RES_PROC Flow Diagram (Sheet 4 of 4).....	64
4.5.1.4-1.	GYO_TORQ Flow Diagram.....	68
4.5.1.5-1.	BITE_SUM Flow Diagram.....	73
4.5.2.1-1.(1)	ACP_COMP Flow Diagram (Sheet 1 of 2).....	81
4.5.2.1-1.(2)	ACP_COMP Flow Diagram (Sheet 2 of 2).....	82
4.5.2.2-1.	GYO_COMP Flow Diagram.....	87
4.5.2.3-1.	ACP_TRSF Flow Diagram.....	93
4.5.2.4-1.	T_UPDATE Flow Diagram.....	96
4.5.2.5-1.	TOR_TRSF Flow Diagram.....	99
4.5.2.6-1.(1)	LAT_FUNC Flow Diagram (Sheet 1 of 5).....	107
4.5.2.6-1.(2)	LAT_FUNC Flow Diagram (Sheet 2 of 5).....	108
4.5.2.6-1.(3)	LAT_FUNC Flow Diagram (Sheet 3 of 5).....	109

## List of Figures

<b><u>FIGURE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.2.6-1.(4)	LAT_FUNC Flow Diagram (Sheet 4 of 5) .....	110
4.5.2.6-1.(5)	LAT_FUNC Flow Diagram (Sheet 5 of 5) .....	111
4.5.2.7-1.	LSF_FILR Flow Diagram.....	118
4.5.2.8-1.	TNB_CL Flow Diagram.....	123
4.5.2.9-1.(1)	CL_CLRATE Flow Diagram (Sheet 1 of 2) .....	127
4.5.2.9-1.(2)	CL_CLRATE Flow Diagram (Sheet 2 of 2) .....	128
4.5.2.10-1.	SINE_EXRTE Flow Diagram.....	131
4.5.2.12-1.	RGM_COMP Flow Diagram.....	138
4.5.4.2.1-1.(1)	IMU_ATT Flow Diagram (Sheet 1 of 4) .....	181
4.5.4.2.1-1.(2)	IMU_ATT Flow Diagram (Sheet 2 of 4) .....	182
4.5.4.2.1-1.(3)	IMU_ATT Flow Diagram (Sheet 3 of 4) .....	183
4.5.4.2.1-1.(4)	IMU_ATT Flow Diagram (Sheet 4 of 4) .....	184
4.5.4.3.1-1.(1)	HANG_CALA Error Parameter Computations (Sheet 1 of 3).....	241
4.5.4.3.1-1.(2)	HANG_CALA Error Parameter Computations (Sheet 2 of 3).....	242
4.5.4.3.1-1.(3)	HANG_CALA Error Parameter Computations (Sheet 3 of 3).....	243
4.5.4.3.1-2.(1)	HANG_CALA Calibration Parameter Update Equations (Sheet 1 of 3) .....	244
4.5.4.3.1-2.(2)	HANG_CALA Calibration Parameter Update Equations (Sheet 2 of 3) .....	245
4.5.4.3.1-2.(3)	HANG_CALA Calibration Parameter Update Equations (Sheet 3 of 3) .....	246
4.5.4.3.1-3.(1)	IMU Cluster Calibration Positions (Sheet 1 of 2).....	247
4.5.4.3.1-3.(2)	IMU Cluster Calibration Positions (Sheet 2 of 2).....	248
4.5.4.3.1-4.(1)	HANG_CALA Flow Diagram (Sheet 1 of 9).....	249

## List of Figures

<b><u>FIGURE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.4.3.1-4.(2)	HANG_CALA (Block: HANG_CALA1) Flow Diagram (Sheet 2 of 9) .....	250
4.5.4.3.1-4.(3)	HANG_CALA (Block: HANG_CALA1) Flow Diagram (Sheet 3 of 9) .....	251
4.5.4.3.1-4.(4)	HANG_CALA (Block: Procedure 1) Flow Diagram (Sheet 4 of 9) .....	252
4.5.4.3.1-4.(5)	HANG_CALA (Block: Procedure 1 cont) Flow Diagram (Sheet 5 of 9).....	253
4.5.4.3.1-4.(6)	HANG_CALA (Block: Procedure 1 cont) Flow Diagram (Sheet 6 of 9).....	254
4.5.4.3.1-4.(7)	HANG_CALA (Block: Procedure 3) Flow Diagram (Sheet 7 of 9) .....	255
4.5.4.3.1-4.(8)	HANG_CALA (Block: Procedure 3) Flow Diagram (Sheet 8 of 9) .....	256
4.5.4.3.1-4.(9)	HANG_CALA (Block: Procedure 2) Flow Diagram (Sheet 9 of 9) .....	257
4.5.4.3.2-1.(1)	HANG_CALB Flow Diagram (Sheet 1 of 4).....	269
4.5.4.3.2-1.(2)	HANG_CALB (Block: HANG_CALB_2) Flow Diagram (Sheet 2 of 4).....	270
4.5.4.3.2-1.(3)	HANG_CALB (Block: HANG_CALB_2) Flow Diagram (Sheet 3 of 4).....	271
4.5.4.3.2-1.(4)	HANG_CALB (Block: HANG_CALB_3) Flow Diagram (Sheet 4 of 4).....	272
4.5.4.4.1-1.(1)	PFLT_CALA Calibration Error Parameter Computations (Sheet 1 of 3).....	360
4.5.4.4.1-1.(2)	PFLT_CALA Calibration Error Parameter Computations (Sheet 2 of 3).....	361
4.5.4.4.1-1.(3)	PFLT_CALA Calibration Error Parameter Computations (Sheet 3 of 3).....	362
4.5.4.4.1-2.(1)	PFLT_CALA Calibration Parameter Update Computations (Sheet 1 of 2).....	363
4.5.4.4.1-2.(2)	PFLT_CALA Calibration Parameter Update Computations (Sheet 2 of 2).....	364
4.5.4.4.1-3.(1)	PFLT_CALA Flow Diagram (Sheet 1 of 4).....	365
4.5.4.4.1-3.(2)	PFLT_CALA (Block: PFLT_CALA 1) Flow Diagram (Sheet 2 of 4) .....	366
4.5.4.4.1-3.(3)	PFLT_CALA (Block: PFLT_CALA 1) Flow Diagram (Sheet 3 of 4) .....	367
4.5.4.4.1-3.(4)	PFLT_CALA (Block: PFLT_CALA 2) Flow Diagram (Sheet 4 of 4) .....	368

## List of Figures

<b><u>FIGURE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.5.4.5.1-1.( 1 )	GC_ALIGN Flow Diagram (Sheet 1 of 7).....	380
4.5.4.5.1-1.( 2 )	GC_ALIGN Flow Diagram (Sheet 2 of 7).....	381
4.5.4.5.1-1.( 3 )	GC_ALIGN Flow Diagram (Sheet 3 of 7).....	382
4.5.4.5.1-1.( 4 )	GC_ALIGN Flow Diagram (Sheet 4 of 7).....	383
4.5.4.5.1-1.( 5 )	GC_ALIGN Flow Diagram (Sheet 5 of 7).....	384
4.5.4.5.1-1.( 6 )	GC_ALIGN Flow Diagram (Sheet 6 of 7).....	385
4.5.4.5.1-1.( 7 )	GC_ALIGN Flow Diagram (Sheet 7 of 7).....	386
4.5.4.5.2-1.( 1 )	GC_ALIGN1 Flow Diagram (Sheet 1 of 4).....	440
4.5.4.5.2-1.( 2 )	GC_ALIGN1 Flow Diagram (Sheet 2 of 4).....	441
4.5.4.5.2-1.( 3 )	GC_ALIGN1 Flow Diagram (Sheet 3 of 4).....	442
4.5.4.5.2-1.( 4 )	GC_ALIGN1 Flow Diagram (Sheet 4 of 4).....	443
4.5.4.7-1.( 1 )	IMU_ORBIT_AL Detailed Flow Diagram (Sheet 1 of 4).....	490
4.5.4.7-1.( 2 )	IMU_ORBIT_AL Detailed Flow Diagram (Sheet 2 of 4).....	491
4.5.4.7-1.( 3 )	IMU_ORBIT_AL Detailed Flow Diagram (Sheet 3 of 4).....	492
4.5.4.7-1.( 4 )	IMU_ORBIT_AL Detailed Flow Diagram (Sheet 4 of 4).....	493
5.1-1.	NWU Geographic Coordinate System .....	548
5.1-2.	Body Axis Coordinate System.....	549
5.1-3.	Navigation Base Coordinate System.....	550
5.1-4.(1)	Stable Member (IMU Cluster) Coordinate Sytem (Sheet 1 of 2).....	551
5.1-4.(2)	Stable Member (IMU Cluster) Coordinate System (Sheet 2 of 2) .....	552
5.1-5.	Earth-Fixed, Greenwich True-of-Date Coordinate System .....	553

**List of Figures**

<b><u>FIGURE</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
5.1-6.	Topodetic Coordinate System.....	554
5.1-7.	Aries Mean-of-1950 Cartesian Coordinate System .....	555

This page intentionally left blank.

## 1.0 INTRODUCTION

### 1.1 PURPOSE

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

### 1.2 SCOPE

This document contains the requirement details and formulations for those IMU SOP functions which are operative during the Orbital Flight Test (OFT). The SOP functions are those specified in the VU Level B functional requirements document.

### 1.3 ORGANIZATION

This document is organized into the following sections:

- 1.0 Introduction
- 2.0 Applicable Documents
- 3.0 Overview
- 4.0 Detail Level Requirements
- 5.0 Supplementary Material

Section 1 defines the purpose, scope, and organization of this document. Section 2 lists the applicable documents. Section 3 provides an overview of the OFT software functions and discusses the contents of Section 4. Section 4 specifies the requirement details and presents formulations of the functional requirements for each Subsystem Operating Program. It also contains applicable tables (Interface Definition Document (IDD) inputs/outputs, I-Loads, K-Loads, and Constants) located at the end of each Principal Function. Section 5 provides supplementary coordinate systems.

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

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

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



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

This page intentionally left blank.

## 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
- SS-P-0002-580 Shuttle Functional Level Requirements, Systems Management

### 2.3 LEVEL C DOCUMENTS

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

**STS 83-0013-34**  
**December 14, 2007**

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
	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 ICD 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 OPERATIONAL FLIGHT PROGRAM

The Operational Flight Program (OFP) represents the total computer program which operates in the Orbiter general-purpose flight computer. For the Orbiter flight tests, the OFP will consist of two versions; one for the Approach and Landing Test (ALT), and one for the Orbital Flight Test (OFT). The requirements for each OFP are specified at three levels:

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

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

### 3.2 IMPLEMENTATION CONSTRAINTS

The IMU SOP design is capable of recovering from the effects of many transient type errors. Accordingly, the software design and code shall not preclude this capability by causing a program halt, permanent discontinuance of IMU SOP processing or loss of protected data as a result of program check or error interrupts. Check or error interrupts shall either be prevented by software safeguards or standard fixup, and error returns shall be provided which are appropriate to the IMU SOP function as described in Level A CPDS, Section 4.6.4. The notes specified in the SOP’s (F1, F2, F3, etc.) refer to specific fixup as described in Level A CPDS.

#### 3.2.1 Timing

Timing in this document is related to error free processing conditions. See Level A CPDS SS-P-0002-170, Section 4.4.2A, for timing related to error processing conditions.

This page intentionally left blank.

## 4.0 INERTIAL MEASUREMENT UNIT SOP

The detailed functional requirements and formulations for the Inertial Measurement Unit (IMU) Subsystem Operating Program (SOP) are documented in Section 4.1. The IMU SOP defines the software associated with multiple IMU moding, self-test, failure identification, hangar calibration, preflight calibration, alignment, and inertial operation.

The IMU SOP defined in Section 4 is presented in several subsections. The scope and content of the subsections are as follows:

- A. Section 4.1, Requirements Overview, is an introduction to the IMU SOP. A functional overview of the hardware is presented for the purpose of defining hardware dictated constraints as well as to provide background information. Similarly, the functional overview of the software states certain software requirements which may not be stated elsewhere. This is especially true of certain commonly used processing sequences and the processing rates.
- B. Section 4.2 provides the reader with a traceability table which correlates the detailed requirements of this Level C document with the top-level functional requirements specified in the GN&C Level B CPDS and VU Level B CPDS.
- C. Section 4.3 lists all of the interface signals related to the data transmissions between the three IMU's and the IMU SOP, and between the IMU SOP principal functions.
- D. Section 4.4 provides a tabulation of all the required data load parameters (constants and variables) associated with the IMU SOP.
- E. Section 4.5 presents the detailed requirements and formulations for approximately 30 modules that constitute the IMU SOP.

### 4.1 REQUIREMENTS OVERVIEW

#### 4.1.1 IMU Functional Overview

The Shuttle IMU consists of an all-attitude, four gimbal, inertial, stabilized platform and associated equipment. The IMU includes the gimbal structure, gyros, accelerometers, power supplies, platform electronics, interface electronics, built-in test electronics (BITE), thermal control circuitry, and provisions for housing and mounting the various components. Resolvers within the IMU provide outputs proportional to attitude (gimbal angles), and accelerometer channels provide outputs proportional to changes in velocity. The gyros sense disturbances to the stable element (cluster) and develop signals that drive the platform stabilization loops. Under the control of the Shuttle general purpose computer, the IMU has the capability of orienting the cluster to any attitude, of generating velocity and attitude data to determine calibration parameters, of determining cluster alignment to a local vertical reference, and of providing velocity and attitude data for inertial (flight) operations.

The IMU resolvers provide roll, pitch, and yaw gimbal attitude outputs through the range 0 to 360 degrees for vehicle angular rates up to  $\pm 35$  deg/sec and angular accelerations up to  $\pm 35$  deg/sec<sup>2</sup>. The three IMU accelerometers provide linear acceleration along an orthogonal axis set for acceleration inputs up to  $\pm 6$  g's per axis.

**STS 83-0013-34**  
**December 14, 2007**

The IMU gimbal sequence is outer roll, pitch, inner roll, and azimuth. The outer roll gimbal rotates about a case supported pivot. The cluster consisting of the gyros and accelerometers is attached to the azimuth gimbal. The outer roll gimbal is redundant to the inner roll gimbal and is driven from error signals generated from disturbances to the inner roll gimbal. Gimbal flipping action, resulting in high rates on the outer roll gimbal, occurs when the pitch gimbal is displaced approximately 90 degrees with respect to the outer roll gimbal and a disturbance is applied to the inner roll gimbal. The three IMU cases are aligned colinearly on the navigation base, so that the pitch axes are colinear with the vehicle pitch axis, the forward end of each case being mounted  $10.6 \pm 0.5$  degrees pitch down from the X-Axis.

Power is applied to each IMU individually through manually controlled switches/circuit breakers. A switch scan discrete is available to indicate that power has been commanded to the IMU. However, a positive indication that the IMU is actually powered (IMU power present) is not available. The presence of IMU power is detected by the IMU SOP from monitoring other related discretes. When power is manually applied to the IMU, only the heater and blower circuits are energized. It nominally takes the IMU 30 minutes to achieve warmup and thermal equilibrium, although warmup can take as long as two hours under worst-case conditions. Completion of warmup is indicated by two discretes (logic 1), platform temperature ready, and CAPRI temperature ready. Safe temperatures (indicating the IMU is not overheating) are indicated by two additional discretes (logic 1), platform temperature safe and CAPRI temperature safe. The HAINS' CAPRI temperature ready and temperature safe discretes are set true (=1) when power is applied to the HAINS IMU. IMU performance characteristics may be degraded if the IMU is operated outside the normal temperature. Equipment damage is likely to occur if the IMU is continuously operated with an overtemperature condition.

Once warmup has been achieved and the IMU's have reached a STANDBY condition, they can be individually commanded to up-mode to the OPERATE modes. The software, in response to a manual command, issues the OPERATE command discrete to the IMU. The presence of this discrete input to the IMU (logic 1) causes the IMU to cycle through a runup sequence in which it becomes fully powered and operable. The runup sequence normally takes between 29.4 and 45.4 seconds for the KT-70 and between 80.7 and 88.7 seconds for the HAINS IMU and is concluded by the issuance of an in-operate discrete (logic 1) from the IMU. During the runup sequence and the OPERATE mode, the serial digital interface is activated in addition to the discrete interfaces previously discussed. It should be noted that the IMU has an internal delay timer designed to prevent equipment damage should the IMU be commanded to the OPERATE mode within less than 3 minutes (+0.75, -0.5 minutes) from a previous downmode to STANDBY or if power is interrupted. If necessary, the IMU's can be commanded to the OPERATE mode before the normal warmup period has been completed. However, degraded performance may be expected under these circumstances.

In OPERATE mode, the IMU will support all of the major functions of calibration, alignment, self test, inertial operation, and on-orbit operations. The IMU's can be individually downmoded from OPERATE to STANDBY by removal of the OPERATE command discrete (time interval of 1 to 4 seconds at logic 0 required to downmode). The IMU will respond by removing the in-operate discrete (logic 0), deactivating the serial digital interface, initiating the three-minute rundown timer, and removing all internal power except for the heater and blower circuits.

The IMU's can be downmoded to the off state individually by manually turning off power to the IMU. All circuits, including the heaters, are deactivated in the off state. The IMU's can be safely powered-down from either the warmup/STANDBY mode or the OPERATE mode.

Each IMU has both one-speed (1X) and eight-speed (8X) resolvers on the outer roll, pitch, inner roll, and yaw gimbals. Only the 8X inner roll resolver is read out; both the 1X and 8X roll, pitch, and yaw resolvers



are read out. The 1X resolver electrical output represents the true gimbal mechanical angle; whereas, for greater resolution, the 8X resolver electrical output represents eight times (Modulo 360) the true mechanical angle. The IMU SOP applies the proper logic to extract the correct angle data. In addition, a measurement representing redundant axis rate is available on IMU data word 2.

Each IMU contains three velocity registers that accumulate the delta velocity. The three velocity accumulators are initially set to zero upon upmoding to the OPERATE mode. The accumulators are 16-bit up/down counters, which, when filled will overflow to zero and continue counting. The IMU SOP applies the proper logic to detect overflow and to maintain the correct velocity accumulation. The individual IMU can be operated with either high- or low-gain accelerometer/CAPRI scale factor. High-gain (nominal scale factor of 0.00344488 ft/sec/pulse) results in ten times more velocity pulse accumulations for a given acceleration input than down low gain (nominal scale factor of 0.0344488 ft/sec/pulse). The IMU SOP controls the gain by setting the appropriate bit in command word two transmitted to the IMU (logic 1 is high gain). In OPERATE mode, the IMU D8 sequencer discrete provides a positive indication of accelerometer gain setting. Most ground operations are normally done in high gain; whereas the flight operations are generally done in low gain. It must be noted that the phasing of the Z accelerometer is negative with respect to the X and Y accelerometers. The IMU SOP must provide the necessary phase reversal.

The IMU gyros may be slewed at a rate of 1.2 deg/sec under control of the IMU SOP. The SOP sets the appropriate slew bits in command word two to logic 1 (for each IMU individually) to cause slewing of the roll, pitch, and yaw gimbals. Six slew bits are available for slewing in either plus or minus direction about each of the three axes. Slewing continues for as long as the bits are set to logic 1. Slewing is normally used whenever large angle cluster repositioning is required. After cluster repositioning is completed, a thermal stabilization period is normally observed before accelerometer and resolver data are utilized.

Gyro torquing is accomplished under control of the IMU SOP to move the cluster through small angles to a precise position and also to maintain a required cluster angular rate. Torquing is commanded individually for each IMU and for each gyro axis within an IMU. The IMU SOP provides three 5-bit torquing words (for X, Y, and Z gyros) in command word one, which is transmitted to the IMU. Negative torquing is required by the IMU to be in 2's complement form. The IMU counts down the torquing bits at the rate of one bit every 5 milliseconds. Therefore, for continuous torquing rates, the IMU SOP must continuously output torquing commands at a suitable refreshment rate.

Each IMU contains BITE circuitry that monitors the health and status of various internal circuits and performance characteristics. The BITE/status indicators are packed into IMU word one, which is transmitted to the computer. The BITE word becomes active during the runup sequence and is monitored by the IMU SOP during OPERATE mode to detect IMU failures. The BITE word is transmitted in addition to the temperature, pressure, and operate discretely previously discussed.

In addition to the BITE word, each IMU also provides an echo (to the SOP) of command words one and two, which were previously transmitted to the IMU. The IMU SOP performs an echo check to determine the health of the data link and the probable validity of the input words received from the IMU. The IMU also checks the validity of command words one and two received from the IMU SOP. If a discrepancy is detected, the IMU sets the appropriate transmission failure bits in the BITE word. The IMU does not use an input word in which it detected an error. Systems software (FCOS) also sets failure flags whenever I/O transmission errors are detected on the data bus.

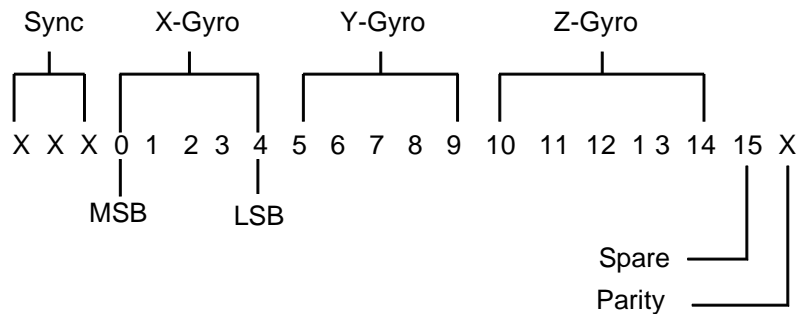
Input and output transmission between the three IMU's and the IMU SOP are accomplished at the same rate. The rates are specified elsewhere in this document and are a function of the particular operating

phase. Both torquing commands (word 1) and slewing commands (word 2) are transmitted to the IMU each cycle. Similarly, all 14 of the data words are transmitted to the computer on each cycle. The digital input and output words are 16 bits in size, plus three bits for synchronization and one bit for odd parity. Generally, throughout the IMU SOP, the sync and parity bits are disregarded, and the most significant data bit in the word is designated as bit 0 with the least significant bit being bit 15.

The contents, format, and bit values of the two command words to the IMU and the 14 data words from the IMU are as follows:

A. Command Words (Computer to IMU)

1. Command Word 1 – Gyro Torquing

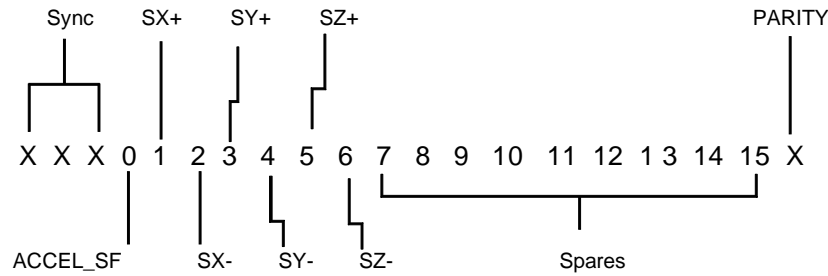


The three gyro torquing words (five bits) are identical in format. Positive pulses are coded in normal binary with a range of 0 to 15 pulses. Negative pulses are coded in 2's complement binary with a hardware range of -1 to -16 pulses. Torquing command words are illustrated as follows:

No. of Pulses To Be Sent (Positive)	Binary Word	No. of Pulses to Be Sent (Negative)	Binary Word
0	00000		
1	00001	1	11111
2	00010	2	11110
3	00011	3	11101
.	.	.	.
15	01111	15	10001
		16	10000

Torquing words count down within the IMU and must be periodically transmitted by the computer to maintain continuous torquing. The bit value of the LSB is nominally -0.5 arc seconds per pulse. Positive pulses within the X gyro word segment will cause a negative rotation about the X platform axis. Negative pulses will cause a positive rotation. The Y and Z Gyro word segments cause similar rotations about their respective axis.

2. Command Word 2 – Scale Factor and Slew



Setting the accelerometer scale factor (ACCEL\_SF) bit to logic 1 sets the accelerometer/Capri gain for all three channels (X, Y, Z) to high-gain scale factor (9340 pps/g nominal). Logic 0 results in low gain (934 pps/g nominal).

The slew positive and slew negative bit when set to logic 1 cause the respective axis (X, Y, Z) to be slewed at 1.2 DEG/SEC rate (maximum slew rate). Slewing will continue until the bits are set to logic 0. Only 1 bit (+ or -) shall be set per axis. The setting of a positive slew bit to logic 1 will cause the platform to rotate in the negative direction about the applicable axis. The negative slew bit causes rotation in the positive direction.

B. IMU Data Words (IMU to Computer)

Data Word 1 – Mode/BITE Status

<u>Bit Number</u>	<u>KT-70 Assignment</u>	<u>HAINS Assignment</u>
X	SYNC	SAME
X	SYNC	SAME
X	SYNC	SAME
0	KT70 GOOD	HAINS GOOD
1	I/O FAIL	MUX FAIL
2	A/D FAIL	A/D FAIL
3	PLATFORM FAIL	PLATFORM FAIL
4	POWER CONTROLLER FAIL	DIGITAL SUBSYSTEM FAIL
5	DC/DC NO. 1 FAIL	DC/DC CARD FAIL
6	FILTER/DC NO. 2 FAIL	DISCRETE POWER SUPPLY FAIL
7	RX CURRENT FAIL	RX FAIL
8	POWER CONDITIONER OVERTEMPERATURE	CIRCUIT CARD OVERTEMPERATURE
9	TRANSMISSION WORD 1 FAIL	SAME
10	TRANSMISSION WORD 2 FAIL	SAME
11	D1 or D8 SEQUENCER DISCRETE	D1 OR D8 SEQUENCER DISCRETE
12	D2 SEQUENCER DISCRETE	SAME
13	D3 SEQUENCER DISCRETE	SAME
14	D4 SEQUENCER DISCRETE	SAME
15	D5 SEQUENCER DISCRETE	SAME
X	PARITY	

Data Word 1 – Bit Assignment/Function

Bit  
Number

Function

For KT70

0

KT70 GOOD. This bit is set to logic 1 if none of the following conditions occur:

Platform fail  
DC/DC No. 1 fail  
Filter/DC No. 2 fail  
Power controller fail  
Power conditioner overtemperature  
A/D converter fail  
I/O fail  
RX current fail

For HAINS

HAINS GOOD. This bit shall be set to logic “1” if none of the following conditions occurs:

A/D converter failure  
Platform failure  
DC/DC failure  
Discrete power supply failure  
Digital subsystem failure  
Circuit card overtemperature  
MUX failure  
Resolver (RX) failure

Bit  
Number

Function

1 I/O FAIL (For KT-70). This bit is set to logic 1 if a failure is detected in an end-around transmission test to be performed on data word 13.

MUX FAIL (For HAINS). This bit shall be set to logic “1” when either a failure is detected in the end-around transmission test performed on output words, or when the MUX BITE detects a fail condition.

2 A/D FAIL (For KT-70). This bit is set to logic 1 when the A/D converter and interpolator (in the I/O) indicates a fail condition during its self-test.

A/D FAIL (For HAINS). This bit shall be set to logic “1” when the A/D converter BITE detects a fail condition.

- 3 PLATFORM FAIL (For KT-70). This bit is set to logic 1 when PLATFORM FAIL BITE detection is made or when a failure of the platform BITE circuitry is detected during BITE-on-BITE test. PLATFORM FAIL is not issued when the platform BITE inhibit is connected to unipoint ground.

PLATFORM FAIL (For HAINS). This bit shall be set to logic “1” when either the platform BITE or the gyro wheel supply BITE detects a failure.

- 4 POWER CONTROLLER FAIL (For KT-70). This bit is set to logic 1 when either a POWER CONTROLLER FAIL BITE detection is made or a failure of the power controller BITE circuitry is detected during the BITE-on-BITE tests.

DIGITAL SUBSYSTEM FAIL (For HAINS). This bit shall be set to logic “1” when the BITE detects a failure on any of the following circuit cards: CPU, I/O or memory.

- 5 DC/DC CARD NO. 1 FAIL (For KT-70). This bit is set to logic 1 when either a DC/DC No. 1 FAIL BITE detection is made or when a DC/DC NO. 1 BITE circuit failure is detected during the BITE-on-BITE test.

DC/DC CARD FAIL (For HAINS). This bit shall be set to logic “1” when the dc/dc fail BITE detects a fail condition.

- 6 FILTER/DC CARD NO. 2 FAIL (For KT-70). This bit is set to logic 1 when either a FILTER/DC NO. 2 FAIL BITE detection is made or when a FILTER/DC NO. 2 BITE circuit failure is detected during the BITE-on-BITE test.

DISCRETE POWER SUPPLY FAIL (For HAINS). This bit shall be set to logic “1” when the BITE fail detection is made of the +5 vdc isolated power supply used to power the HAINS discretes.

- 7 RESOLVER CURRENT FAIL (For KT-70). This bit is set to a logic 1 when the resolver current exceeds its allowable tolerance.

RESOLVER FAIL (For HAINS). This bit shall be set to logic “1” when either the resolver voltage or current exceeds its allowable tolerance.

- 8 POWER CONDITIONER OVERTEMPERATURE (For KT-70). This bit is set to logic 1 when a PC overtemperature condition is detected.

CIRCUIT CARD OVERTEMPERATURE (For HAINS). This bit shall be set to logic “1” when a circuit card overtemperature condition is detected.

- 9 TRANSMISSION WORD 1 FAIL. This bit is set to logic 1 if a failure of parity, gap, or Manchester coding occurs in command word 1.

- 10 TRANSMISSION WORD 2 FAIL. This bit is set to logic 1 if a failure of parity, gap, or Manchester coding occurs in command word 2.

- 11 D1 or D8 SEQUENCER DISCRETE (For KT-70). This bit is set to a logic 1 when the D1 or D8 discrete from the sequencer goes to a logic 1. At 6.6 seconds after POWER ON RESET (POR), this discrete is D1 and is set to logic 0 to start the vertical gyro rotating. At 19.8

seconds after POR, the discrete is D8 and functions to set high-gain (logic 1) or low-gain (logic 0) scale factor for the velocity (CAPRI) outputs.

D1/D8 SEQUENCER DISCRETE (For HAINS). This bit, which initially represents the D1 sequence-up discrete, shall be set to a logic "1" at logic reset. This bit is set to a logic "0" / .6 seconds after logic reset in order to start the vertical gyro wheel rotating at 240 Hz. After the in-operate-mode discrete is issued by the HAINS, this bit is designated D8. The D8 bit then represents the velocity channel gain. At logic "0", the channel is set at low gain; at logic "1", it is set at high gain.

- 12 D2 SEQUENCER DISCRETE. This bit is set to a logic 1 when the D2 discrete from the sequencer goes to a logic 1. Its function is to close low-gain isolation loops around the vertical gyro axes.
- 13 D3 SEQUENCER DISCRETE. This bit is set to a logic 1 when the D3 discrete from the sequencer goes to a logic 1. Its function is to close high-gain isolation loops around the vertical gyro axes and start the azimuth gyro wheel.
- 14 D4 SEQUENCER DISCRETE. This bit is set to a logic 1 when the D4 discrete from the sequencer goes to a logic 1. Its function is to close the low-gain isolation loops around the azimuth gyro axes.
- 15 D5 SEQUENCER DISCRETE. This bit is set to a logic 1 when the D5 discrete from the sequencer goes to a logic 1. The function of D5 is to close the high-gain isolation loops around the azimuth gyro and to close the redundant gyro capture loop.

Data Word 2 - Redundant Axis Rate

<u>Bit Number</u>	<u>Assigned Value</u>	
X	SYNC	
X	SYNC	
X	SYNC	
0	SIGN	(0 is negative, 1 is positive)
1	*	
2	70.656	} Bit value (deg/hr)
3	35.328	
4	17.664	
5	8.832	
6	4.416	
7	2.208	
8	1.104	
9	0.552	
10	0.276	
11	0.138	
12	SPARE	
13	SPARE	
14	SPARE	
15	SPARE	
X	PARITY	

When bit 0 is logic 1, the cluster rotates in the positive sense about the redundant axes.

\*When bit 1 is logic 1, a voltage saturation is indicated. This condition invalidates the redundant axis rate data word. The range of the redundant axis rate is  $\pm 120$  degrees/hour.

Data Words 3 to 9 – Resolver Angles

<u>Bit No.</u>	<u>Assigned Value (Degrees)</u>	<u>Word Number</u>	<u>Data Word</u>
X	SYNC	3	$\theta$ RL (8X) INNER ROLL
X	SYNC	4	$\theta$ XM (1X) OUTER ROLL
X	SYNC	5	$\theta$ XL (8X) OUTER ROLL
0	180.0000000000	6	$\theta$ YM (1X) PITCH
1	90.0000000000	7	$\theta$ YL (8X) PITCH
2	45.0000000000	8	$\theta$ ZM (1X) AZIMUTH
3	22.5000000000	9	$\theta$ ZL (8X) AZIMUTH
4	11.2500000000		
5	5.6250000000		
6	2.8125000000		
7	1.4062500000		
8	0.7031250000		
9	0.3515625000		
10	0.1757812500		
11	0.0878906250		
12	0.0439453125		
13	SPARE		
14	SPARE		
15	SPARE		
X	PARITY		

Note: The 8X resolver data are in electrical degrees and must be divided by 8 to generate equivalent mechanical degrees.



Data Words 10 to 12 – Velocity Words

<u>Bit Number</u>	<u>Count Value</u>	<u>Word No.</u>	<u>Data Word</u>
X	SYNC	10	V <sub>x</sub> VELOCITY
X	SYNC	11	V <sub>y</sub> VELOCITY
X	SYNC	12	V <sub>z</sub> VELOCITY
0	32,768		
1	16,384		
2	8,192		
3	4,096		
4	2,048		
5	1,024		
6	512		
7	256		
8	128		
9	64		
10	32		
11	16		
12	8		
13	4		
14	2		
15	1		
X	PARITY		

Note: The V<sub>z</sub> velocity data are inverted (for word 12, the values shown are negative)

Nominal pulse value = 0.0344488 ft/sec/pulse (low gain) or  
= 0.00344488 ft/sec/pulse (high gain)

Data Words 13 and 14 – Echo Words

Data words 13 and 14 are the echo of command words 1 and 2, respectively. Therefore, the format and content of data words 13 and 14 are the same as command words 1 and 2.

Data words 13 and 14 will reflect the most recent transmission of command words 1 and 2. It should be noted that the IMU sets data word 14 to zero after it has been read.

**4.1.2 IMU SOP Functional Overview**

The Orbiter IMU SOP controls and monitors the operation of the three IMU's and processes IMU data for use by other program elements. The IMU Control Spec Function interfaces with the IMU hardware previously defined to perform the moding functions associated with the transitions between off, warmup/STANDBY, and OPERATE. The IMU SOP responds to inputs from the User Interface function and provides responses to User Interface (UI), as required. The IMU SOP performs logical operations on input/output data validity indicators and IMU\_BITE data and conducts software aided BITE tests to determine the status and quality of IMU data. The IMU SOP then reports this status to UI, RM, and other affected software elements.

In the OPERATE mode, the IMU SOP responds to User Interface requests to perform various submode options as follows:

A. Terminate/Idle. This option represents the quiescent or default state of IMU SOP processing. The torque and slew outputs are set to zero. Resolver, accelerometer, and BITE data are processed for DISPLAYS whenever the IMU control/monitor DISPLAYS are active.

B. Attitude Determination. The attitude determination submode computes the transformation from navigation base to the north/west/up reference coordinate system. This transformation is a prerequisite for running all subsequent options involving alignment and calibration. Therefore, it should be noted that this option must be executed for each IMU every time that the vehicle/ navigation base is moved or whenever the transformation data may have been destroyed in GPC memory. The attitude determination function utilizes resolver and velocity data to determine the orientation of the navigation base with respect to an NWU coordinate frame. A gyrocompassing technique is used to determine the position of north, west, and up relative to cluster position. This, in conjunction with the gimbal angles, is used to define the required navigation base-to-NWU transformation. It should be noted that a specific cluster orientation is not required, but generally the cluster will be near the initial caged position as attitude determination will normally be performed shortly after runup. The duration of this submode is approximately 4 minutes.

C. Hangar Calibration A. The hangar calibration A submode consists of a calibration of (1) accelerometer biases, scale factors, symmetry, and misalignments; (2) gyro scale factors, restraints, mass unbalances, and misalignments; and (3) redundant gyro scale factors, restraints, and mass unbalances. Hangar calibration A is a sequence normally consisting of several cluster positions where velocity data are collected to be used subsequently to compute updated values for the calibration parameters. Hangar calibration A takes approximately 8 hours and must be accomplished within 14 days prior to flight. Hangar calibration A is normally accomplished on all three IMU's simultaneously.

D. Hangar Calibration B. The hangar calibration B submode consists of a calibration of resolver offsets, outer roll gimbal nonorthogonality, and gyro and accelerometer misalignments. Data for each IMU are collected in four calibration conditions involving two positions and two rates. Hangar calibration B software requires that at least two IMU's be operating simultaneously. A complete hangar calibration B for all three IMU's takes approximately 2-1/2 hours.

E. Hangar Calibration C. The hangar calibration C submode consists of a calibration of the IMU-to-IMU relative attitude errors for the selected skewed cluster position. A set of parameters representing the difference between the relative attitude between clusters measured by resolver and accelerometers is derived. Hangar calibration C software requires that at least two IMU's be in OPERATE. This submode requires approximately 3 minutes.

F. Preflight Calibration A. The preflight calibration A submode consists of a calibration of accelerometer scale factors and biases; gyro restraints and gyro mass unbalances; and redundant gyro scale factors, restraints, and mass unbalances. Preflight calibration A is a sequence normally consisting of seven cluster positions where velocity data and drift rates are collected for subsequent use in computing updated values for the calibration parameters. Preflight calibration A takes approximately two hours and must be accomplished within 15 hours prior to flight. The IMU must remain in the OPERATE mode after this calibration, through the preflight countdown, and into the flight mode in order to support critical performance requirements. Preflight calibration A is normally accomplished on all three IMU's simultaneously.

G. Preflight Alignment. The preflight alignment submode establishes each IMU's cluster orientation relative to Aries mean-of-1950 coordinate system prior to launch. It also provides ground-to-flight switchover functions, as well as the software interface for the crew initiated INERTIAL command. Preflight alignment consists of a two-position gyrocompassing procedure, followed by repeated measurements and error torque-out in gyrocompass position two, and the final preflight transformation and velocity initializations that establish the navigation reference.

H. INERTIAL Operation. The INERTIAL submode consists of operating the IMU in an inertial state to provide velocity and attitude data for flight computations. The IMU is torqued only to correct for errors due to gyro drifts.

I. On-Orbit Alignment. The purpose of the on-orbit alignment submode is to provide an accurate definition of the IMU cluster orientation with respect to inertial space. This may be done by physical realignment to known references. The time required for this submode is variable depending on which of the several available options the crew chooses to employ. A physical realignment of the cluster through large angles may take in excess of two hours.

J. Platform Positioning. The platform positioning submode consists of positioning the platforms to manually selected orientations to support checkout.

#### **4.1.3 Modules Summary**

The modules that constitute the IMU SOP are defined in Table 4.1.3-1. Each of the modules, including functions and formulations, are presented in detail in Section 4.5. The format used in documenting each module consists of the following:

- Name and purpose
- Functional requirements
- Interface requirements
- Detailed requirements
- Special considerations (optional)
- Input table
- Output table
- Flow diagram (optional)

The IMU SOP modules are grouped into minor cycles fast rate processing modules, major cycle slow rate processing modules, support modules, and the higher level modules associated with manually selectable submode options. The module entries in Table 4.1.3–1 show the respective grouping.

Table 4.1.3-1.IMU SOP Module Summary		
Module Name	Applicable Paragraph	Module Description
IMU_BITE	4.5.1.1	IMU_BITE processing
ACP_ACUM	4.5.1.2	Accelerometer processing
RES_PROC	4.5.1.3	Resolver processing
GYO_TORQ	4.5.1.4	Gyro torque processing
BITE_SUM	4.5.1.5	BITE summary
ACP_COMP	4.5.2.1	Accelerometer pulse compensation
GYO_COMP	4.5.2.2	Gyro compensation
ACP_TRSF	4.5.2.3	Accelerometer pulse transformation
T_UPDATE	4.5.2.4	Reference to cluster transform update
TOR_TRSF	4.5.2.5	Torque rate transformation
LAT_FUNC	4.5.2.6	Large angle torquing
LSF_FILR	4.5.2.7	Least squares fit processing
TNB_CL	4.5.2.8	Navigation base to cluster transformation
CL_CLRATE	4.5.2.9	Cluster-to-cluster relative rate
SINE_EXRTE	4.5.2.10	Sinusoidal excess rate
IMU_UPLINK	4.5.2.11	IMU uplink interface
RGM_COMP	4.5.2.12	Redundant gyro monitor compensation
DISP_SUP	4.5.3.1	Display support
TERM/IDLE	4.5.4.1	Term/Idle
IMU_ATT	4.5.4.2.1	IMU attitude determination
HANG_CALA	4.5.4.3.1	Hangar calibration A
HANG_CALB	4.5.4.3.2	Hangar calibration B
HANG_CALC	4.5.4.3.3	Hangar calibration C
PFLT_CALA	4.5.4.4	Preflight calibration
GC_ALIGN	4.5.4.5.1	Gyrocompass alignment
GC_ALIGN1	4.5.4.5.2	Gyrocompass alignment 1
INERTIAL	4.5.4.6	Inertial
IMU_ORBIT_AL	4.5.4.7	IMU on-orbit alignment
PLAT_POS	4.5.4.8	Platform positioning

**4.1.3.1 Module Cross-Reference.**

The tables in this section are intended to be used as a guide in quickly ascertaining which modules apply to the submodes and OPS sequences. It should be noted that OPS sequence partitioning of principal functions is defined in the applicable Level B CPDS. As stated above, the tables are guides only and, in the event of a disagreement with the requirements defined in this document or the Level B CPDS, the table information should be disregarded.

Table 4.1.3.1-1. Modules Vs. Submodes										
FSSR Modules	IMU Submodes									
	IMU- ATT	HANG_ CALA	HANG_ CALB	HANG_ CALC	PFLT_ CALA	GC_ ALIGN	PLAT_ POS	TERM/ IDLE	INER- TIAL	IMU_ ORBIT_ AL
IMU_BITE	X	X	X	X	X	X	X	X	X	X
ACP_ACUM	X	X	X	X	X	X	X	X	X	X
RES_PROC	X	X	X	X	X	X	X	X	X	X
GYO_TORQ	X	X	X	X	X	X	X		X	X
BITE_SUM	X	X	X	X	X	X	X	X	X	X
ACP_COMP	X	X	X	X	X	X	X	X	X	X
GYO_COMP	X	X	X	X	X	X	X		X	X
ACP_TRSF	X	X	X	X	X	X			X	X
T_UPDATE		X	X		X	X				
TOR_TRSF		X	X	X	X	X				
LAT_FUNC		X	X	X	X	X	X			X
LSF_FILR	X	X		X	X	X				
TNB_CL	X	X	X	X	X	X	X			X
CL_CLRATE			X	X		X				
SINE_EXRTE			X							
IMU_UPLINK									X	
RGM_COMP	X	X	X	X	X	X			X	
DISP_SUP	X	X	X	X	X	X	X	X	X	X
TERM/IDLE								X		
IMU_ATT	X									
HANG_CALA		X								
HANG_CALB			X							
HANG_CALC				X						
PFLT_CALA					X					
GC_ALIGN						X				
GC_ALIGN1						X				
INERTIAL									X	
IMU_ORBIT_AL										X
PLAT_POS							X			

Table 4.1.3.1-2. Modules Vs. OPS Sequences

FSSR Modules	OPS Sequences							
	GN&C					PRE- COUNT	SM	
	ASCENT	ORBIT	ENTRY	RTLS	ORBIT CHECK- OUT		MM UTILITY	INIT/ CHECKOUT
1	2	3	6	8	9	8	9	
IMU_BITE	X	X	X	X	X	X		
ACP_ACUM	X	X	X	X	X	X		
RES_PROC	X	X	X	X	X	X		
GYO_TORQ	X	X	X	X	X	X		
BITE_SUM	X	X	X	X	X	X		
ACP_COMP	X	X	X	X	X	X		
GYO_COMP	X	X	X	X	X	X		
ACP_TRSF	X	X	X	X	X	X		
T_UPDATE						X		
TOR_TRSF						X		
LAT_FUNC		X	X			X		
LSF_FILR						X		
TNB_CL		X	X			X		
CL_CLRATE						X		
SINE_EXRTE						X		
IMU_UPLINK		X	X					
RGM_COMP	X	X	X	X	X	X		
DISP_SUP		X	X			X		
TERM/IDLE						X		
IMU_ATT						X		
HANG_CALA						X		
HANG_CALB						X		
HANG_CALC						X		
PFLT_CALA						X		
GC_ALIGN						X		
GC_ALIGN1	*					X		
INERTIAL	X	X	X	X	X	X		
IMU_ORBIT_AL		X	X					
PLAT_POS						X		

\* NOTE: Only Single Position Gyrocompass and Error Torque-Out is performed during OPS – 1 (Prelaunch)

Table 4.1.3.1-3. IMU Submodes Vs. OPS Sequences

IMU Submodes	OPS Sequences							
	GN&C					PRE-COUNT	SM	
	ASCENT	ORBIT	ENTRY	RTLS	ORBIT CHECK-OUT		MM UTILITY	INIT/CHECKOUT
1	2	3	6	8	9	8	9	
IMU_ATT						X		
HANG_CALA						X		
HANG_CALB						X		
HANG_CALC						X		
PFLT_CALA						X		
GC_ALIGN	*					X		
VEL_TILT						X		
PLAT_POS						X		
TERM_IDLE						X		
INERTIAL	X	X	X	X	X	X		
IMU_ORBIT_AL		X	X					

\* Note: Only Single Position Gyrocompass and Error Torque Out is performed during OPS-1 (Pre-launch).

#### 4.1.4 Processing Sequences

The IMU SOP major functions, such as attitude determination, calibration, alignment, and INERTIAL operation, utilize several common processing sequences to perform the required functions. These processing sequences consist of executing various IMU SOP modules in a predefined sequence. The required inputs to the processing modules come from the major cycle module and from the input data being processed by the minor cycle modules. The three basic processing sequences are (1) ground sequence (consisting of several different variations), (2) cluster repositioning sequence, and (3) inertial sequence. These sequences are defined in the following paragraphs.

A. Ground Sequence. The ground sequence is the fundamental processing sequence for IMU ground tests and preflight operations including calibration and alignment. It utilizes a sequence of software modules which control the cluster so that it is rotated at local earth's rate or at a specified rate relative to a local NWU geographic reference. It provides corrected acceleration measurements in a NWU coordinate system. Measurements using these accelerations are used to compute vertical channel acceleration and acceleration rate error, horizontal tilt and acceleration rate error. The ground sequence also provides the capability of measuring relative (IMU-to-IMU) cluster attitude and attitude rate errors.

There are several variations of the basic ground sequence. Table 4.1.4-1 identifies these sequences and indicates which modules are to be executed and the order of execution (execution order for a given sequence is from top to bottom of the table). The modules that are associated with the ground sequence are as follows:

**STS 83-0013-34**  
**December 14, 2007**

- Accelerometer pulse compensation (ACP\_COMP)
- Sinusoidal excess rate (SINE\_EXRTE)
- Torque rate transform (TOR\_TRSF)
- Gyro compensation (GYO\_COMP)
- Accelerometer pulse transform (ACP\_TRSF)
- Least squares fit filter (LSF\_FILR)
- Cluster to cluster rate (CL\_CLRATE)
- Transform update (T\_UPDATE)
- Redundant gyro monitor compensation (RGM\_COMP)

When ground sequences 1, 3, 4, 7, or 9 are scheduled, the execution of the LSF\_FILR module shall be bypassed for the first three major cycles. This delay of three major cycles is required to eliminate transients caused by changing the accelerometer/CAPRI gain setting or by changing the gyro torquing rate and/or direction. LSF\_FILR first-pass initialization shall be executed within the first three major cycles. The execution of other applicable ground sequence modules shall not be affected by the LSF\_FILR delay.

When ground sequences 4, 6, and 9 are scheduled, the execution of the CL\_CLRATE module shall be bypassed for the first three major cycles.

The ground sequences are utilized by the IMU submodes as follows:

- Ground Sequence 1 – HANG\_CALA
- Ground Sequence 2 – HANG\_CALA, GC\_ALIGN, PFLT\_CALA
- Ground Sequence 3 – HANG\_CALA, PFLT\_CALA, GC\_ALIGN, GC\_ALIGN1
- Ground Sequence 4 – Not used
- Ground Sequence 5 – HANG\_CALB
- Ground Sequence 6 – HANG\_CALB
- Ground Sequence 7 – IMU\_ATT
- Ground Sequence 8 – HANG\_CALA, HANG\_CALB, HANG\_CALC, PFLT\_CALA, GC\_ALIGN
- Ground Sequence 9 – HANG\_CALC, GC\_ALIGN



B. Cluster Repositioning Sequence. The cluster repositioning sequence positions the cluster from any initial attitude to any desired attitude required by the IMU submode. The cluster repositioning sequence cycles through the following major cycle modules in the indicated order:

1. Accelerometer pulse compensation (ACP\_COMP)
2. Large angle torquing (LAT\_FUNC)
3. Gyro compensation (GYO\_COMP)

C. Inertial Sequence. The INERTIAL sequence is the fundamental processing sequence for providing corrected acceleration data in an inertial frame. Gyro drifts and errors are removed by torquing. The INERTIAL sequence cycles through the required modules as specified in Section 4.5.4.6.

Table 4.1.4-1.IMU SOP Ground Sequences									
Module	Sequence Number								
	1	2	3	4 Not Used	5	6	7	8	9
ACP_COMP	X	X	X		X	X	X	X	X
SINE_EXRTE					X	X			
TOR_TRSF	X	X	*		X	X		*	*
GYO_COMP	X	X	X		X	X	X	X	X
ACP_TRSF	X	X	X		X	X	X	X	X
LSF_FILR	X		X				X		X
CL_CLRATE						X			X
T_UPDATE	X	X			X	X			
RGM_COMP	X	X	X		X	X	X	X	X

\*Note: When ground sequence 3, 8, or 9 is scheduled, the TOR\_TRSF module needs to execute once prior to the start of the the ground sequence.

#### 4.1.5 Processing Rates and General Requirements

To efficiently satisfy the functional requirements associated with IMU processing, the IMU SOP detailed requirements and formulations utilize several different processing rates. Modules requiring high frequency processing rates are designated as minor cycle modules. Modules requiring lower processing rates are designated as major cycle modules. Variations of the basic major and minor cycles are also specified. The multiple processing rates satisfy the functional requirements and also provide efficient utilization of CPU resources in performing IMU computation.

The specific rates associated with the IMU processing cycles are dependent upon the particular operational sequence and mission phase. The IMU ground minor and major cycle processing rates and the IMU inertial cycle rate are specified in Table 4.1.5-1. Exceptions to these rates, such as IMU\_BITE, GYO\_TORQ, etc., are specifically identified in the requirements associated with the affected module or submode.

A typical IMU minor cycle shall consist of the following sequence: (1) input discretized and digital data from three IMU's, (2) process data from three IMU's, (3) output OPERATE discrete and digital commands for three IMU's, and (4) delay until end of cycle. It is recommended that IMU minor cycle processing be scheduled for synchronous operation with minimum skew time between IMU's.

IMU major cycle processing shall begin after every  $n$ th minor cycle has been completed ( $n$  currently equals 8 for noninertial operation). The major cycle must be completed before the next  $n$ th +1 minor cycle has been started. Major cycle processing shall also be accomplished in a manner that minimizes data skew between IMU's. The data must be passed from the major cycle to the minor cycle modules between the completion of the  $n$ th and the  $n$ th +1 passes to assure constant transport lag.

For INERTIAL submode as indicated in Table 4.1.5-1, the processing rates are specified in Section 4.5.4.6.

If the program is designed for asynchronous operation, the DELTT parameter utilized in various computations must be computed so as to represent the true delta time associated with the applicable input data. This time is the time interval between the last input data sample currently applicable to the computation and the last input data sample that was currently applicable on the previous iteration of the computation of interest. It is important to note that the last input data currently applicable are not in general the input data last read into the computer but, in the case of the major cycle modules, are the data sample associated with the last  $n$ th (or 8th) minor cycle completed prior to the start of the major cycle.

Input data from the IMU's shall be time tagged each read cycle. Each input transaction from the three IMU's shall be tagged with a single time tag (T\_IMUS, V95W0002C) that corresponds to the time associated with the input transaction for the three IMU set. This time tag shall be used to compute the DELTT of the previous paragraph and shall be made available for other software functions. The maximum uncompensated time tag bias shall not exceed 4 milliseconds ( $3\sigma$ ) and the maximum time tag variation (jitter) shall not exceed 0.7 milliseconds ( $3\sigma$ ).

The IMU SOP submode modules require that the software set the accelerometer gain to either high or low gain as specified. When a gain change is required, it shall be executed at the completion of the first minor cycle within a major cycle. The ACP\_COMP module will always assume the gain setting that was effective during the final minor cycle of a major cycle accumulation period.

Table 4.1.5-1. IMU SOP Processing Rates	
Operational Sequence or Mission Phase	Processing Cycles
Ground operations (hangar calibrations, platform postioning)	40-msec minor cycle 320-msec major cycle
Preflight operations (preflight calibration, alignment)	Initial GN&C 9 rates 320-msec major cycle 40-msec minor cycle OPS-1 and subsequent GN&C 9 rates are specified in 4.5.4.5.2
Inertial submode	Rates are specified in paragraph 4.5.4.6
On-orbit align	Rates are specified in paragraph 4.5.4.7

#### 4.1.6 Computational and Coding Considerations

All IMU SOP computations may be performed using single precision coding, except where double precision is specifically noted to obtain the required accuracy. Fixed-point/floating-point conversions and computations can be implemented in the manner that most efficiently satisfies the IMU SOP requirements.

It is recognized that, for the sake of programming efficiency, the design and coding of the IMU software may deviate from the partitioning of functional requirements presented in the IMU SOP modules. This deviation includes special processing requirements for OPS cleanup/initialization and first-pass algorithm following OPS transition requests. This deviation, where necessary, is both expected and acceptable provided the overall design and coded program comply with the basic intent of the IMU SOP.

#### 4.2 FUNCTIONAL REQUIREMENTS TRACEABILITY

The detailed requirements and formulations contained herein satisfy both the Vehicle Utility and the GN&C, Level B, CPDS functional requirements for the IMU subsystem operating programs.

Table 4.2-1 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 4.2-2 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 4.2-1. IMU SOP Requirements Traceability							
CPDS–Level B (-510) / (-550)		Level B PF Name (Acronym)	Level C FSSR Section No.				
GN&C Section No.	VU Section No.						
N/A	4.9a	Ground Calibration (IMU GND CAL)	4.5.4.3	Hangar Calibration			
			4.5.4.4	Preflight Calibration			
			4.5.3.1	Display Support			
			4.5.2	Major Cycle Processing			
			4.5.1	Minor Cycle Processing			
N/A	4.11	Gyrocompass alignment (IMU G/C ALIGN)	4.5.4.5	Preflight Alignment			
			4.5.3.1	Display Support			
			4.5.2	Major Cycle Processing			
			4.5.1	Minor Cycle Processing			
4.38	4.11a	Inertial Processing (IMU INT PROC)	4.5.4.6	INERTIAL			
			4.5.3.1	Display Support			
			4.5.2.1	ACP_COMP			
			4.5.2.2	GYO_COMP			
			4.5.2.3	ACP_TRSF			
			4.5.2.11	IMU_UPLINK (OPS 2 and 3)			
			4.5.2.12	RGM_COMP			
			4.5.1	Minor Cycle Processing			
			N/A	4.10	Attitude Determination (IMU ATT DET)	4.5.4.2	Attitude Determination
						4.5.3.1	Display Support
4.5.2.1	ACP_COMP						
4.5.2.2	GYO_COMP						
4.5.2.3	ACP_TRSF						
4.5.2.5	TOR_TRSF						
4.5.2.7	LSF_FILR						
4.5.2.12	RGM_COMP						

Table 4.2-1. IMU SOP Requirements Traceability						
CPDS–Level B (-510) / (-550)		Level B PF Name (Acronym)	Level C FSSR Section No.			
GN&C Section No.	VU Section No.					
N/A	4.11b	Platform positioning (IMU PLAT POS)	4.5.1	Minor Cycle Processing		
			4.5.4.8	Platform Positioning		
			4.5.1	Minor Cycle Processing		
			4.5.2.6	LAT_FUNC		
		4.208 (5.1) (6.26)		On–orbit alignment (IMU ORB A/CAL)	4.5.3.1	Display Support
					4.5.4.7	On–Orbit Alignment
					4.5.3.1	Display Support
					4.5.2.1	ACP_COMP
					4.5.2.2	GYO_COMP
					4.5.2.3	ACP_TRSF
N/A	4.11c	Termination/Idle Processing (IMU TERM/IDLE)	4.5.2.6	LAT_FUNC		
			4.5.2.12	RGM_COMP		
			4.5.1	Minor Cycle Processing		
			4.5.4.1	TERM/IDLE		
			4.5.3.1	Display Support		
			4.5.2.1	ACP_COMP		
			4.5.1	Minor Cycle Processing		

Table 4.2-2. IMU SOP FSSR/PRD Correlation					
Principal Function	FSSR Paragraph	FSSR Title	BFS PRD	PRD Paragraph	BFS Title
G4.38	4.5.4.6	IMU Inertial Submode Requirements	MG038106	3.2.5.1	Inertial Measurement Unit HIP
G4.208	4.5.4.7	IMU On-Orbit Alignment	N/A	N/A	N/A
V4.9A	4.5.4.3	IMU Hangar Calibration Modules	N/A	N/A	N/A
V4.10	4.5.4.2	Initial Attitude Determination	N/A	N/A	N/A
V4.11	4.5.4.5.1	Gyrocompass Alignment (GC_ALIGN)	N/A	N/A	N/A
V4.11B	4.5.4.8	Platform Positioning (PLAT_POS)	N/A	N/A	N/A
V4.11C	4.5.4.1	IMU Term/Idle Processing	N/A	N/A	N/A

### 4.3 DOCUMENTED REQUIREMENTS PRECEDENCE

Requirements precedence in this document shall be as follows:

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

The automated Interface Definition Document (IDD) tables define the signal (parameter) interface requirements either between hardware (LRU) and software elements or between software elements and other software elements.<sup>1</sup>

<sup>1</sup> A GN&C software element is either a sequenced principal function (PF), crew generated–specialist/display function, or an OPS display function.

Note that IDD output (source) tables that reflect parameters going to input (destination) TLM shall not be interpreted as a signal actually being downlisted. The parameter may only be available for downlist in COMPOOL and may not appear in a downlist format.

#### 4.4 PARAMETER INITIALIZATION

The IMU SOP utilizes many constants and variable parameters in performing the required computations and logical operations. These parameters are in most cases preloaded into computer memory with the required values prior to execution of the IMU SOP. These data include program constants and calibration parameters, local geographic parameters, and mission oriented parameters. The input tables associated with each of the IMU SOP modules specify the constants and variable parameters required by each module. The data range column in the tables is used to indicate specific values for all applicable constants. When local initialization of parameters is required, it is specified in the applicable module.

The IMU SOP I-load summary table specifies the parameters which must be entered into the computer prior to executing the IMU SOP for either ground or flight operations. Note that the compensation parameter (included in the table) values are updated by the appropriate calibration functions prior to flight. Data values are specified for each parameter.

Throughout the IMU SOP, two parameters are utilized in computations involving gravitational acceleration. “ $G_0$ ” is defined as the standard acceleration due to gravity with a value of 32.174048 ft/sec<sup>2</sup>/g. “ $G\_SITE\_N$  (N = 1–9)” or “ $G$ ” is defined as acceleration due to local gravity with a range of 32.08 to 32.21 ft/sec<sup>2</sup>.

Tables 4.4–1, 4.4–2, and 4.4–3 identify the initial parameters updated for subsequent use, computed parameters which become initialization values for subsequent submodes/OPS sequences, and initial parameters possibly updated by ground command.

Table 4.4-1. Initial Parameters Updated for Subsequent Submodes or OPS Sequences		
FSSR Name	Description	Applicable Submode for Parameter Update
KIX KIY KIZ	Low-gain accelerometer scale factors	HANG_CALA, PFLT_CALA
KIXH KIYH KIZH	High-gain accelerometer scale factors	HANG_CALA, PFLT_CALA
KOX KOY KOZ	Low-gain accelerometer biases	HANG_CALA, PFLT_CALA
KOXH KOYH KOZH	High-gain accelerometer biases	HANG_CALA, PFLT_CALA
KSX KSY KSZ	Accelerometer low-gain symmetry	HANG_CALA
KTX KTY KTZ	Gyro torquer scale factors	HANG_CALA
DFX DFY DFZ	Gyro restraints	HANG_CALA, PFLT_CALA
DSX DSZ	Gyro mass unbalance (spin axis)	HANG_CALA, PFLT_CALA
DIX DIZ	Gyro mass unbalance (input axis)	HANG_CALA
DOZ	Gyro mass unbalance (output axis)	HANG_CALA, PFLT_CALA
DELTXZ DELTXYX DELTZYX DELTZX DELTZY	Accelerometer misalignments	HANG_CALB HANG_CALA HANG_CALB HANG_CALA, HANG_CALB HANG_CALA, HANG_CALB



Table 4.4-1. Initial Parameters Updated for Subsequent Submodes or OPS Sequences		
FSSR Name	Description	Applicable Submode for Parameter Update
BXY	Gyro misalignments	HANG_CALA
BXZ		HANG_CALA, HANG_CALB
BYX		HANG_CALA
BYZ		HANG_CALA, HANG_CALB
BZX		HANG_CALA, HANG_CALB
BZY		HANG_CALA, HANG_CALB
PO	Resolver offsets	HANG_CALB
IRO		HANG_CALB
AZO		HANG_CALB
DP	Roll/pitch nonorthogonality	HANG_CALB
DFR	Redundant gyro restraint	HANG_CALA, PFLT_CALA
DDFR	Delta redundant gyro restraint	HANG_CALA, PFLT_CALA
DIR	Redundant gyro mass unbalances	HANG_CALA, PFLT_CALA
DOR		
DSR	Redundant gyro scale factors	
KXR		HANG_CALA, PFLT_CALA
KYR		
KZR		

Note: Parameters are one each per IMU.

Table 4.4-2. Computed Parameters for Use in Subsequent Submodes or OPS Sequences		
FSSR Name	Description	Applicable Submode for Parameter Update
$T_{NB}^{NWU}$	Transformation: Navigation base to north, west, up	IMU_ATT
$T_C^{M50}$	Transformation: Cluster-to-M50	GC_ALIGN1 ORBIT_AL
$T_{M50}^{DC}$	Transformation: M50-to-desired cluster	IMU_UPLINK
Note: Parameters are one each per IMU.		

Table 4.4-3. Initial Parameters Updated by Uplink/Initialization		
FSSR Name	Description	Applicable Submode for Parameter Update
$T_{M50}^{DC}$	Transformation: M50-to-desired cluster *a)	IMU_ORBIT_AL
DFX DFY DFZ	X gyro restraint } Y gyro restraint } *b) Z gyro restraint }	
KOX KOY KOZ	X low-gain accelerometer bias } Y low-gain accelerometer bias } *a) Z low-gain accelerometer bias }	
KIX KIY KIZ	X low-gain accelerometer scale factor } Y low-gain accelerometer scale factor } *a) Z low-gain accelerometer scale factor }	
Note: *a) Parameters are one each per IMU and shall be capable of being updated in GN&C OPS 2 and 3 (MM301 ONLY) via uplink.		
*b) Parameters are one each per IMU and shall be capable of being updated in GN&C OPS1 (MM101 ONLY), OPS2 and 3 (MM301 ONLY), via uplink.		

## 4.5 DETAILED REQUIREMENTS AND FORMULATIONS

This section defines the IMU SOP modules in sufficient detail to create a design and generate computer code. Each module defines the functional requirements, interface requirements, detailed requirements and formulations, and special considerations if applicable. A flow diagram is also included for most modules. However, the flow diagram is supplementary material and is not intended to convey requirements or to place restrictions on functional design or coding.

It is particularly important to note that the flow diagrams generally assume a synchronous operating system; hence, the timers shown may not reflect the actual method of achieving the timing requirements in the integrated computer program. Similarly, the initializations and resets of certain variables may be implemented differently than shown in the flow diagrams. The detailed requirements are stated in such a manner that the true timing, initialization, and reset requirements are inherent to the stated requirements. No strict partitioning of functions to specific modules is implied simply because the flow charts show them within a specific module.

### 4.5.1 IMU Minor Cycle Processing Modules

The purpose of the modules defined in this section is to provide the fast rate processing required for IMU monitoring and input/output data utilization. The detailed requirements addressing each of these functions are found in the appropriate subparagraphs. The following requirements pertain to the minor cycle modules as a group:

- A. The processing rates are specifically stated in the individual module/submode requirements.
- B. The sequence of execution during noninertial operations shall be:
  - IMU\_BITE
  - ACP\_ACUM
  - RES\_PROC
  - GYO\_TORQ
  - BITE\_SUM
- C. All of the above modules shall be executed in the specified sequence whenever the IMU is in the OPERATE mode unless otherwise specified in the module/submode paragraphs.
- D. The rates and sequence required during flight operations and nonflight operations that involve an INERTIAL mode of operation are specified in Section 4.5.4.6. and Section 4.5.4.5.2.

#### 4.5.1.1 IMU BITE Processing (IMU\_BITE)

The purpose of the IMU\_BITE module is to monitor IMU hardware BITE indications, as well as perform software aided reasonableness tests on IMU performance. When failures are detected, IMU\_BITE sets the appropriate failure flags. IMU\_BITE is executed whenever the IMU is in the OPERATE mode.

A. Functional Requirements. The IMU\_BITE module performs the following functions for each IMU:

1. When not in TERM/IDLE, compare data words 13 and 14 with command words one and two (from the previous cycle) to verify correct transmissions. Set the echo failure flags if transmission errors are detected.
2. During flight modes, compare the compensated and filtered redundant axis rate (data word two) for reasonableness. Set the appropriate flags to indicate failure status if excessive rates are detected during nominal quiescent torquing operation.
3. Check the inner resolver angle for reasonableness. Set appropriate flags to indicate failure status if the null reading is not within limits. (Bypass this test if the IMU cluster is within the established gimbal flip region.)
4. During ground calibration when an IMU Commfault has caused an IMU to be removed from the FCOS “Read Chain,” causes the appropriate IMU to be deselected to prevent an erroneous calibration.

B. Interface Requirements. The input/output interface associated with the IMU\_BITE module are listed in Tables 4.5.1.1-1 and 4.5.1.1-2.

C. Detailed Requirements. The following sequence of operations is required for each applicable IMU:

1. Set the FAIL\_ECHO\_1 flag equal to zero. If not in TERM/IDLE submode, compare IMU echo word 13 with the previously transmitted command word one. If echo word 13 does not compare with the transmitted command word one (OUTPUT\_1) and if the TRANS\_1\_FAIL bit does not equal one, set the FAIL\_ECHO\_1 flag equal to one.
2. Set the FAIL\_ECHO\_2 flag equal to zero. If not in TERM/IDLE submode, compare IMU echo word 14 with the previously transmitted command word two. If echo word 14 does not compare with the transmitted command word (OUTPUT\_2) and if the TRANS\_2\_FAIL bit does not equal one, set the FAIL\_ECHO\_2 flag equal to one.
3. If not in GN&C 9 and REFSMAT’s have been computed, skip this item. Otherwise, if FCOS indicates that any IMU is not in the “Read Chain,” set IMU\_i\_SEL\_STATUS to zero and remove the “Select Command” by setting IMU\_i\_SEL to zero and in GN&C 9 cause the affected IMU to enter the TERM/IDLE submode.
4. If REFSMAT’s have not been computed, or if OPS transition “catch-up” torquing is in progress, or if on-orbit alignment slewing/ torquing is in progress, set FAIL\_RED\_RTE flag to zero and proceed to step 5. Otherwise, set the FAIL\_RED\_RTE flag equal to zero. If bit 1 of the redundant axis rate data word equals zero, perform the following redundant axis rate check; otherwise, continue processing with step 5. If  $|WRCF| > (RRTOL)$ , set the FAIL\_RED\_RTE flag equal to one. (WRCF is the compensated and filtered redundant axis rate; and RRTOL is defined in Table 4.5.1.1-1.)

5. Set the FAIL\_IR\_NULL flag equal to zero. Determine if the cluster is in the gimbal flip region by ascertaining if the IX pitch resolver angle is near 90 or 270 degrees within the boundaries defined by the parameters GIM\_FLIP\_Bi (see Table 4.5.1.1-1). If so, continue processing with step 6; otherwise, determine if the 8X inner roll resolver reading is between IRL1 degrees through IRL2 degrees. If so, set the FAIL\_IR\_NULL flag equal to one. The compensated resolver angles that are currently available from the RES\_PROC module may be used for these computations.
6. Exit the IMU\_BITE routine.

A suggested design flow which satisfies the IMU\_BITE requirements is shown in Figure 4.5.1.1-1.

This module shall be executed at 1.04 Hz for all OPS sequences to satisfy DISPLAYS, and TLM requirements and at 6.25 Hz on RM demand.

Table 4.5.1.1-1. IMU_BITE Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
ECHO_13(1)	V71M2260P	IMU-1 CMD WD1 WD13	IMU-1	LOGICAL	16 BITS	NA	OD
ECHO_13(2)	V71M3260P	IMU-2 CMD WD1 WD13	IMU-2	LOGICAL	16 BITS	NA	OD
ECHO_13(3)	V71M4260P	IMU-3 CMD WD1 WD13	IMU-3	LOGICAL	16 BITS	NA	OD
ECHO_14(1)	V71M2280P	IMU-1 CMD WD2 WD14	IMU-1	LOGICAL	16 BITS	NA	OD
ECHO_14(2)	V71M3280P	IMU-2 CMD WD2 WD14	IMU-2	LOGICAL	16 BITS	NA	OD
ECHO_14(3)	V71M4280P	IMU-3 CMD WD2 WD14	IMU-3	LOGICAL	16 BITS	NA	OD
OUTPUT_1		LAST TRANSMITTED IMU COMMAND WORD 1 (TORQUING): 1 PER IMU	COMPOOL (I/O)	LOGICAL	16 BITS	NA	OD
OUTPUT_2		LAST TRANSMITTED IMU COMMAND WORD 2 (SLEWING): 1 PER IMU	COMPOOL (I/O)	LOGICAL	16 BITS	NA	OD
WRCF(1)	V95R0660C	IMU-1 RGM RATE	RGM_COM P	SCALAR	+/-120	DEG/HR	OD
WRCF(2)	V95R0661C	IMU-2 RGM RATE	RGM_COM P	SCALAR	+/-120	DEG/HR	OD
WRCF(3)	V95R0662C	IMU-3 RGM RATE	RGM_COM P	SCALAR	+/-120	DEG/HR	OD
θRL(1)	V71H2060B	GN IMU-1 THETA R 8X WD3	IMU-1	SCALAR	0-120 240-360	DEG	OD
θRL(2)	V71H3060B	GN IMU-2 THETA R 8X WD3	IMU-2	SCALAR	0-120 240-360	DEG	OD
θRL(3)	V71H4060B	GN IMU-3 THETA R 8X WD3	IMU-3	SCALAR	0-120 240-360	DEG	OD
θYM(1)	V71H2120B	GN IMU-1 THETA Y 1X WD6	IMU-1	SCALAR	0-360	DEG	OD
θYM(2)	V71H3120B	GN IMU-2 THETA Y 1X WD6	IMU-2	SCALAR	0-360	DEG	OD
θYM(3)	V71H4120B	GN IMU-3 THETA Y 1X WD6	IMU-3	SCALAR	0-360	DEG	OD
GIM_FLIP_B1	V90H7625C	GIMBAL FLIP REGION DEFINITION BOUNDARY - QUADRANT I	CONSTANT	SCALAR	80	DEG	OD
GIM_FLIP_B2	V90H7626C	GIMBAL FLIP REGION DEFINITION BOUNDARY - QUADRANT II	CONSTANT	SCALAR	100	DEG	OD
GIM_FLIP_B3	V90H7627C	GIMBAL FLIP REGION DEFINITION BOUNDARY - QUADRANT III	CONSTANT	SCALAR	260	DEG	OD
GIM_FLIP_B4	V90H7628C	GIMBAL FLIP REGION DEFINITION BOUNDARY - QUADRANT IV	CONSTANT	SCALAR	280	DEG	OD
IRL1	V90H7633C	INNER ROLL NULL LIMIT 1	CONSTANT	SCALAR	24	DEG	OD
IRL2	V90H7634C	INNER ROLL NULL LIMIT 2	CONSTANT	SCALAR	336	DEG	OD
RRTOL	V90R7635C	REDUNDANT AXIS RATE TEST TOLERANCE	I-LOAD	SCALAR		DEG/HR	OD
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL WD1 B9	IMU-1	LOGICAL	0,1	NA	OD
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL WD1 B9	IMU-2	LOGICAL	0,1	NA	OD
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL WD1 B9	IMU-3	LOGICAL	0,1	NA	OD
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL WD1 B10	IMU-1	LOGICAL	0,1	NA	OD
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL WD1 B10	IMU-2	LOGICAL	0,1	NA	OD
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL WD1 B10	IMU-3	LOGICAL	0,1	NA	OD
REFS_RDY	V95X0780X	REFSMAT COMPUTATION COMPLETED	GC_ALIGN1	LOGICAL	0,1	NA	OD
TERM_IDLE_CMD	V93X6055X	TERM/IDLE COMMAND	DISPLAYS	LOGICAL	0,1	NA	OD

Table 4.5.1.1-2. IMU\_BITE Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
FAIL_ECHO_1(1)	V95X0030X	IMU-1 WORD 13 ECHO FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_ECHO_1(2)	V95X1030X	IMU-2 WORD 13 ECHO FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_ECHO_1(3)	V95X2030X	IMU-3 WORD 13 ECHO FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_ECHO_2(1)	V95X0031X	IMU-1 WORD 14 ECHO FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_ECHO_2(2)	V95X1031X	IMU-2 WORD 14 ECHO FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_ECHO_2(3)	V95X2031X	IMU-3 WORD 14 ECHO FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_RED_RTE(1)	V95X0033X	IMU-1 REDUNDANT RATE FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_RED_RTE(2)	V95X1033X	IMU-2 REDUNDANT RATE FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_RED_RTE(3)	V95X2033X	IMU-3 REDUNDANT RATE FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_IR_NULL(1)	V95X0034X	IMU-1 INNER RESOLVER NULL FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_IR_NULL(2)	V95X1034X	IMU-2 INNER RESOLVER NULL FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
FAIL_IR_NULL(3)	V95X2034X	IMU-3 INNER RESOLVER NULL FAIL	DISP_SUP BITE_SUM TLM	LOGICAL	0,1	NA	1.04
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	DISPLAYS GC_ALIGN1	LOGICAL	0,1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	DISPLAYS GC_ALIGN1	LOGICAL	0,1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	DISPLAYS GC_ALIGN1	LOGICAL	0,1	NA	OD
IMU_1_SEL	V93X6711X	IMU-1 SELECT/DESELECT	DISPLAYS	LOGICAL	0,1	NA	OD
IMU_2_SEL	V93X6712X	IMU-2 SELECT/DESELECT	DISPLAYS	LOGICAL	0,1	NA	OD
IMU_3_SEL	V93X6713X	IMU-3 SELECT/DESELECT	DISPLAYS	LOGICAL	0,1	NA	OD

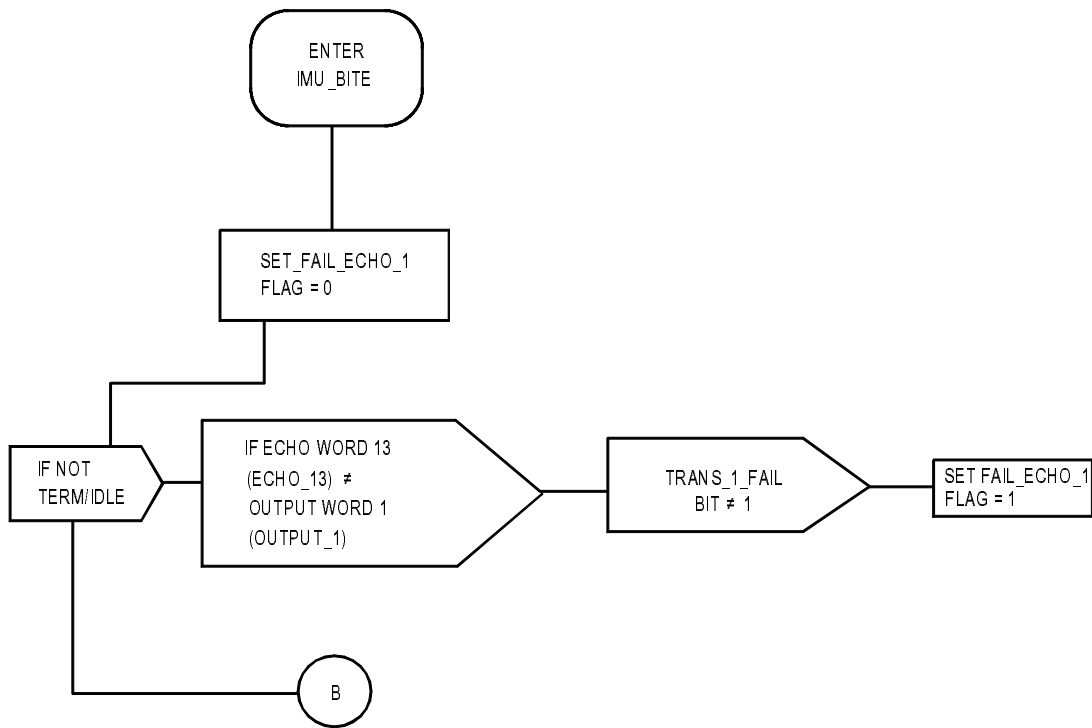


FIGURE 4.5.1.1-1.(1) IMU\_BITE Flow Diagram (Sheet 1 of 3)



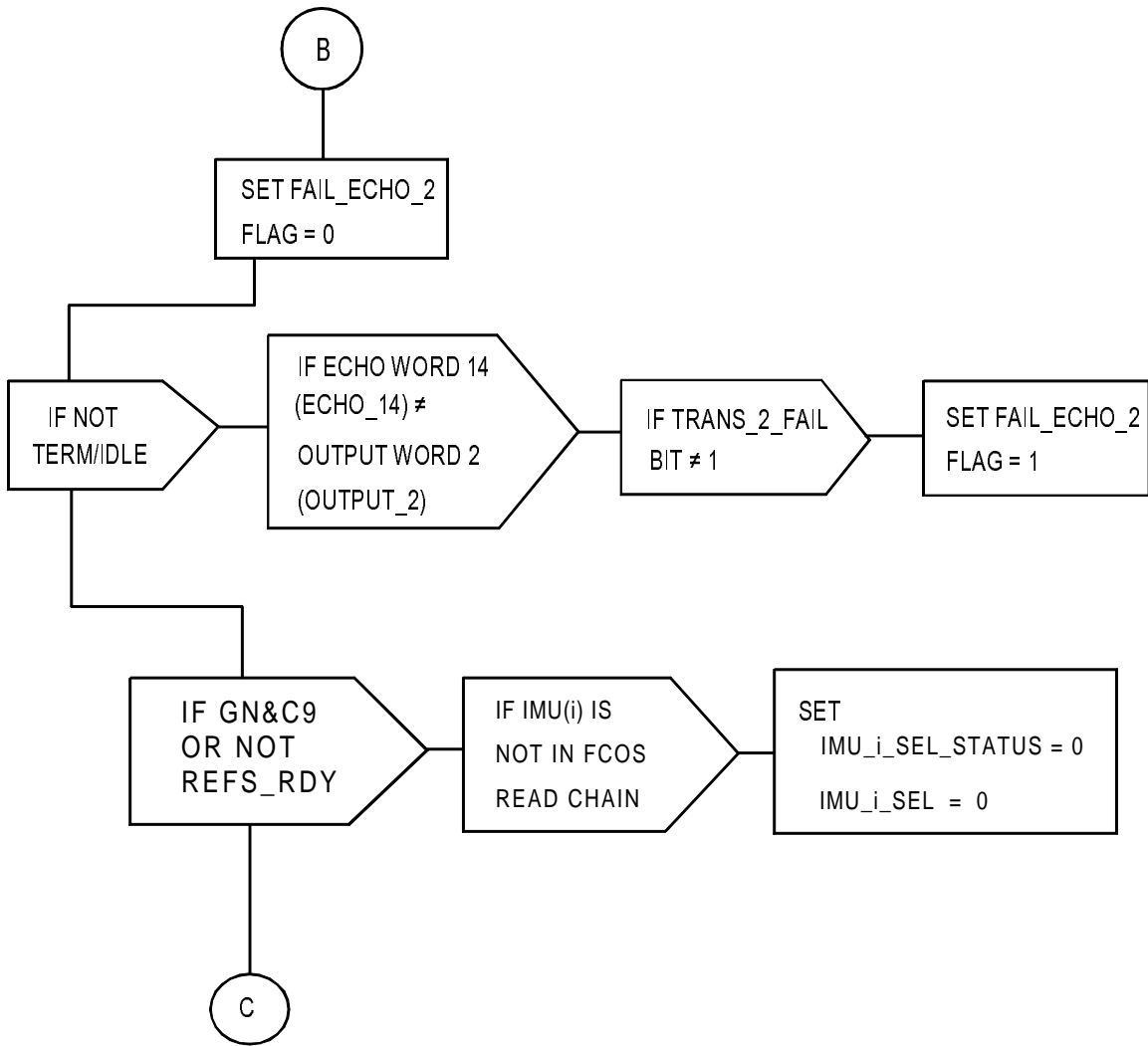


FIGURE 4.5.1.1-1.(2) IMU\_BITE Flow Diagram (Sheet 2 of 3)

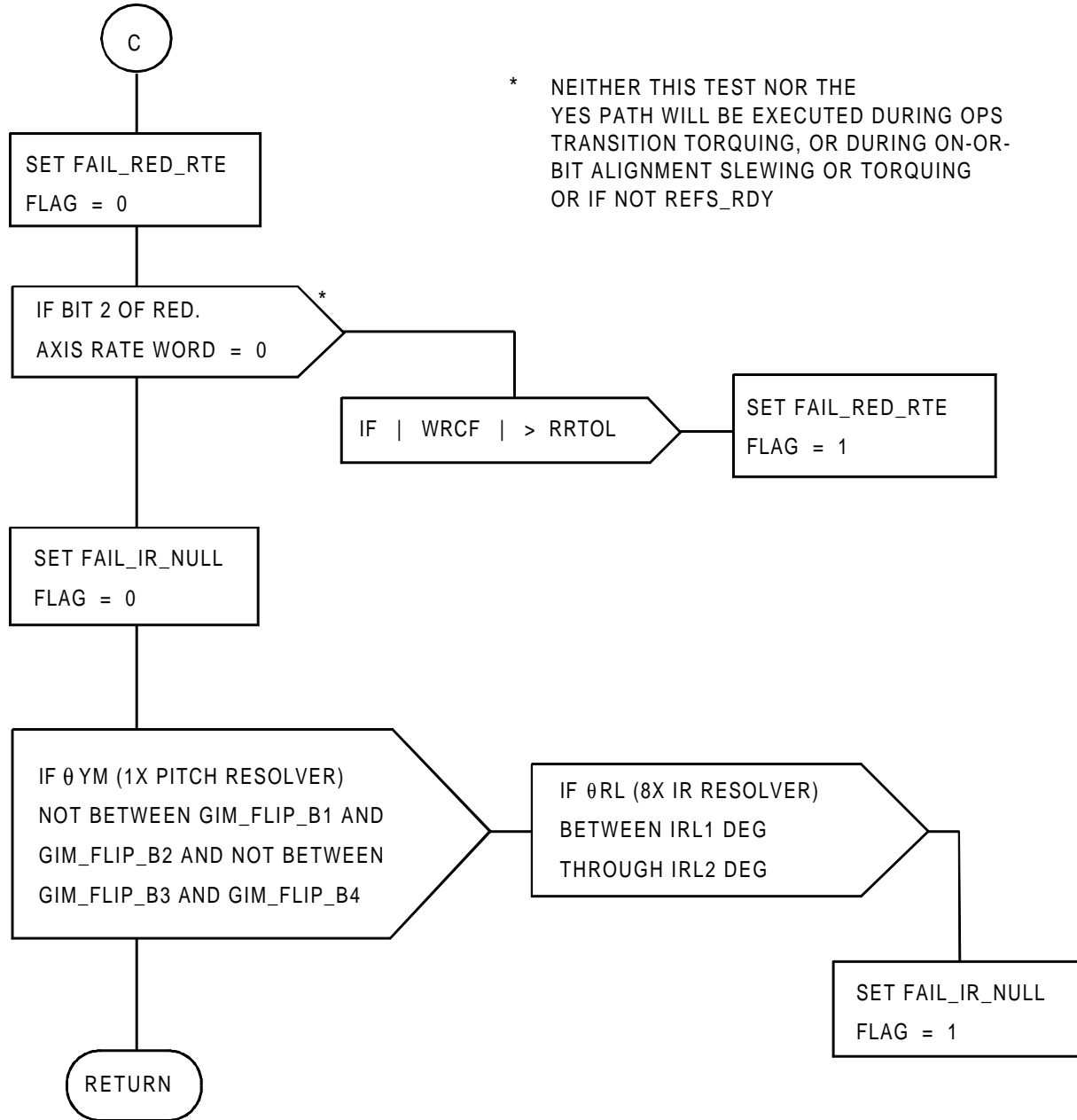


FIGURE 4.5.1.1-1.(3) IMU\_BITE Flow Diagram (Sheet 3 of 3)

#### 4.5.1.2 Accelerometer Processing (ACP\_ACUM)

The purpose of the ACP\_ACUM module is to perform the minor cycle processing of the velocity pulses for each accelerometer channel. The inputs to this module consist of the FCOS supplied reading of the x, y, and z velocity register of each applicable IMU.

A. Functional Requirements. The ACP\_ACUM module performs the following functions for each applicable IMU.

1. Compute the change in the velocity counter reading for the x, y, and z accelerometer channels.
2. Provide compensation for velocity samples lost due to detected transmission errors by assuming constant acceleration over the sample period in question. A transmission error is defined to exist if a system (FCOS) reported error is present.
3. Detect and compensate for velocity counter overflow. Provide a sign reversal for the z accelerometer channel.
4. Perform an over-limit test on delta velocities to detect and report accelerometer channel failure.
5. Accumulate the positive and negative delta velocities separately over the ACP\_COMP sample period.
6. Sum the foregoing positive and negative sums separately over the ACP\_COMP module sample period to form double sums during noninertial operation.
7. When the LSF\_FILR module is active, detect and compensate for accelerometer output zero crossover.

B. Interface Requirements. The input/output interfaces associated with the ACP\_ACUM functional module are listed in Tables 4.5.1.2-1 and 4.5.1.2-2.

C. Detailed Requirements. The following sequence of operations is required for each accelerometer channel of each applicable IMU.

1. On the first pass since the most recent scheduling of this module (this includes the first pass following an OPS transition), ACP\_ACUM shall initialize itself to assure that the first computed delta velocity and the accumulated delta velocities are zero.
2. Check the IMU accelerometer/CAPRI gain setting. If the DI/D8 bit of the IMU Output Word 1 is not equal to the last transmitted gain setting, bit 0, OUTPUT\_2, then set the FAIL\_ACCEL\_SF flag equal to one; otherwise reset the FAIL\_ACCEL\_SF flag equal to zero. Allow a minimum of 160 msec after a gain setting before making the gain setting check.
3. If FCOS has detected input data errors, compensate for the lost data by using the delta count computed the previous cycle (assume constant acceleration). Initialize the internal variables so that a proper input on the next pass will result in correct accumulated velocity pulses.

4. When no transmission error exists, the true positive or negative pulse count change shall be determined each iteration. (For the z accelerometer, a sign reversal is required.) The IMU velocity register mechanization requires that the software determines the direction and magnitude of any change. Thus, the software must detect and compensate for overflow of the register. (Note, the velocity registers within the IMU consist of 16-bit continuous up/down counters which are reset only upon completing runup.)
5. Compare the delta count to a predetermined limit: If in high gain (bit 0, OUTPUT\_2=1) and the absolute value of the pulse count change exceeds KVELLIM1 for any channel, or if in low gain and the absolute value of the pulse count delta exceeds KVELLIM2 (noninertial) for any channel or KVELLIM3 (6.25 Hz – inertial) for any channel or KVELLIM4 (1.04 Hz – inertial) for any channel, set a velocity over-limit fail flag for use by the BITE\_SUM module. If the pulse count change does not exceed the limit for any channel, reset the velocity over-limit fail flag.
6. When the current delta velocity data are to be processed by the LSF\_FILR module, detect and compensate for accelerometer output zero crossing as follows:
  - a. If the delta pulse count from the current minor cycle is negative and the delta pulse count from the last previous minor cycle with a nonzero delta pulse count was positive, then add one negative count to the current delta pulse count.
  - b. If the delta pulse count from the current minor cycle is positive and the delta pulse count from the last previous minor cycle with a nonzero delta pulse count was negative, then add one positive count to the current delta pulse count.
  - c. No compensation shall be performed for the first nonzero delta pulse count to be processed by the LSF\_FILR module.
7. Accumulate the positive and negative delta velocities separately for each iteration over the ACP\_COMP sample period.
8. If in INERTIAL or TERM/IDLE, make the positive and negative deltas available to the ACP\_COMP module.
9. If not in INERTIAL or TERM/IDLE, use the accumulated deltas to form positive and negative double sums for use in the filter within the ACP\_COMP module. Upon completion of the ACP\_COMP modules sample period, make the accumulations resulting from steps 7 and 9 available to the ACP\_COMP module.

This module shall be executed at 25 Hz during GN&C 9 operation except the INERTIAL and TERM/IDLE submodes and at 1.04 Hz or 6.25 Hz during INERTIAL and all other OPS (reference Section 4.5.4.6 and 4.5.4.5.2 for the applicable rate), except for the tests associated with steps 2 and 5. During GN&C 9, steps 2 and 5 are to be executed at least at a 1.04-Hz rate. During all other OPS sequences, steps 2 and 5 shall be executed at least at a 1.04-Hz rate and on demand from BITE\_SUM at 6.25 Hz (on RM demand).

A suggested design flow which satisfies the ACP\_ACUM requirements is shown in Figure 4.5.1.2-1.

Table 4.5.1.2-1. ACP\_ACUM Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
CVX(1)	V71L2200B	IMU-1 ACCUMD VX WD10	IMU-1	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
CVX(2)	V71L3200B	IMU-2 ACCUMD VX WD10	IMU-2	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
CVX(3)	V71L4200B	IMU-3 ACCUMD VX WD10	IMU-3	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
CVY(1)	V71L2220B	IMU-1 ACCUMD VY WD11	IMU-1	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
CVY(2)	V71L3220B	IMU-2 ACCUMD VY WD11	IMU-2	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
CVY(3)	V71L4220B	IMU-3 ACCUMD VY WD11	IMU-3	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
CVZ(1)	V71L2240B	IMU-1 ACCUMD VZ WD12	IMU-1	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
CVZ(2)	V71L3240B	IMU-2 ACCUMD VZ WD12	IMU-2	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
CVZ(3)	V71L4240B	IMU-3 ACCUMD VZ WD12	IMU-3	INTEGER	1-2**16	PULSES	25.0 6.25 1.04
KVELLIM1	V96L7003C	HIGH-GAIN VELOCITY LIMIT	K-LOAD	INTEGER	480	PULSES	OD
KVELLIM2	V96L7075C	LOW-GAIN (NONINERTIAL) VELOCITY LIMIT	K-LOAD	INTEGER	48	PULSES	OD
KVELLIM3	V90U7624C	LOW-GAIN (INERTIAL) VELOCITY LIMIT (6.25 Hz)	K-LOAD	INTEGER	720	PULSES	OD
KVELLIM4	V98U7964C	LOW-GAIN (INERTIAL) VELOCITY LIMIT (1.04 Hz)	K-LOAD	INTEGER	4300	PULSES	OD
VCMAX	V90Q7637C	VELOCITY COUNTER OVER-FLOW FACTOR EQUALS MSB OF COUNTER	CONSTANT	INTEGER	2**15	PULSES	OD
INERTIAL	V95X0001X	IN INERTIAL MODE (IMU)	GC_ALIGN1	LOGICAL	0,1	NA	25.0 6.25 1.04
OUTPUT_2		LAST TRANSMITTED IMU COMMAND WORD 2 (SLEWING); 1 PER IMU	COMPOOL (I/O)	LOGICAL	16 BITS	NA	OD
IMU_CF(1)	V91X3101X	IMU-1 COMMFAULT	FCOS	LOGICAL	0,1	NA	25.0 6.25 1.04
IMU_CF(2)	V91X3131X	IMU-2 COMMFAULT	FCOS	LOGICAL	0,1	NA	25.0 6.25 1.04
IMU_CF(3)	V91X3161X	IMU-3 COMMFAULT	FCOS	LOGICAL	0,1	NA	25.0 6.25 1.04

Table 4.5.1.2-1. ACP\_ACUM Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
D1/D8_SEQR(1)	V71X2032B	IMU-1 D1/D8 SEQUENCER WD1 B11	IMU-1	LOGICAL	0,1	NA	25.0 6.25 1.04
D1/D8_SEQR(2)	V71X3032B	IMU-2 D1/D8 SEQUENCER WD1 B11	IMU-2	LOGICAL	0,1	NA	25.0 6.25 1.04
D1/D8_SEQR(3)	V71X4032B	IMU-3 D1/D8 SEQUENCER WD1 B11	IMU-3	LOGICAL	0,1	NA	25.0 6.25 1.04

Table 4.5.1.2-2. ACP\_ACUM Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
Ci+		POSITIVE VELOCITY COUNTS OVER MAJOR CYCLE; i=X,Y,Z; 1 SET PER IMU	ACP_COMP	SCALAR	GROUND; 0+10**4 FLIGHT 1+10**5	PULSES	6.25 3.125 1.04
Ci-		NEGATIVE VELOCITY COUNTS OVER MAJOR CYCLE; i=X,Y,Z; 1 SET PER IMUI	ACP_COMP	SCALAR	GROUND; 0-10**4 FLIGHT 0-10**5	PULSES	6.25 3.125 1.04
DCi+		POSITIVE VELOCITY COUNTS (DOUBLE SUMS IN GROUND MODE); i=X,Y,Z; 1 SET PER IMU	ACP_COMP	SCALAR	GROUND; 0+10**5 FLIGHT 0+10**4	PULSES	6.25 3.125 1.04
DCi-		NEGATIVE VELOCITY COUNTS (DOUBLE SUMS IN GROUND MODE); i=X,Y,Z; 1 SET PER IMU	ACP_COMP	SCALAR	GROUND; 0-10**5 FLIGHT 1-10**4	PULSES	6.25 3.125 1.04
FAIL_VEL_OV_LIM(1)		IMU-1 VELOCITY OVER LIMIT FAIL	ACP_TRSF	LOGICAL	0,1	NA	OD
FAIL_VEL_OV_LIM(2)		IMU-2 VELOCITY OVER LIMIT FAIL	ACP_TRSF	LOGICAL	0,1	NA	OD
FAIL_VEL_OV_LIM(3)		IMU-3 VELOCITY OVER LIMIT FAIL	ACP_TRSF	LOGICAL	0,1	NA	OD
FAIL_ACCEL_SF(1)	V95X0081X	IMU-1 ACC/ CAPRI SF FAIL	BITE_SUM DISP_SUP TLM	LOGICAL	0,1	NA	OD
FAIL_ACCEL_SF(2)	V95X1081X	IMU-2 ACC/ CAPRI SF FAIL	BITE_SUM DISP_SUP TLM	LOGICAL	0,1	NA	OD
FAIL_ACCEL_SF(3)	V95X2081X	IMU-3 ACC/ CAPRI SF FAIL	BITE_SUM DISP_SUP TLM	LOGICAL	0,1	NA	OD

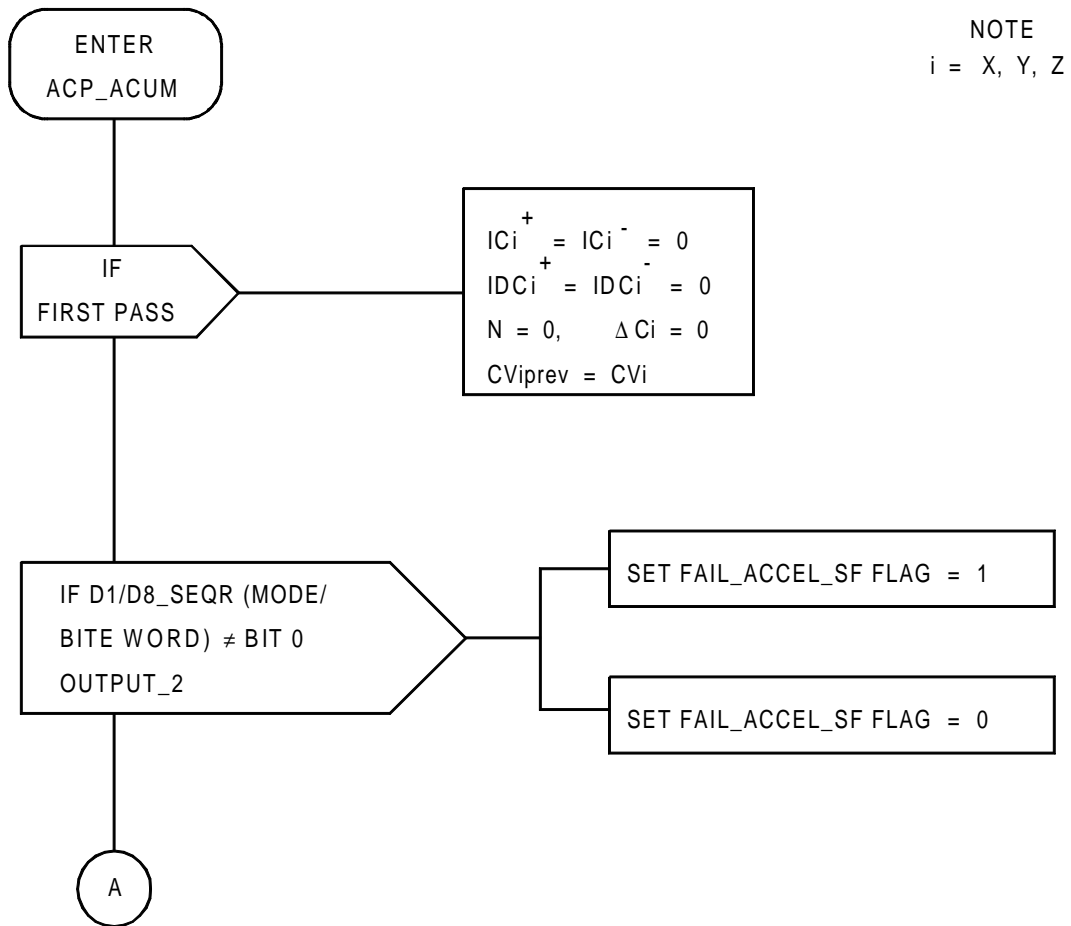


FIGURE 4.5.1.2-1.(1) ACP\_ACUM Flow Diagram (Sheet 1 of 3)

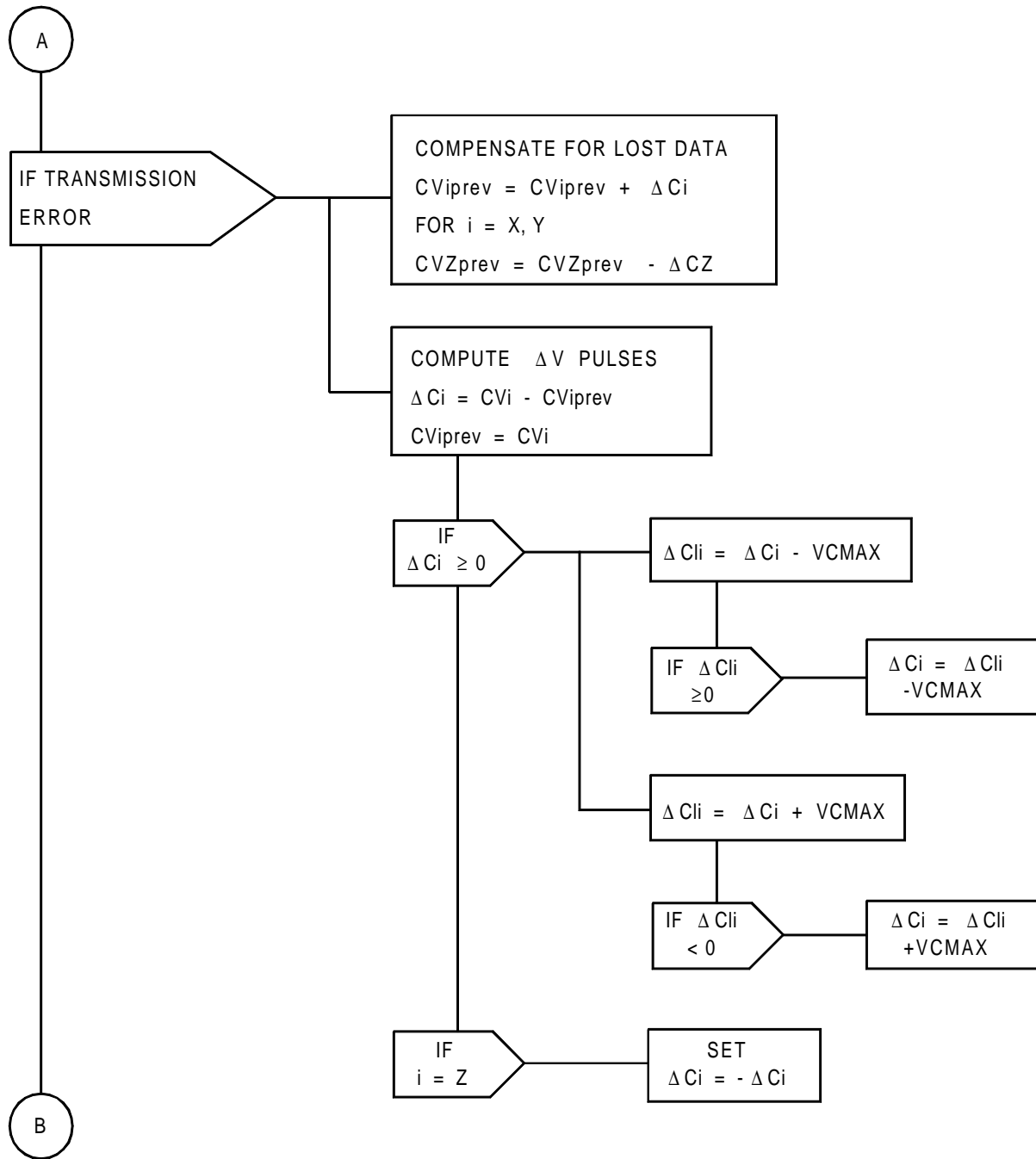


FIGURE 4.5.1.2-1.(2) ACP\_ACUM Flow Diagram (Sheet 2 of 3)





### 4.5.1.3 Resolver Processing (RES\_PROC)

The RES\_PROC module computes the mechanical gimbal angles for each channel of each IMU.

A. Functional Requirements. The RES\_PROC module performs the following for each applicable IMU:

1. Compute the mechanical gimbal angles by combining and compensating the resolver readings.
2. Perform a reasonableness test on the computed mechanical angles versus the resolver readings and indicate failure status.
3. Compensate for data lost by transmission errors by assuming a constant attitude rate over the sample period.
4. Compute the average of the compensated gimbal angles calculated over the major sample period during certain Hangar Calibration B operations.
5. Support the Star Tracker SOP by computing the average of the compensated gimbal angles over the Star Tracker sample period.

B. Interface Requirements. The input/output interfaces associated with the RES\_PROC module are listed in Tables 4.5.1.3-1 and 4.5.1.3-2.

C. Detailed Requirements. It is important to note that the 1X and 8X resolver readings represent the same mechanical angle. Both resolver data words are modulo 360 degrees, but the 8X overflows at a gimbal angle of 45 degrees because the resolver value (electrical degrees) is 8X the mechanical angle. Errors in both channels cause anomalies at multiples of 45 degrees (mechanical) that must be corrected in the computation. For example, if the 8X resolver data word overflows prior to the setting of bit 3 (45 degrees) of the 1X word, ANGi (as formed in item 1b below) fails to reflect a valid 45 degree segment.

In addition, there is a variable skewness (-5 to +7 msec) between the 1X and 8X data that contributes to the anomaly at high rates of gimbal rotation, especially during "gimbal flip." Also important is that the inner roll gimbal is physically restrained to  $\pm(11$  to 15 degrees) and that the inner roll 1X resolver is not read out.

Since the inputs to this module are modulo 360 degrees and the outputs are required to be modulo 360 degrees, a certain amount of caution is required in summing and differencing angles at the 0 to 360 degree discontinuity point. It is expected that complementary arithmetic in conjunction with a (properly scaled) fixed point mode of operation might simplify the required code.

The assigned bit values for the resolver input words are specified in paragraph 4.1.1B.

The following operations are required for each applicable IMU:

1. Convert the resolver readings to compensated mechanical angles.
  - a. Determine the inner roll gimbal angle:

If  $\Theta_{RL} < 180^\circ$ :

$$\text{ANGRL} = \frac{\Theta\text{RL}}{8} - \text{IRO}$$

If  $\Theta\text{RL} > 180^\circ$ :

$$\text{ANGRL} = \frac{(\Theta\text{RL} - 360^\circ)}{8} - \text{IRO}$$

If ANGRL is negative:

$$\text{ANGRL} = \text{ANGRL} + 360^\circ$$

Subtracting IRO is required to compensate for resolver offset.

- b. Determine the combined roll, pitch, and azimuth resolver angles:

Form an angle by combining the data contained in the three most significant bits of IMU output words 4, 6, or 8 with the data contained in IMU output words 5, 7, or 9, respectively. The appropriate resolver offsets are to be subtracted to yield compensated mechanical angles. This is to be done in a manner to constitute

$$\text{ANG}_i = (3 \text{ MSB of word } 4, 6, \text{ or } 8)$$

$$+ \frac{(\text{Word } 5, 7, \text{ or } 9)}{8}$$

– offset (i); i = X, Y, Z

where the first term equals 0 to 315 degrees and the second term equals 0 to 45 degrees.

- c. Test the validity of the computed roll, pitch, and azimuth angles formed above by comparing to the 1X resolver reading. Any absolute difference exceeding 22.5 degrees is sufficient to identify the anomalous singularity that can occur at multiples of 45 degrees.
- d. Correct the computed mechanical angles if the above described anomaly exists by adding or subtracting 45 degrees as appropriate from the previously computed mechanical angle,  $\text{ANG}_i$ . The 45 degrees is summed with  $\text{ANG}_i$  in a manner to make  $\text{ANG}_i$  more nearly agree with the 1X resolver reading.
- e. Convert the compensated angles to modulo 360 degrees:

If  $\text{ANG}_i$  is negative:

$$\text{ANG}_i = \text{ANG}_i + 360^\circ$$

If  $\text{ANG}_i \geq 360$ :

$$\text{ANG}_i = \text{ANG}_i - 360^\circ$$

2. If Star Tracker support is not required and ground sequences 5 or 6 is not scheduled in Hangar Calibration B, make the compensated angles available as outputs to the using module.

3. If the submode is Hangar Calibration B and ground sequence 5 or 6 is scheduled, compute the average compensated gimbal angles over the major cycle period and make these averages available at the end of the sample period. These angles are to be modulo 360 degrees. These computations can be done as follows:

For  $i = X, Y, Z, RL$

First minor cycle of sample period

$$iSUM = 0$$

Subsequent minor cycles

$$iSUM = iSUM + \Delta\Theta_i (9-N)$$

Where  $|\Delta\Theta_i|$  is the signed value of the following with the smallest magnitude

$$(ANG_i - ANG_{iPREV})$$

$$(ANG_i - ANG_{iPREV} + 360^\circ)$$

$$(ANG_i - ANG_{iPREV} - 360^\circ)$$

$ANG_{iPREV}$  is the compensated angles computed during the previous minor cycle.  $N$  is the current minor cycle number.

Last minor cycle of sample period

$$KANG = \frac{iSUM}{N} + ANG_i$$

Where  $K = OR, P, AZ, IR$  for  $i = X, Y, Z, RL$  and where  $ANG_{i}$  is the  $ANG_i$  computed during the first minor cycle.

$$\text{If } KANG \text{ is negative: } KANG = KANG + 360^\circ$$

$$\text{If } KANG > 360^\circ: KANG = KANG - 360^\circ$$

4. a. If time for reasonableness test, compute a reasonableness test limit for the roll, pitch, and azimuth gimbal angles:

$$RESLIM_i = RESLIMO + \frac{|\Delta\Theta_i|}{TRS} (RESLAGT), i = X, Y, Z$$

where  $|\Delta\Theta_i|$  is the smallest absolute value of the following:

$$(\text{ANG}_i - \text{ANG}_i\text{PREV})$$

$$(\text{ANG}_i - \text{ANG}_i\text{PREV} + 360^\circ)$$

$$(\text{ANG}_i - \text{ANG}_i\text{PREV} - 360^\circ)$$

and TRS is the current resolver processing interval in seconds.

- b. Test the computed roll, pitch, and azimuth gimbal angles for reasonableness and report any implied resolver failure. If  $|\Delta\phi_i| > \text{RESLIM}_i$ , set the resolver fail flag; otherwise reset the flag to indicate no failure is detected.

$|\Delta\phi_i|$  is the smallest absolute value of the following:

$$(\Theta_{iM} - \text{ANG}_i - \text{offset}(i))$$

$$(\Theta_{iM} - \text{ANG}_i - \text{offset}(i) + 360^\circ)$$

$$(\Theta_{iM} - \text{ANG}_i - \text{offset}(i) - 360^\circ)$$

$$i = X, Y, Z$$

5. If RES\_PROC is required to support the Star Tracker SOP:

Compute and store the average compensated gimbal angles over the first 21 160-msec samples read in support of the Star Tracker SOP. (The Star Tracker requires 21 samples total.) These angles are to be modulo 360 degrees. It is suggested that a technique similar to step 3 above be employed.

When averaging gimbal angles for the Star Tracker SOP, an area parameter must be computed for gimbal averaging error detection. The averaging error is caused by gimbal angle nonlinearity with respect to time.

On the last (twenty-first) pass, compute the area parameter for each IMU for output to the Star Tracker SOP. The area parameter is the absolute value of the azimuth gimbal angle sum (computed as in step 3 above):

$$\text{AREA} = |\sum_{i=1}^{21} \text{ANG}_i|$$

where SUM21 is the value of iSUM after the twenty-first pass.

Terminate the Star Tracker support processing until a subsequent request by the Star Tracker SOP.

6. In addition to the foregoing processing requirements, this module is to monitor for an FCOS-detected transmission failure and compensate by assuming that the missed data represent an attitude change equal to that sensed on the previous cycle. This involves updating the compensated angle based on the stated assumption and performing steps 2 through 5 above. Step 4 may be omitted when a transmission error is determined to exist.

7. When one or more IMU's are in INERTIAL, the IMU gimbal data time tag (T\_IMUS\_GA\_TLM) must reflect the read time of the raw data used in computing the processed gimbal angle data output to the ascent/entry attitude processing function:

$$T\_IMUS\_GA\_TLM = T\_IMUS\_GA$$

8. This module is to be executed as follows:
  - a. During all GN&C 9 operations except INERTIAL, Hangar Calibration B (ground sequences 5 or 6) and TERM/IDLE, it shall be executed at the "major cycle" rate of 3.125 Hz.
  - b. During the Hangar Calibration B (ground sequence 5 or 6), it shall be executed at the "minor cycle" rate of 25 Hz and the averaging of step 3 above is applicable.
  - c. During TERM/IDLE, it shall be executed at not less than the display rate whenever the IMU Control/Monitor display is active.
  - d. During INERTIAL, it shall be executed at the rate required by ATT\_PROC function, which is 6.25 Hz in OPS-2 and OPS-8, on demand when ST\_DATA\_FILTER is active and at the rates specified in paragraphs 4.5.4.6 and 4.5.4.5.2.
  - e. Whenever the Star Tracker module DATA\_FILTER is initiated, this module will process twenty-one 160-msec samples as indicated in step 5 above. The resulting 21 sample averages shall be made available to the TNB\_CL module for processing in response to a Star Tracker SOP call of TNB\_CL.
  - f. The BITE reasonableness test required by step 4 above shall be executed at a 1.04 Hz rate and on RM demand (6.25 Hz) during all submodes.

A suggested design flow that satisfies the RES\_PROC requirements is shown in Figure 4.5.1.3-1.

D. Special Considerations. The foregoing requirements are stated in terms of degrees to provide visibility into the required function of this module. It is not intended to preempt the coder's option of fulfilling the requirements in an economical manner through various available implementation techniques such as fixed-point bit manipulation.

Table 4.5.1.3-1. RES\_PROC Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
$\theta_{RL}(1)$	V71H2060B	IMU 1 THETA R 8X WD3	IMU-1	SCALAR	0-120 240-360	DEG	OD
$\theta_{RL}(2)$	V71H3060B	IMU 2 THETA R 8X WD3	IMU-2	SCALAR	0-120 240-360	DEG	OD
$\theta_{RL}(3)$	V71H4060B	IMU 3 THETA R 8X WD3	IMU-3	SCALAR	0-120 240-360	DEG	OD
$\theta_{XM}(1)$	V71H2080B	IMU 1 THETA X 1X WD4	IMU-1	SCALAR	0-360	DEG	OD
$\theta_{XM}(2)$	V71H3080B	IMU 2 THETA X 1X WD4	IMU-2	SCALAR	0-360	DEG	OD
$\theta_{XM}(3)$	V71H4080B	IMU 3 THETA X 1X WD4	IMU-3	SCALAR	0-360	DEG	OD
$\theta_{XL}(1)$	V71H2100B	IMU 1 THETA X 8X WD5	IMU-1	SCALAR	0-360	DEG	OD
$\theta_{XL}(2)$	V71H3100B	IMU 2 THETA X 8X WD5	IMU-2	SCALAR	0-360	DEG	OD
$\theta_{XL}(3)$	V71H4100B	IMU 3 THETA X 8X WD5	IMU-3	SCALAR	0-360	DEG	OD
$\theta_{YM}(1)$	V71H2120B	IMU 1 THETA Y 1X WD6	IMU-1	SCALAR	0-360	DEG	OD
$\theta_{YM}(2)$	V71H3120B	IMU 2 THETA Y 1X WD6	IMU-2	SCALAR	0-360	DEG	OD
$\theta_{YM}(3)$	V71H4120B	IMU 3 THETA Y 1X WD6	IMU-3	SCALAR	0-360	DEG	OD
$\theta_{YL}(1)$	V71H2140B	IMU 1 THETA Y 8X WD7	IMU-1	SCALAR	0-360	DEG	OD
$\theta_{YL}(2)$	V71H3140B	IMU 2 THETA Y 8X WD7	IMU-2	SCALAR	0-360	DEG	OD
$\theta_{YL}(3)$	V71H4140B	IMU 3 THETA Y 8X WD7	IMU-3	SCALAR	0-360	DEG	OD
$\theta_{ZM}(1)$	V71H2160B	IMU 1 THETA Z 1X WD8	IMU-1	SCALAR	0-360	DEG	OD
$\theta_{ZM}(2)$	V71H3160B	IMU 2 THETA Z 1X WD8	IMU-2	SCALAR	0-360	DEG	OD
$\theta_{ZM}(3)$	V71H4160B	IMU 3 THETA Z 1X WD8	IMU-3	SCALAR	0-360	DEG	OD
$\theta_{ZL}(1)$	V71H2180B	IMU 1 THETA Z 8X WD9	IMU-1	SCALAR	0-360	DEG	OD
$\theta_{ZL}(2)$	V71H3180B	IMU 2 THETA Z 8X WD9	IMU-2	SCALAR	0-360	DEG	OD
$\theta_{ZL}(3)$	V71H4180B	IMU 3 THETA Z 8X WD9	IMU-3	SCALAR	0-360	DEG	OD
IMU_CF (1)	V91X3101X	IMU 1 COMMFAULT	FCOS	LOGICAL	0,1	NA	OD
IMU_CF (2)	V91X3131X	IMU 2 COMMFAULT	FCOS	LOGICAL	0,1	NA	OD
IMU_CF (3)	V91X3161X	IMU 3 COMMFAULT	FCOS	LOGICAL	0,1	NA	OD
INERTIAL	V95X0001X	IN INERTIAL MODE (IMU)	GC_ALIGN1	LOGICAL	0,1	NA	OD
RESLIMO	V90H7640C	RESOLVER LIMIT	CONSTANT	SCALAR	1.0	DEG	OD
RESLAGT	V90W7642C	APPROXIMATE MAXIMUM DATA SKEW TIME	CONSTANT	SCALAR	0.007	SEC	OD
RO (1) RO (2) RO (3)	V90H7650C V90H7651C V90H7652C	ROLL RESOLVER OFFSET; 1 PER IMU	I-LOAD	SCALAR	+/-5	DEG	OD
PO (1) PO (2) PO (3)	V99H2620C V99H2621C V99H2622C	PITCH RESOLVER OFFSET; 1 PER IMU	HANG_CALB I-LOAD	SCALAR	+/-5	DEG	OD
AZO (1) AZO (2) AZO (3)	V99H2610C V99H2611C V99H2612C	AZIMUTH RESOLVER OFFSET; 1 PER IMU	HANG_CALB I-LOAD	SCALAR	+/-5	DEG	OD
IRO (1) IRO (2) IRO (3)	V99H2615C V99H2616C V99H2617C	INNER ROLL RESOLVER OFFSET; 1 PER IMU	HANG_CALB I-LOAD	SCALAR	+/-5	DEG	OD

Table 4.5.1.3-1. RES_PROC Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
T_IMUS_GA	V95W0002C	IMU INPUT TRANSACTION TIME TAG	FCOS	SCALAR DP		SEC	OD



Table 4.5.1.3-2. RES\_PROC Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
AZANG(1)	V95H0051C	IMU-1 COMP AZIMUTH RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD
AZANG(2)	V95H1051C	IMU-2 COMP AZIMUTH RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD
AZANG(3)	V95H2051C	IMU-3 COMP AZIMUTH RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD
IRANG(1)	V95H0053C	IMU-1 COMP INNER ROLL RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-15 345-360	DEG	OD
IRANG(2)	V95H1053C	IMU-2 COMP INNER ROLL RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-15 345-360	DEG	OD
IRANG(3)	V95H2053C	IMU-3 COMP INNER ROLL RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-15 345-360	DEG	OD
ORANG(1)	V95H0054C	IMU-1 COMP OUTER ROLL RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD
ORANG(2)	V95H1054C	IMU-2 COMP OUTER ROLL RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD
ORANG(3)	V95H2054C	IMU-3 COMP OUTER ROLL RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD
PANG(1)	V95H0050C	IMU-1 COMP PITCH RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD
PANG(2)	V95H1050C	IMU-2 COMP PITCH RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD
PANG(3)	V95H2050C	IMU-3 COMP PITCH RES ANGLE	TNB_CL DISPLAYS ST_SOP TLM ATT_PROC	SCALAR	0-360	DEG	OD

Table 4.5.1.3-2. RES\_PROC Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
FAIL_RES_LIM(1)	V95X0037X	IMU-1 RESOLVER LIMIT FAIL	BITE_SUM DISP_SUP TLM	LOGICAL	0,1	NA	1.04
FAIL_RES_LIM(2)	V95X1037X	IMU-2 RESOLVER LIMIT FAIL	BITE_SUM DISP_SUP TLM	LOGICAL	0,1	NA	1.04
FAIL_RES_LIM(3)	V95X2037X	IMU-3 RESOLVER LIMIT FAIL	BITE_SUM DISP_SUP TLM	LOGICAL	0,1	NA	1.04
ORAVG21(1)		IMU-1 OUTER ROLL ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
ORAVG21(2)		IMU-2 OUTER ROLL ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
ORAVG21(3)		IMU-3 OUTER ROLL ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
PAVG21(1)		IMU-1 PITCH ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
PAVG21(2)		IMU-2 PITCH ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
PAVG21(3)		IMU-3 PITCH ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
AZAVG21(1)		IMU-1 AZ ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
AZAVG21(2)		IMU-2 AZ ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
AZAVG21(3)		IMU-3 AZ ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
IRAVG21(1)		IMU-1 INNER ROLL ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
IRAVG21(2)		IMU-2 INNER ROLL ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
IRAVG21(3)		IMU-3 INNER ROLL ANG 21 SPL AVG	TNB_CL	SCALAR	0 TO 360	DEG	OD
T_IMUS_GA_TLM	V95W0036C	IMU GIMBAL DATA TIME TAG	TLM	SCALAR DP		SEC	OD
T_IMUS	V95W0002C	IMU INPUT TRANS TIME TAG	ENT UPP, TAEM UPP, STAR TRCK SOP, A/L UPP, ENT NAV, PRELAND NAV, G/C STEER, RTLS NAV A/E ATT PROC, ORB ATT PROC, ORB/RND NAV, D/L NAV SEQ, ASC UPP, ORB UPP, RTLS UPP, ORB/RND NAV SEQ, IMU RM, TLM	SCALAR DP		SEC	OD
AREA (1)		GIMBAL AREA PARAMETER; IMU-1	ST_SOP	SCALAR	0 TO 2500	DEG	OD
AREA (2)		GIMBAL AREA PARAMETER; IMU-2	ST_SOP	SCALAR	0 TO 2500	DEG	OD
AREA (3)		GIMBAL AREA PARAMETER; IMU-3	ST_SOP	SCALAR	0 TO 2500	DEG	OD

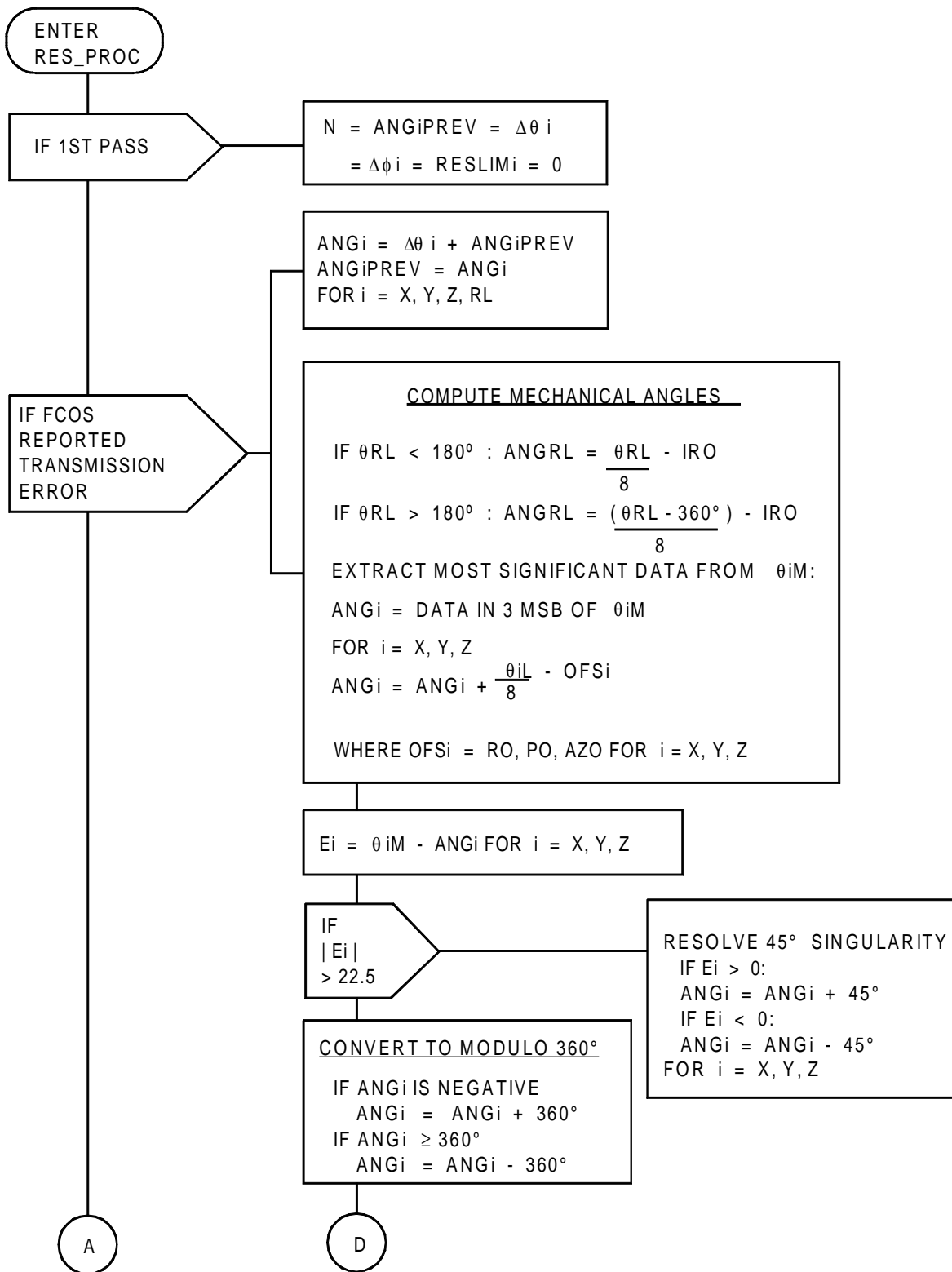


FIGURE 4.5.1.3-1.(1) RES\_PROC Flow Diagram (Sheet 1 of 4)

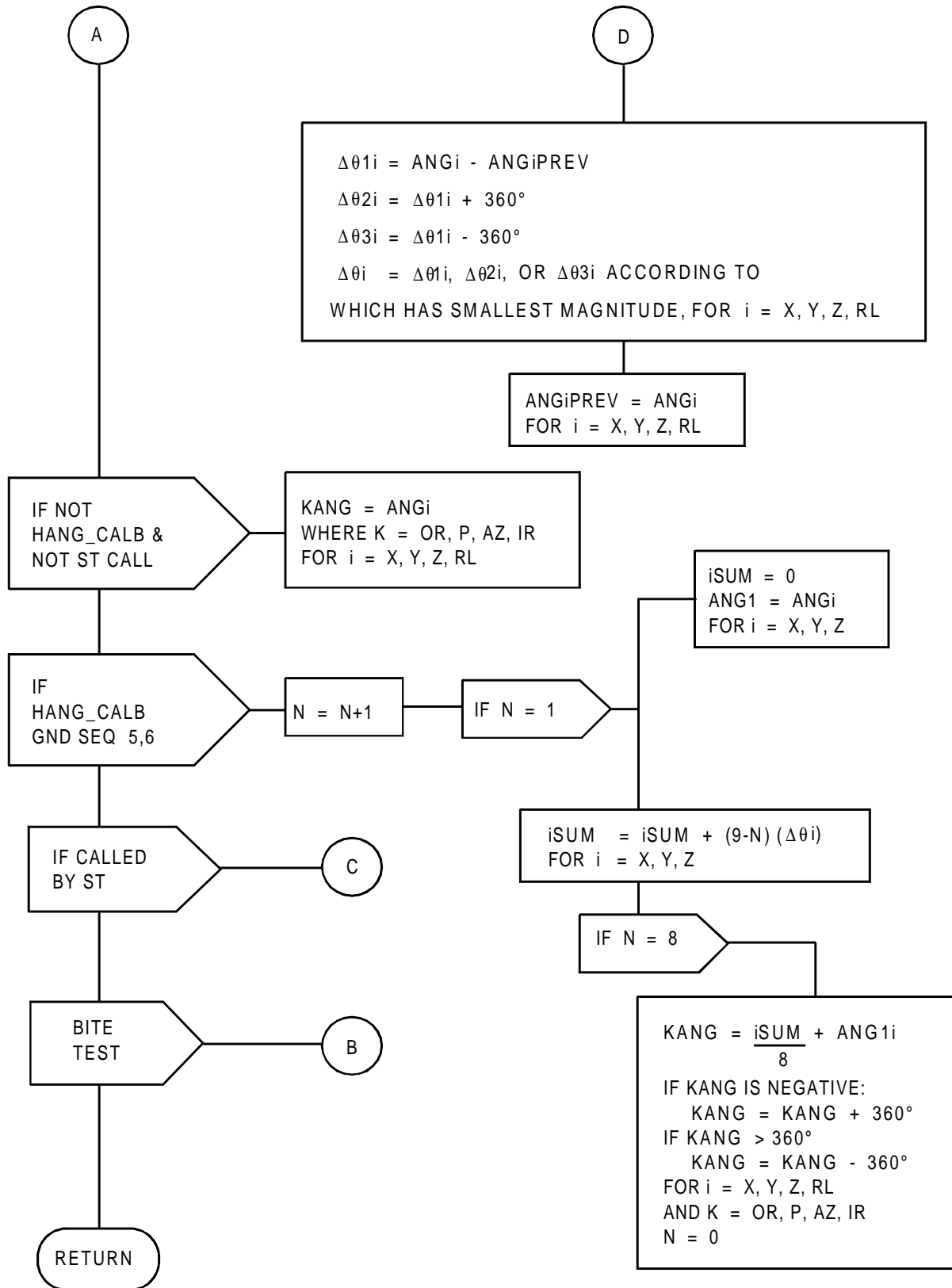


FIGURE 4.5.1.3-1.(2) RES\_PROC Flow Diagram (Sheet 2 of 4)

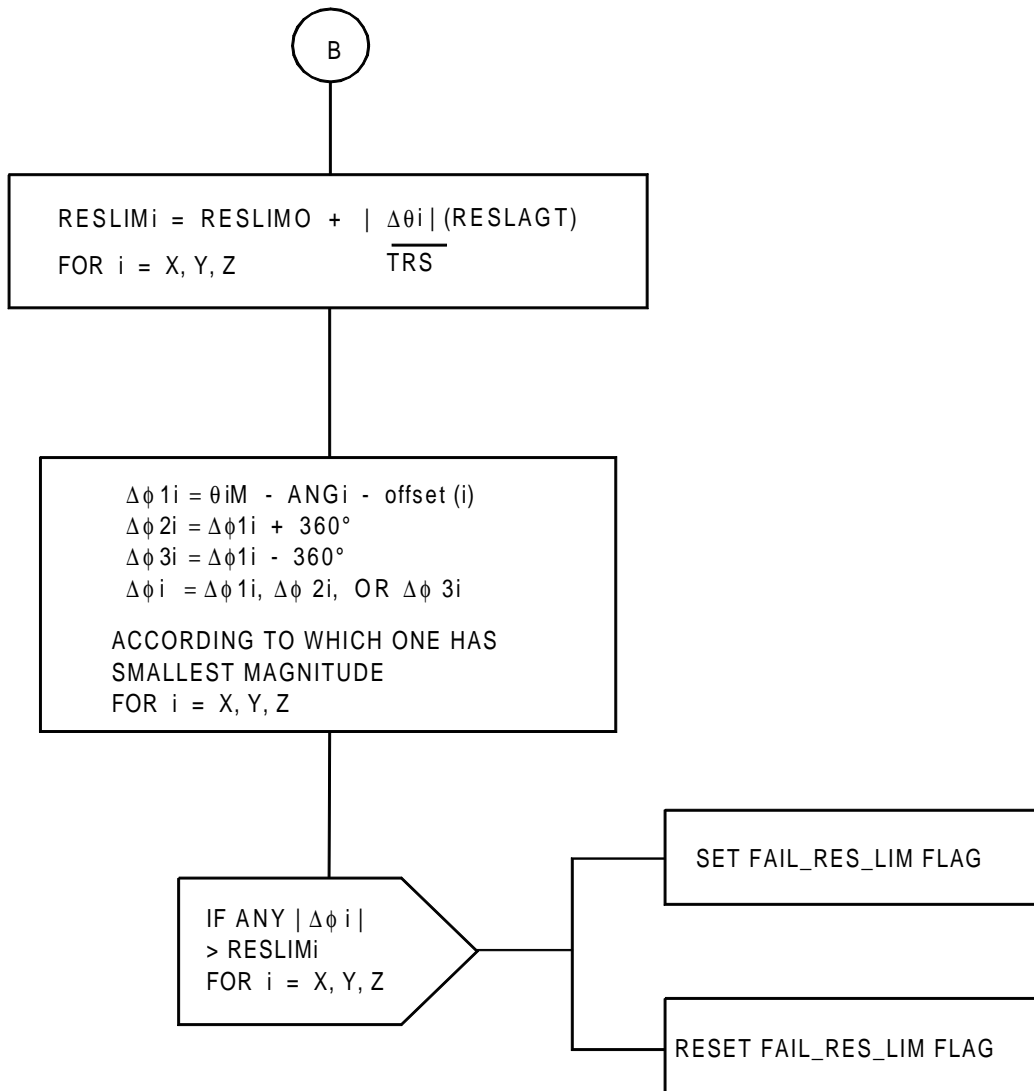


FIGURE 4.5.1.3-1.(3) RES\_PROC Flow Diagram (Sheet 3 of 4)

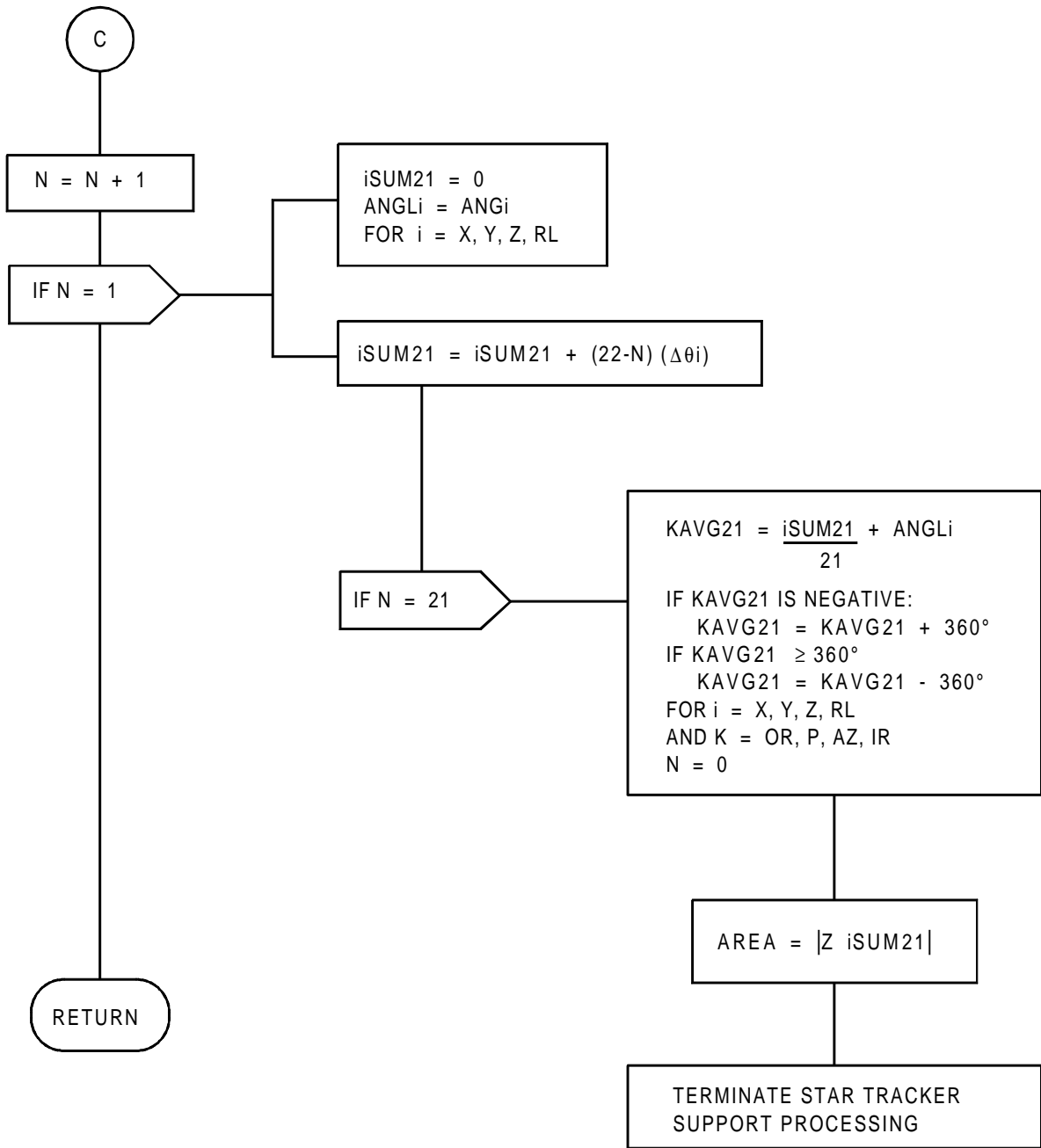


FIGURE 4.5.1.3-1.(4) RES\_PROC Flow Diagram (Sheet 4 of 4)

#### 4.5.1.4 Gyro Torque Processing (GYO\_TORQ)

The purpose of the GYO\_TORQ module is to convert the computer-derived torquing rates into the required integer number of pulses for application to the X, Y, and Z gyros.

A. Functional Requirements. The GYO\_TORQ module performs the following functions for each applicable IMU:

1. Convert the commanded torquing rate computed by the GYO\_COMP module into the required number of integer pulses to be applied to the X, Y, and Z gyros.
2. Save fractional pulses for application in subsequent cycles.
3. Compensate a BITE detected transmission error by saving and retransmitting any pulses lost through a transmission error.
4. Limit the number of pulses output on a given iteration to assure compatibility with the design constraints of Part D. Compensate for any excess above the limit value by transmitting on later cycles as in steps 2 and 3.

B. Interface Requirements. The input/output interfaces associated with the GYO\_TORQ module are listed in Tables 4.5.1.4-1 and 4.5.1.4-2.

C. Detailed Requirements. The following operations are required for each X, Y, and Z channel of each applicable IMU.

1. Convert the GYO\_COMP commanded torquing rate into the required pulse value needed to achieve this rate over the torquing cycle period by applying the nominal torque register scale factor.
2. Modify the value determined above as follows:
  - a. Add any pulses that were transmitted on the previous cycle but not received by the IMU as indicated by the transmission fail bit from the IMU.
  - b. Add any pulses and fractional pulses that were not transmitted on the previous cycle due to the limiting functions of following steps 3 and 4.
  - c. Subtract any excess fractional pulses that were transmitted due to a “round up” by step 4.
  - d. On the first pass after an OPS transition, add the torquing pulses that were not transmitted due to the OPS transition. These are: The commanded torquing rate multiplied by the OPS transition time (DTOS) and divided by the nominal scale factor plus any residual pulses computed but not output in the previous OPS. OPS transition time means the time during which no torquing pulses are output to the IMU’s due to both the lack of I/O transmissions during the transition period and the time of any forced zero outputs that may be required to effect predictable controlled outputs to the IMU’s during the total transition period. The OPS transition logic shall recognize when the GMT (CLOCK) indicates that a reset of GMT for a year end rollover has occurred during a transition into OPS 3, and adjust any resulting negative DTOS by adding 31,622,400 seconds if LAUNCH\_YEAR was a leap year or by adding 31,536,000 seconds otherwise. Note that the value of

LAUNCH\_YEAR used in this calculation is one that has not been updated by the Deorbit/Landing Navigation Sequencer.

3. Limit the output to  $\pm 8$  pulses if the torquing output cycle period is 40 msec. Limit the output to  $\pm 15$  pulses if the torquing cycle is  $\geq 80$  msec. Save the remainder for step 2.
4. Round the resulting pulse value to the nearest whole integer. Save the remainder or deficiency for step 2.
5. Make the integer value available to the I/O for output to the appropriate gyro torquer registers of each IMU. (Refer to paragraph 4.1.1A for specific gyro torquing output word assignments.)
6. In addition to the preceding requirements, on the first pass, following the initiation of a preflight submode, initialize the desired pulses (see step 1) and the residual (see step 2) to zero.

GYO\_TORQ shall be executed at 25 Hz or 6.25 Hz during ground and preflight operations. The sequence is specified in paragraphs 4.5.1 and 4.5.4.5.2. During INERTIAL operation, GYO\_TORQ shall be executed at 160-msec rate in accordance with the sequence requirements of Sections 4.5.4.6 and 4.5.4.5.2. During On-Orbit Align, the GYO\_TORQ shall be executed at a 160-msec rate in accordance with the requirements of Section 4.5.4.7. A suggested design flow that satisfies the GYO\_TORQ requirements is shown in Figure 4.5.1.4-1.

D. Special Considerations. The number of pulses that can be sent to the IMU is limited by the size of the torquing register +15 or -16 pulses. The hardware torquing mechanization employs a 200-Hz countdown of the torquing register; hence, the pulse output must be limited to  $\pm 8$  pulses per 40-msec cycle (when  $T_{min} = 40$  msec) or  $\pm 15$  pulses for cycles of 80 msec or longer. The negative pulse outputs must be expressed in 2's complement notation.

Table 4.5.1.4-1. GYO\_TORQ Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
INERTIAL	V95X0001X	IN INERTIAL MODE (IMU)	GC_ALIGN1	LOGICAL	0,1	NA	OD
GTi		COMPENSATED TORQUING RATE CMD; i = X,Y,Z; 1 SET PER IMU	GYO_COMP	SCALAR	+/-100	DEG/HR	OD
KTN	V90G7621C	NOMINAL GYRO TORQUER SCALE FACTOR	CONSTANT	SCALAR	-0.5	ARC-SEC/PULSE	OD
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL WD1 B9	IMU-1	LOGICAL	0,1	NA	OD
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL WD1 B9	IMU-2	LOGICAL	0,1	NA	OD
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL WD1 B9	IMU-3	LOGICAL	0,1	NA	OD



Table 4.5.1.4-2. GYO\_TORQ Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
PX(1)	V71K2521B	GN IMU-1 TORQUE X WD1 B0-4 CMD	IMU-1, TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25
PX(2)	V71K3521B	GN IMU-2 TORQUE X WD1 B0-4 CMD	IMU-2, TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25
PX(3)	V71K4521B	GN IMU-3 TORQUE X WD1 B0-4 CMD	IMU-3, TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25
PY(1)	V71K2526B	GN IMU-1 TORQUE Y WD1 B5-9 CMD	IMU-1, TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25
PY(2)	V71K3526B	GN IMU-2 TORQUE Y WD1 B5-9 CMD	IMU-2, TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25
PY(3)	V71K4526B	GN IMU-3 TORQUE Y WD1 B5-9 CMD	IMU-3, TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25
PZ(1)	V71K2531B	GN IMU-1 TORQUE Z WD1 B10-14 CMD	IMU-1, TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25
PZ(2)	V71K3531B	GN IMU-2 TORQUE Z WD1 B10-14 CMD	IMU-2 TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25
PZ(3)	V71K4531B	GN IMU-3 TORQUE Z WD1 B10-14 CMD	IMU-3, TLM	INTEGER	-8, +7.5	ARC-SEC	25.0 6.25

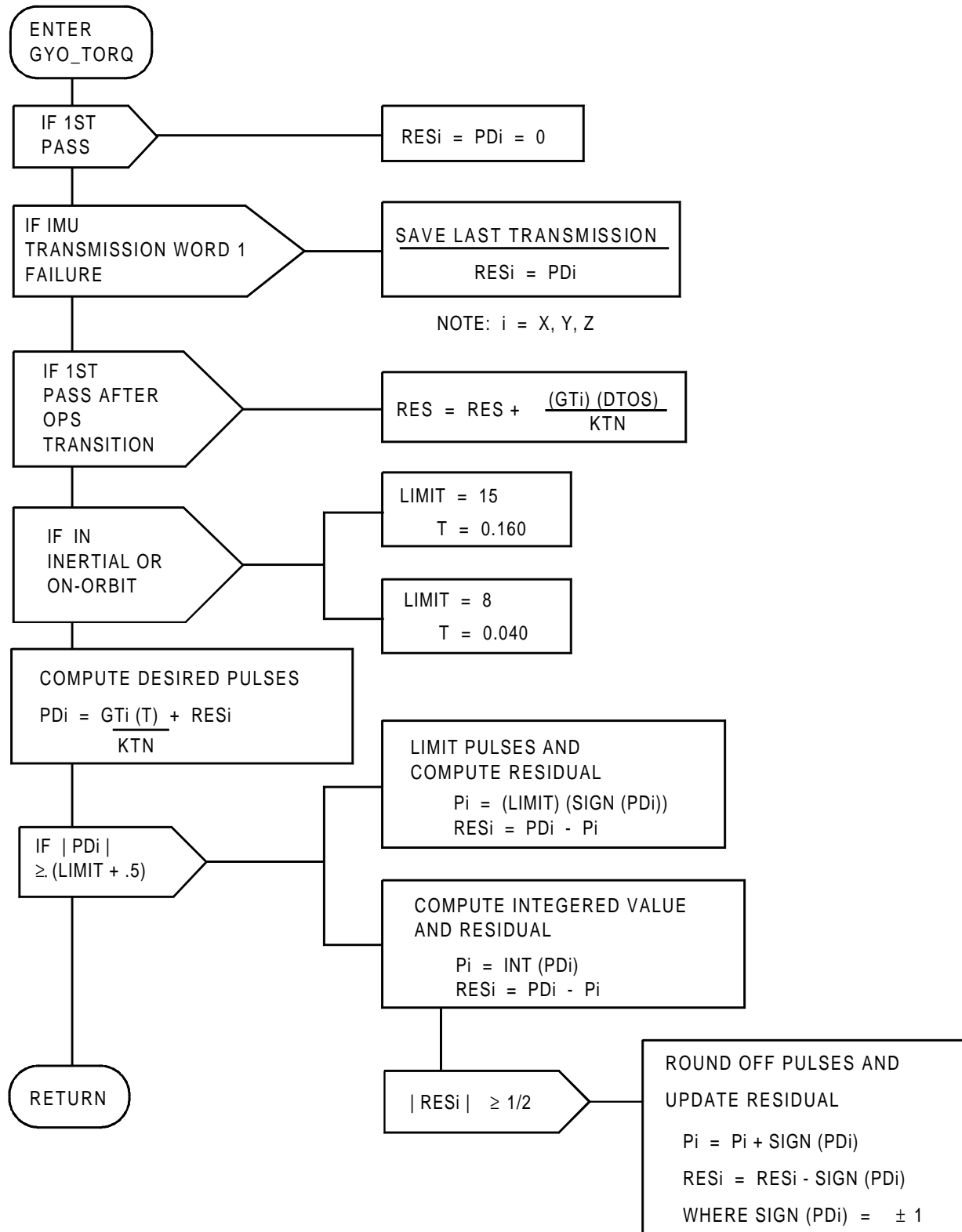


FIGURE 4.5.1.4-1. GYO\_TORQ Flow Diagram

#### 4.5.1.5 IMU BITE Summary (BITE\_SUM)

The purpose of the BITE\_SUM module is to provide the redundancy management and display functions with a current BITE status summary. Also, a current BITE status word is provided for display.

A. Functional Requirements. The BITE\_SUM module performs the following function for each IMU:

1. Monitor the various failure flags and mode status word to provide a failure summary indication and format the IMU\_BITE\_STATUS word for display.
2. Provide for the masking of any crew deselected bite's.

B. Interface Requirements. The input/output interfaces associated with the IMU\_BITE module are listed in Tables 4.5.1.5-1 and 4.5.1.5-2.

C. Detailed Requirements. The following sequence of operations is required for each applicable IMU:

1. Form the 14 bits of the IMU\_BITE\_STATUS word from the IMU BITE failure flags as follows:

$$\begin{array}{rcl}
 \text{IMU\_BITE\_STATUS} & = & \overline{\text{IMU\_GOOD}} \quad (\text{MSB}) \\
 & & \text{TRANS\_2\_FAIL} \\
 & & \text{TRANS\_1\_FAIL} \\
 & & \text{FAIL\_RED\_RTE} \\
 & & \\
 & & \text{FAIL\_IR\_NULL} \\
 & & \text{FAIL\_RES\_LIM} \\
 & & \text{FAIL\_VEL\_LIM} \\
 & & \text{FAIL\_ECHO\_2} \\
 & & \text{FAIL\_ECHO\_1} \\
 & & \text{FAIL\_ACCEL\_SF} \\
 & & \overline{\text{PLAT\_TEMP\_RDY}} \\
 & & \overline{\text{PLAT\_TEMP\_SAFE}} \\
 & & \overline{\text{CAP\_TEMP\_RDY}} * \\
 & & \overline{\text{CAP\_TEMP\_SAFE}} * \quad (\text{LSB})
 \end{array}$$

\* Note : For the HAINS IMU the CAPRI TEMP discrettes are set true (=1) when power is applied to the IMU.

2. If any of the 14 bits of the IMU\_BITE\_STATUS word is set, indicating an IMU failure, and if the corresponding mask bit in the IMU\_BITE\_MASK word is set, then set the IMU\_FAIL\_IND flag equal to one; otherwise set the IMU\_FAIL\_IND flag equal to zero. The IMU\_BITE\_MASK word from the DISP\_SUP module indicates whether a particular bite failure flag has been deselected by the crew. The bits of the IMU\_BITE\_MASK word correspond to the following IMU BITE Failure Flags:

IMU\_BITE\_Mask Word

(MSB) BIT 1	M1	IMU_GOOD
	M2	TRANS_2_FAIL
	M3	TRANS_1_FAIL
	M4	FAIL_RED_RTE
	M5	FAIL_IR_NULL
	M6	FAIL_RES_LIM
	M7	FAIL_VEL_LIM
	M8	FAIL_ECHO_2
	M9	FAIL_ECHO_1
	M10	FAIL_ACCEL_SF
	M11	PLAT_TEMP_RDY
	M12	PLAT_TEMP_SAFE
	M13	CAP_TEMP_RDY *
(LSB) BIT 14	M14	CAP_TEMP_SAFE *

To accommodate display requirements, and to constrain implementation, the 14 bit BITE status and mask words shall reside, left justified, in 16 bit memory words. The two least significant bits of these memory words shall be initialized, and shall remain, off in the status words and on in the mask words.

The BITE\_SUM module shall be executed at the display processing or GAX rate or at 6.25 Hz on RM demand.

A suggested design flow that satisfies the BITE\_SUM requirements is shown in Figure 4.5.1.5-1.

\* Note : For the HAINS IMU the CAPRI TEMP discrettes are set true (=1) when power is applied to the IMU.

Table 4.5.1.5-1. BITE\_SUM Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
IMU_GOOD(1)	V71X2021B	GN IMU-1 GOOD WD1 B0	IMU-1	LOGICAL	0,1	NA	OD
IMU_GOOD(2)	V71X3021B	GN IMU-2 GOOD WD1 B0	IMU-2	LOGICAL	0,1	NA	OD
IMU_GOOD(3)	V71X4021B	GN IMU-3 GOOD WD1 B0	IMU-3	LOGICAL	0,1	NA	OD
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL WD1 B9	IMU-1	LOGICAL	0,1	NA	OD
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL WD1 B9	IMU-2	LOGICAL	0,1	NA	OD
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL WD1 B9	IMU-3	LOGICAL	0,1	NA	OD
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL WD1 B10	IMU-1	LOGICAL	0,1	NA	OD
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL WD1 B10	IMU-2	LOGICAL	0,1	NA	OD
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL WD1 B10	IMU-3	LOGICAL	0,1	NA	OD
FAIL_ECHO_1(1)	V95X0030X	IMU-1 WORD 13 ECHO FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_ECHO_1(2)	V95X1030X	IMU-2 WORD 13 ECHO FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_ECHO_1(3)	V95X2030X	IMU-3 WORD 13 ECHO FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_ECHO_2(1)	V95X0031X	IMU-1 WORD 14 ECHO FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_ECHO_2(2)	V95X1031X	IMU-2 WORD 14 ECHO FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_ECHO_2(3)	V95X2031X	IMU-3 WORD 14 ECHO FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_RED_RTE(1)	V95X0033X	IMU-1 REDUNDANT RATE FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_RED_RTE(2)	V95X1033X	IMU-2 REDUNDANT RATE FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_RED_RTE(3)	V95X2033X	IMU-3 REDUNDANT RATE FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_IR_NULL(1)	V95X0034X	IMU-1 INNER RESOLVER NULL FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_IR_NULL(2)	V95X1034X	IMU-2 INNER RESOLVER NULL FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_IR_NULL(3)	V95X2034X	IMU-3 INNER RESOLVER NULL FAIL	IMU_BITE	LOGICAL	0,1	NA	OD
FAIL_VEL_LIM(1)	V95X0035X	IMU-1 VELOCITY LIMIT FAIL	ACP_TRSF	LOGICAL	0,1	NA	OD
FAIL_VEL_LIM(2)	V95X1035X	IMU-2 VELOCITY LIMIT FAIL	ACP_TRSF	LOGICAL	0,1	NA	OD
FAIL_VEL_LIM(3)	V95X2035X	IMU-3 VELOCITY LIMIT FAIL	ACP_TRSF	LOGICAL	0,1	NA	OD
FAIL_RES_LIM(1)	V95X0037X	IMU-1 RESOLVER LIMIT FAIL	RES_PROC	LOGICAL	0,1	NA	OD
FAIL_RES_LIM(2)	V95X1037X	IMU-2 RESOLVER LIMIT FAIL	RES_PROC	LOGICAL	0,1	NA	OD
FAIL_RES_LIM(3)	V95X2037X	IMU-3 RESOLVER LIMIT FAIL	RES_PROC	LOGICAL	0,1	NA	OD
FAIL_ACCEL_SF(1)	V95X0081X	IMU-1 ACC/CAPRI SF FAIL	ACP_ACUM	LOGICAL	0,1	NA	OD
FAIL_ACCEL_SF(2)	V95X1081X	IMU-2 ACC/CAPRI SF FAIL	ACP_ACUM	LOGICAL	0,1	NA	OD
FAIL_ACCEL_SF(3)	V95X2081X	IMU-3 ACC/CAPRI SF FAIL	ACP_ACUM	LOGICAL	0,1	NA	OD
PLAT_TEMP_SAFE(1)	V71X2405X	IMU-1 PLTFRM TEMP SAFE DISCRETE	IMU-1	LOGICAL	0,1	NA	OD
(2)	V71X3405X	-2	-2	LOGICAL	0,1	NA	OD
(3)	V71X4405X	-3	-3	LOGICAL	0,1	NA	OD
PLAT_TEMP_RDY (1)	V71X2404X	IMU-1 PLTFRM TEMP READY DISCRETE	IMU-1	LOGICAL	0,1	NA	OD
(2)	V71X3404X	-2	-2	LOGICAL	0,1	NA	OD
(3)	V71X4404X	-3	-3	LOGICAL	0,1	NA	OD
CAP_TEMP_RDY (1) *	V71X2406X	IMU-1 CAPRI TEMP READY DISCRETE	IMU-1	LOGICAL	0,1	NA	OD
(2) *	V71X3406X	-2	-2	LOGICAL	0,1	NA	OD
(3) *	V71X4406X	-3	-3	LOGICAL	0,1	NA	OD
CAP_TEMP_SAFE(1) *	V71X2407X	IMU-1 CAPRI TEMP SAFE DISCRETE	IMU-1	LOGICAL	0,1	NA	OD
(2) *	V71X3407X	-2	-2	LOGICAL	0,1	NA	OD
(3) *	V71X4407X	-3	-3	LOGICAL	0,1	NA	OD
IMU_BITE_MASK(1)	V95J0028B	IMU-1 BITE MASK WORD	DISP_SUP	LOGICAL	16 BITS	NA	OD
IMU_BITE_MASK(2)	V95J1028B	IMU-2 BITE MASK WORD	DISP_SUP	LOGICAL	16 BITS	NA	OD
IMU_BITE_MASK(3)	V95J2028B	IMU-3 BITE MASK WORD	DISP_SUP	LOGICAL	16 BITS	NA	OD

\* Note : For the HAINS IMU the CAPRI TEMP discrettes are set true (=1) when power is applied to the IMU.

Table 4.5.1.5-2. BITE\_SUM Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
IMU_FAIL_IND(1)	V95X0023X	IMU-1 FAILURE INDICATOR	GAX DISP_SUP TLM,RM RM SENSOR SEL	LOGICAL	0,1	NA	OD
IMU_FAIL_IND(2)	V95X1023X	IMU-2 FAILURE INDICATOR	GAX DISP_SUP TLM,RM RM SENSOR SEL	LOGICAL	0,1	NA	OD
IMU_FAIL_IND(3)	V95X2023X	IMU-3 FAILURE INDICATOR	GAX DISP_SUP TLM,RM RM SENSOR SEL	LOGICAL	0,1	NA	OD
IMU_BITE_STATUS(1)	V95J0029B	IMU-1 BITE STATUS WORD	DISP_SUP IMU ALIGN DISPLAY	LOGICAL	16 BITS	NA	OD
IMU_BITE_STATUS(2)	V95J1029B	IMU-2 BITE STATUS WORD	DISP_SUP IMU ALIGN DISPLAY	LOGICAL	16 BITS	NA	OD
IMU_BITE_STATUS(3)	V95J2029B	IMU-3 BITE STATUS WORD	DISP_SUP IMU ALIGN DISPLAY	LOGICAL	16 BITS	NA	OD

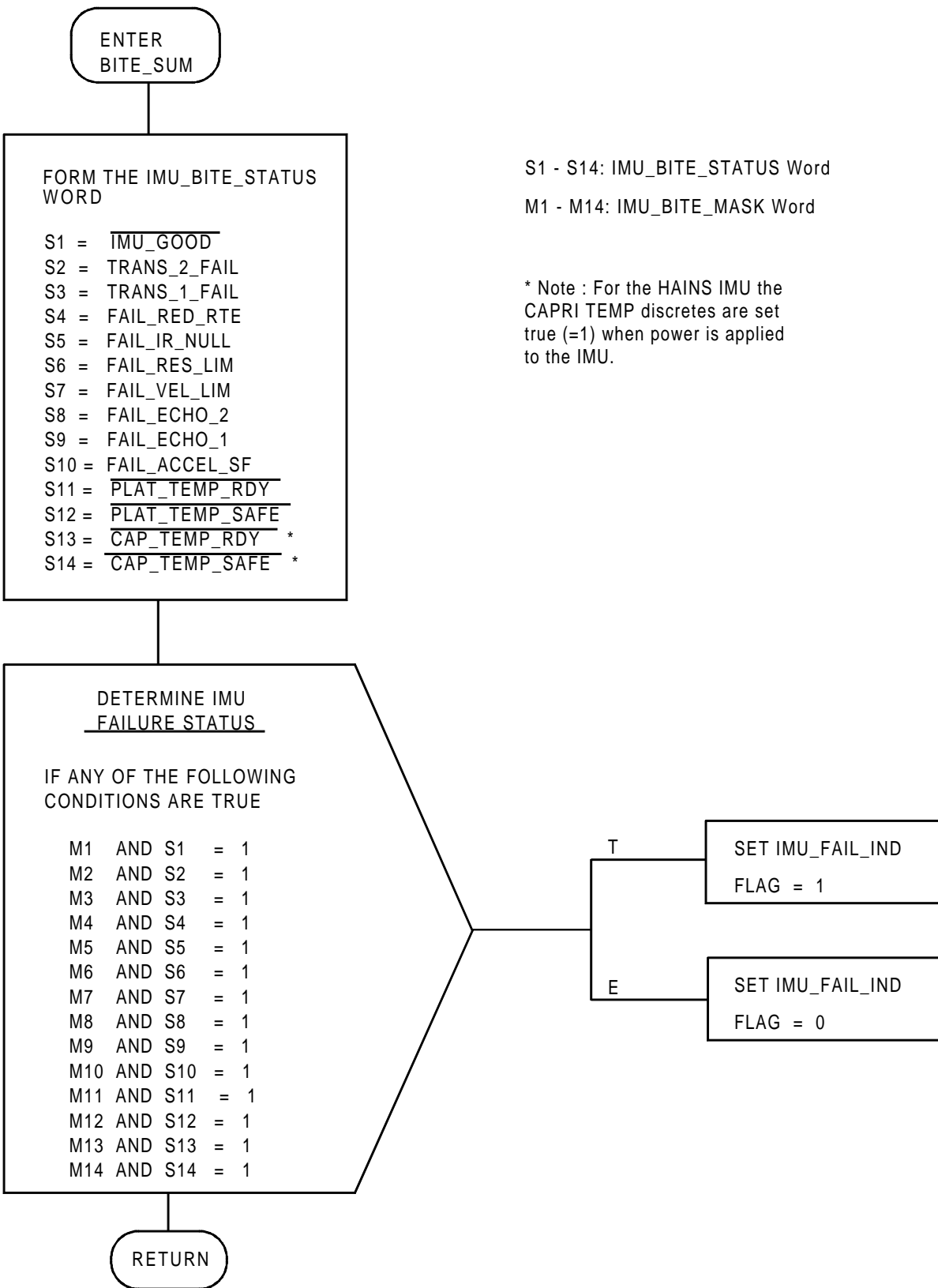


FIGURE 4.5.1.5-1. BITE\_SUM Flow Diagram

## 4.5.2 IMU Major Cycle Processing Modules

This section describes the processing required to support the IMU submodes. Various combinations and sequences of these modules are utilized in the ground sequences, cluster repositioning sequence, and inertial sequence discussed in paragraph 4.1.4. The scheduling and execution rate of these modules shall be under control of the applicable IMU submode program. Major cycle processing is not required for IMU's that are not in the operate mode.

### 4.5.2.1 Accelerometer Pulse Compensation (ACP\_COMP).

The purpose of the ACP\_COMP module is to compensate accelerometer pulses for accelerometer errors and compute the change in sensed velocity in cluster coordinates.

A. Functional Requirements. The ACP\_COMP module is required to perform the following functions for each applicable IMU:

1. Filter and smooth velocity inputs from the ACP\_ACUM module during noninertial operations.
2. Compensate accelerometer pulses for bias, scale factor, and symmetry for either high- or low-gain operations.
3. Compensate accelerometer pulses for misalignments.
4. Accumulate delta velocity over the gyro torquing period.

B. Interface Requirements. The input/output interfaces associated with the ACP\_COMP module are listed in Tables 4.5.2.1-1 and 4.5.2.1-2.

C. Detailed Requirements. The following sequence of operations is required for each applicable IMU:

1. If not in INERTIAL or TERM/IDLE submode, compute the current values for the accelerometer pulse accumulations as follows:

$$CC_i^{\dagger} = (DC_i^{\dagger} - DC_{i\text{prev}}^{\dagger})/8 + C_{i\text{prev}}^{\dagger}$$

$$CC_i^{\bar{}} = (DC_i^{\bar{}} - DC_{i\text{prev}}^{\bar{}})/8 + C_{i\text{prev}}^{\bar{}}$$

where  $i = X, Y, Z$ ; and  $CC_i, C_{i\text{prev}}, DC_{i\text{prev}}$  = intermediate velocity terms (pulses). Also, if not in INERTIAL submode, store the current values for the next cycle as follows:

$$C_{i\text{prev}}^{\dagger} = C_i^{\dagger}; DC_{i\text{prev}}^{\dagger} = DC_i^{\dagger}$$

$$C_{i\text{prev}}^{\bar{}} = C_i^{\bar{}}; DC_{i\text{prev}}^{\bar{}} = DC_i^{\bar{}}$$

where  $i = X, Y, Z$



2. If in INERTIAL or TERM/IDLE submode, perform the following:

$$CCi^{\dagger} = Ci^{\dagger}$$

for i = X, Y, Z

$$CCi^{\bar{}} = Ci^{\bar{}}$$

3. If in high gain, compute and apply accelerometer compensation terms for bias, scale factor, symmetry, and accelerometer pitch attitude as follows:

- a. Update the accelerometer scale factor attitude sensitivities to the pitch gimbal position as follows at 1.04-Hz rate:

$$ASFX = (KASF1)(ASFX) + (KASF2) [(KAXH) (SP) + (KBXH) (CP)]$$

$$ASFY = (KASF1)(ASFY) + (KASF2) [(KAYH) (SP) + (KBYH) (CP)]$$

$$ASFZ = (KASF1)(ASFZ) + (KASF2) [(KAZH) (SP) + (KBZH) (CP)]$$

where

$$SP = \text{SIN} (2 \text{ PANG/RADDEG})$$

$$CP = \text{COS} (2 \text{ PANG/RADDEG})$$

- b. Compute the compensated intermediate velocity terms as follows:

$$CMi = CCi^{\dagger} [1 + (KLiH + ASFi + KSi) 10^{-6}](SFH) + CCi^{\bar{}} [1 + (KLiH + ASFi - KSi) 10^{-6}](SFH) \\ - (KOiH) (Go) (DELTT) (10^{-6})$$

where i = X, Y, Z and CMi = intermediate velocity terms (ft/sec); and DELTT is the time interval between the read times of the input data associated with the last nth (8th) minor cycle completed prior to the start of the current major cycle and last nth minor cycle completed prior to start of the previous major cycle.

4. If in low gain, compute and apply accelerometer compensation terms for bias, scale factor, symmetry, and accelerometer pitch attitude as follows:

- a. Update the accelerometer scale factor attitude sensitivities to the pitch gimbal position as follows at 1.04-Hz rate:

$$ASFX = (KASF1)(ASFX) + (KASF2) [(KAX) (SP) + (KBX) (CP)]$$

$$ASFY = (KASF1)(ASFY) + (KASF2) [(KAY) (SP) + (KBY) (CP)]$$

$$ASFZ = (KASF1)(ASFZ) + (KASF2) [(KAZ) (SP) + (KBZ) (CP)]$$

where

$$SP = \text{SIN} (2 \text{ PANG/RADDEG})$$

$$CP = \text{COS} (2 \text{ PANG/RADDEG})$$

- b. Compute the compensated intermediate velocity terms as follows:

$$CM_i = CC_i^{\dagger} [1 + (KI_i + ASFi + KSi) 10^{-6}] (SFL) \\ + CC_i^{\bar{}} [1 + (KI_i + ASFi - KSi) 10^{-6}] (SFL) - (KO_i) (G_o) (DELTT) (10^{-6})$$

where  $i = X, Y, Z$ .

5. Compute and apply accelerometer misalignment compensation as follows:

$$DVX = CM_x + DELTXZ (CM_z)$$

$$DVY = CM_y + DELTYX (CM_x) + DELTYZ (CM_z)$$

$$DVZ = CM_z + DELTZX (CM_x) + DELTZY (CM_y)$$

6. Compute the compensated sensed change in velocity over the gyro torquing cycle period

$$DVT_i = DVT_i + DV_i, \text{ for } i = X, Y, Z$$

Note that for noninertial submodes, the torquing computation cycle is the same as the major cycle and  $DVT_i = DV_i$  each pass.

During TERM/IDLE, ACP\_COMP shall be executed at least at 1.04 Hz to support DISPLAYS and TLM. During other preflight operations, ACP\_COMP shall be executed at the IMU major cycle rate when required. During INERTIAL, ACP\_COMP shall be executed at the rate specified in paragraphs 4.5.4.6. and 4.5.4.5.2.

On the first pass since the most recent scheduling of this module, the terms ASFX, ASFY, ASFZ,  $C_i^{\dagger \text{prev}}$ ,  $C_i^{\bar{\text{prev}}}$ ,  $DC_i^{\dagger \text{prev}}$ ,  $DC_i^{\bar{\text{prev}}}$ , and  $DVT_i$  must initially be set to zero. The ACP\_COMP module shall always assume the gain setting that was effective during the final minor cycle of a major cycle accumulation period. A suggested design flow which satisfies the ACP\_COMP requirements is shown in Figure 4.5.2.1-1.

Table 4.5.2.1-1. ACP\_COMP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
DCi+		POSITIVE VELOCITY COUNTS (DOUBLE SUMS IN GROUND); i=X,Y,Z; 1 SET PER IMU	ACP_ACUM	SCALAR	GROUND: +10**5 FLIGHT: +10**3	PULSES	6.25 3.125 1.04
DCi-		NEGATIVE VELOCITY COUNTS (DOUBLE SUMS IN GROUND); i=X,Y,Z; 1 SET PER IMU	ACP_ACUM	SCALAR	GROUND: -10**5 FLIGHT: -10**3	PULSES	6.25 3.125 1.04
Ci+		POSITIVE VELOCITY COUNTS OVER MAJOR CYCLE i=X,Y,Z; 1 SET PER IMU	ACP_ACUM	SCALAR	GROUND: +10**4 FLIGHT: +10**3	PULSES	6.25 3.125 1.04
Ci-		NEGATIVE VELOCITY COUNTS OVER MAJOR CYCLE i=X,Y,Z; 1 SET PER IMU	ACP_ACUM	SCALAR	GROUND: -10**4 FLIGHT: -10**3	PULSES	6.25 3.125 1.04
KliH	V99A2681C THRU V99A2689C	HIGH GAIN ACCELEROMETER SCALE FACTOR: i=X,Y,Z; 1 SET PER IMU	I-LOAD HANG_CALA PFLT_CALA	SCALAR	+/- 300,000	MICRO-G /G	OD
KSi	V99A2510C THRU V99A2518C	ACCELEROMETER SYMMETRY FACTOR: i=X,Y,Z; 1 SET PER IMU	I-LOAD HANG_CALA	SCALAR	+/-600	MICRO-G /G	6.25 3.125 1.04
KOiH	V99G2670C THRU V99G2678C	HIGH GAIN ACCELEROMETER BIAS; i=X,Y,Z; 1 SET PER IMU	I-LOAD HANG_CALA PFLT_CALA	SCALAR	+/-10**5	MICRO-G	OD
GO	V90A7622C	STANDARD ACCELERATION DUE TO GRAVITY	CONSTANT	SCALAR	32.174048	FT/SEC** 2/G	6.25 3.125 1.04 OD
Kli	V99A2520C THRU V99A2528C	LOW-GAIN ACCELEROMETER SCALE FACTOR; i=X,Y,Z; 1 SET PER IMU	I-LOAD HANG_CALA PFLT_CALA	SCALAR	+/- 300,000	MICRO-G /G	OD
KOi	V99G2530C THRU V99G2538C	LOW-GAIN ACCELEROMETER BIAS; i=X,Y,Z; 1 SET PER IMU	I-LOAD HANG_CALA PFLT_CALA IMU_UPLINK DISP_SUP	SCALAR	+/- 10**5	MICRO-G	OD
SFH	V96U7004C	NOMINAL ACCELEROMETER SCALE FACTOR HIGH-GAIN	CONSTANT	SCALAR	344488 X10**-8	FT/SEC/ PULSE	OD
SFL	V90A7644C	NOMINAL ACCELEROMETER SCALE FACTOR LOW-GAIN	CONSTANT	SCALAR	344488 X10**-7	FT/SEC/ PULSE	OD
DELTZX(1)	V99H2552C	X ACCELEROMETER MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	I-LOAD HANG_CALB	SCALAR	+/-0.05	RAD	6.25
DELTZX(2)	V99H2553C						3.125
DELTZX(3)	V99H2554C						1.04
DELTXY(1)	V99H2540C	Y ACCELEROMETER MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	I-LOAD HANG_CALA	SCALAR	+/-0.05	RAD	6.25
DELTXY(2)	V99H2541C						3.125
DELTXY(3)	V99H2542C						1.04
DELTZY(1)	V99H2549C	Y ACCELEROMETER MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	I-LOAD HANG_CALB	SCALAR	+/-0.05	RAD	6.25
DELTZY(2)	V99H2550C						3.125
DELTZY(3)	V99H2551C						1.04
DELTZX(1)	V99H2543C	Z ACCELEROMETER MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	I-LOAD HANG_CALA HANG_CALB	SCALAR	+/-0.05	RAD	6.25
DELTZX(2)	V99H2544C						3.125
DELTZX(3)	V99H2545C						1.04
DELTZY(1)	V99H2546C	Z ACCELEROMETER MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	I-LOAD HANG_CALA HANG_CALB	SCALAR	+/-0.05	RAD	6.25
DELTZY(2)	V99H2547C						3.125
DELTZY(3)	V99H2548C						1.04

Table 4.5.2.1-1. ACP\_COMP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
INERTIAL	V95X0001X	IN INERTIAL SUBMODE (IMU)	GC_ALIGN1	LOGICAL	0,1	NA	6.25 3.125 1.04
OUTPUT_2		LAST TRANSMITTED IMU COMMAND WORD 2 (SLEWING); 1 PER IMU	COMPOOL (I/O)	LOGICAL	16 BITS	NA	OD
DVTX		X-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	GYO_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04
DVTY		Y-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	GYO_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04
DVTZ		Z-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	GYO_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04
RADDEG	V96U7007C	CONVERSION FACTOR RAD TO DEG	CONSTANT	SCALAR	57.29578	DEG/RAD	OD
PANG(1)	V95H0050C	IMU-1 COMP PITCH RES ANG	RES_PROC	SCALAR	0 - 360	DEG	1.04
PANG(2)	V95H1050C	IMU-2 COMP PITCH RES ANG	RES_PROC	SCALAR	0 - 360	DEG	1.04
PANG(3)	V95H2050C	IMU-3 COMP PITCH RES ANG	RES_PROC	SCALAR	0 - 360	DEG	1.04
KASF1	V99U5976C	ACCEL SF ATTITUDE FILTER CONSTANT - 1	K-LOAD	SCALAR	0.9952115	N/A	1.04
KASF2	V99U5977C	ACCEL SF ATTITUDE FILTER CONSTANT - 2	K-LOAD	SCALAR	0.0047885	N/A	1.04
KAX(1)	V99U5978C	IMU-1 X ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAX(2)	V99U5979C	IMU-2 X ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAX(3)	V99U5980C	IMU-3 X ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAY(1)	V99U5981C	IMU-1 Y ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAY(2)	V99U5982C	IMU-2 Y ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAY(3)	V99U5983C	IMU-3 Y ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAZ(1)	V99U5984C	IMU-1 Z ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAZ(2)	V99U5985C	IMU-2 Z ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAZ(3)	V99U5986C	IMU-3 Z ACCEL SF SENSITIVITY-1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBX(1)	V99U5987C	IMU-1 X ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBX(2)	V99U5988C	IMU-2 X ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBX(3)	V99U5989C	IMU-3 X ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBY(1)	V99U5990C	IMU-1 Y ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBY(2)	V99U5991C	IMU-2 Y ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBY(3)	V99U5992C	IMU-3 Y ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBZ(1)	V99U5993C	IMU-1 Z ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBZ(2)	V99U5994C	IMU-2 Z ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04

Table 4.5.2.1-1. ACP\_COMP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
KBZ(3)	V99U5995C	IMU-3 Z ACCEL SF SENSITIVITY-2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAXH(1)	V98U7927C	IMU-1 HI-GAIN X ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAXH(2)	V98U7928C	IMU-2 HI-GAIN X ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAXH(3)	V98U7929C	IMU-3 HI-GAIN X ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAYH(1)	V98U7930C	IMU-1 HI-GAIN Y ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAYH(2)	V98U7931C	IMU-2 HI-GAIN Y ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAYH(3)	V98U7932C	IMU-3 HI-GAIN Y ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAZH(1)	V98U7933C	IMU-1 HI-GAIN Z ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAZH(2)	V98U7934C	IMU-2 HI-GAIN Z ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KAZH(3)	V98U7935C	IMU-3 HI-GAIN Z ACCEL SF SENSITIVITY - 1	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBXH(1)	V98U7936C	IMU-1 HI-GAIN X ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBXH(2)	V98U7937C	IMU-2 HI-GAIN X ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBXH(3)	V98U7938C	IMU-3 HI-GAIN X ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBYH(1)	V98U7939C	IMU-1 HI-GAIN Y ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBYH(2)	V98U7940C	IMU-2 HI-GAIN Y ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBYH(3)	V98U7941C	IMU-3 HI-GAIN Y ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBZH(1)	V98U7942C	IMU-1 HI-GAIN Z ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBZH(2)	V98U7943C	IMU-2 HI-GAIN Z ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04
KBZH(3)	V98U7944C	IMU-3 HI-GAIN Z ACCEL SF SENSITIVITY - 2	I-LOAD	SCALAR	+/-1000	MICRO G/G	1.04

Table 4.5.2.1-2. ACP\_COMP Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
DVX(1)	V99U2860C	IMU-1 X-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVX(2)	V99U2861C	IMU-2 X-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVX(3)	V99U2862C	IMU-3 X-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVY(1)	V99U2863C	IMU-1 Y-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVY(2)	V99U2864C	IMU-2 Y-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVY(3)	V99U2865C	IMU-3 Y-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVZ(1)	V99U2866C	IMU-1 Z-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVZ(2)	V99U2867C	IMU-2 Z-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVZ(3)	V99U2868C	IMU-3 Z-AXIS DELTA VEL MAJ CY	DISP_SUP ACP_TRSF TLM	SCALAR	+/-240	FT/SEC	6.25 3.125 1.04
DVTX		X-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	GYO_COMP	SCALAR	+/-240	FT/SEC	1.04 3.125
DVTY		Y-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	GYO_COMP	SCALAR	+/-240	FT/SEC	1.04 3.125
DVTZ		Z-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	GYO_COMP	SCALAR	+/-240	FT/SEC	1.04 3.125

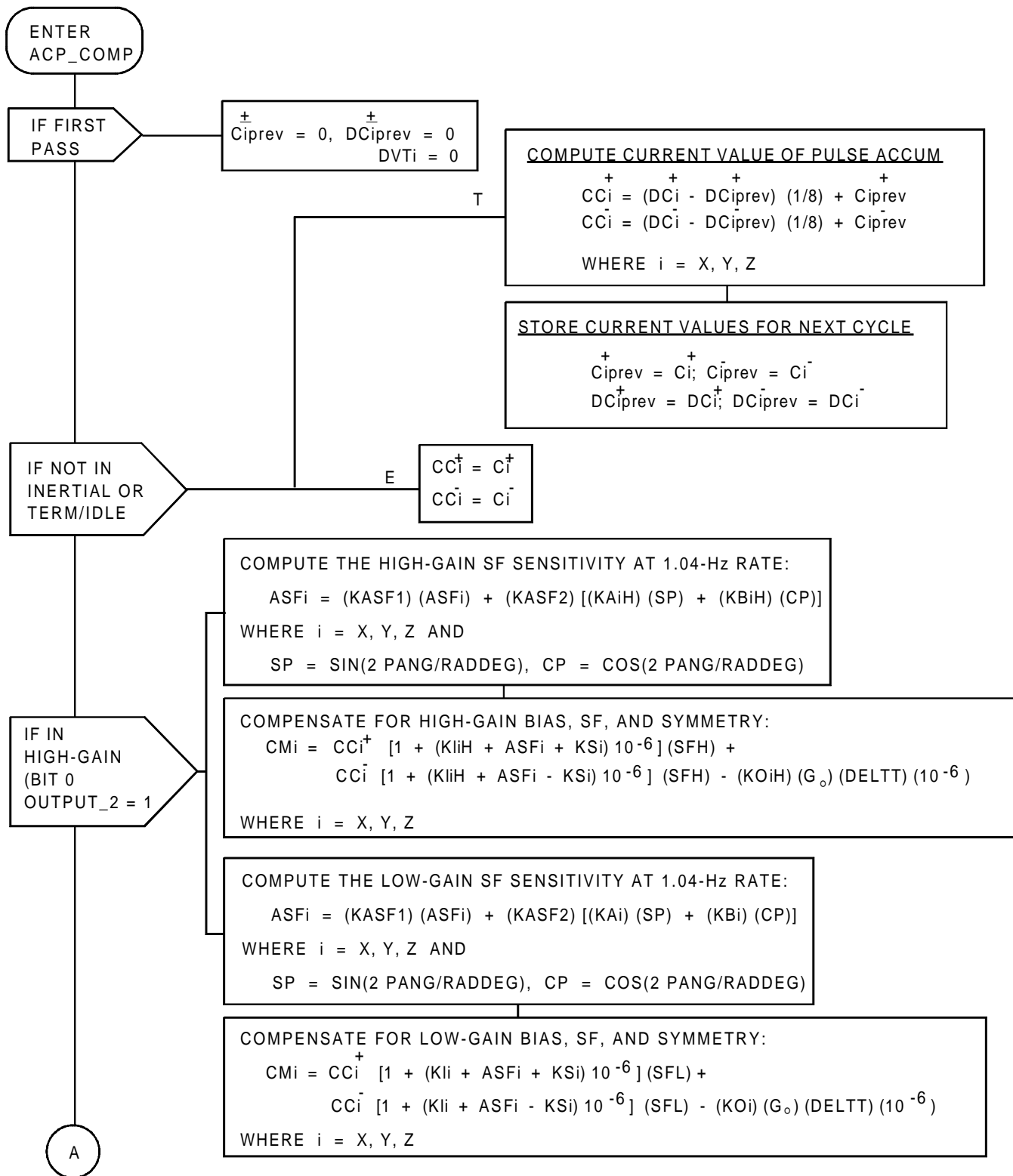


FIGURE 4.5.2.1-1.(1) ACP\_COMP Flow Diagram (Sheet 1 of 2)

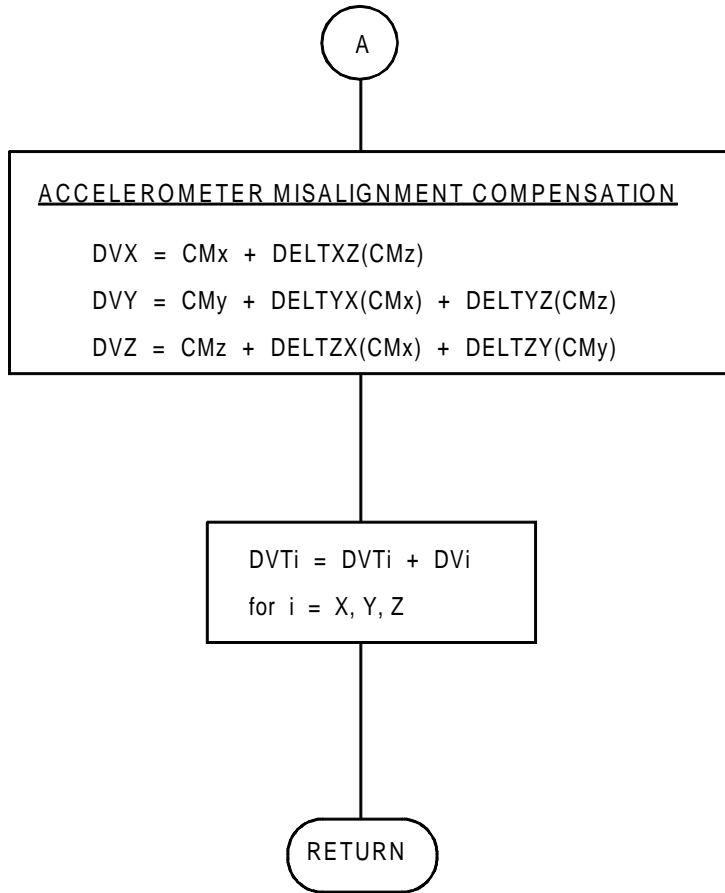


FIGURE 4.5.2.1-1.(2) ACP\_COMP Flow Diagram (Sheet 2 of 2)



#### 4.5.2.2 Gyro Compensation (GYO\_COMP).

The purpose of the GYO\_COMP functional module is to compensate the gyro torquing rates for gyro errors and misalignments.

A. Functional Requirements. The GYO\_COMP module performs the following functions:

1. Compute desired torquing rates in cluster coordinates and compensate for gyro restraints and mass unbalance.
2. Compensate torquing rates for gyro misalignments and torquer scale factors.

B. Interface Requirements. The input/output interfaces associated with the GYO\_COMP module are listed in Tables 4.5.2.2-1 and 4.5.2.2-2.

C. Detailed Requirements. The following set of equations and sequence of computations are needed to perform the GYO\_COMP function and are required for each applicable IMU:

1. Compute the desired torquing rates in cluster coordinates as follows:

$$TRX = LATX + RDCLX$$

$$TRY = LATY + RDCLY$$

$$TRZ = LATZ + RDCLZ$$

Note:

RDCLi = 0 during cluster repositioning

LATi = 0 during ground sequences and INERTIAL sequences (not during On-Orbit Alignment repositioning)

LATi is present only in GN&C 9, OPS 2, and OPS 3.

2. Compensate the desired torquing rates for gyro restraints and mass unbalance as follows:

$$TX1 = TRX - DFX - \frac{[DIX (DVTX) + DSX (DVTY)]}{[T(\text{torq})][G_o]}$$

$$TY1 = TRY - DFY - \frac{[DIX (DVTY) - DSX (DVTX)]}{[T(\text{torq})][G_o]}$$

$$TZ1 = TRZ - DFZ - \frac{[DIZ (DVTZ) - DSZ (DVTY) - DOZ (DVTX)]}{[T(\text{torq})][G_o]}$$

where T(torq) is the gyro torquing computation cycle time and takes on values of 320 msec for noninertial operations, 960 msec for INERTIAL operation, and 320 msec during on-orbit repositioning sequences.

3. Compensate for misalignments and torquer scale factor.

$$GTX = [TX1 + BXY (TY1) + BXZ (TZ1)]/KTX$$

$$GTY = [TY1 + BYX (TX1) + BYZ (TZ1)]/KTY$$

$$GTZ = [TZ1 + BZX (TX1) + BZY (TY1)]/KTZ$$

4. Reinitialize the delta velocities accumulated in the ACP\_COMP module:

$$DVT_i = 0 \text{ for } i = X, Y, Z$$

During noninertial submodes, the GYO\_COMP module shall be executed at the IMU major cycle rate, and the computed torquing rates shall be made available to the GYO\_TORQ module at the end of the 320-msec major cycle period. When in INERTIAL, this module shall be executed every 960 msec (after ACP\_COMP processing). A suggested design flow that satisfies the GYO\_COMP requirements is shown in Figure 4.5.2.2-1.

Table 4.5.2.2-1. GYO\_COMP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
DVTX		X AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04
DVTY		Y AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04
DVTZ		Z AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04
LATX		LAT X DIG-TORQ RATE; 1 PER IMU	LAT_FUNC	SCALAR	+/-80	DEG/HR	3.125
LATY		LAT Y DIG-TORQ RATE; 1 PER IMU	LAT_FUNC	SCALAR	+/-80	DEG/HR	3.125
LATZ		LAT Z DIG-TORQ RATE; 1 PER IMU	LAT_FUNC	SCALAR	+/-80	DEG/HR	3.125
RDCLX		DESIRED X-AXIS TORQUE RATE; 1 PER IMU	TOR_TRSF LAT_FUNC GC_ALIGN1 IMU_ATT	SCALAR	+/-80	DEG/HR	3.125
RDCLY		DESIRED Y-AXIS TORQUE RATE; 1 PER IMU	TOR_TRSF LAT_FUNC GC_ALIGN1 IMU_ATT	SCALAR	+/-80	DEG/HR	3.125
RDCLZ		DESIRED Z-AXIS TORQUE RATE; 1 PER IMU	TOR_TRSF LAT_FUNC GC_ALIGN1 IMU_ATT	SCALAR	+/-80	DEG/HR	3.125
G <sub>o</sub>	V90A7622C	STANDARD ACCELERATION DUE TO GRAVITY	CONSTANT	SCALAR	32.174048	FT/SEC/ SEC/G	3.125 1.04
KTX(1) KTX(2) KTX(3)	V99G2500C V99G2501C V99G2502C	X GYRO-TORQUER SCALE FACTOR; 1 PER IMU	HANG_CALA I-LOAD	SCALAR	1 +/- 0.2	DEG/HR/ DEG/HR	3.125 1.04
KTY(1) KTY(2) KTY(3)	V99G2503C V99G2504C V99G2505C	Y GYRO-TORQUER SCALE FACTOR; 1 PER IMU	HANG_CALA I-LOAD	SCALAR	1 +/- 0.2	DEG/HR/ DEG/HR	3.125 1.04
KTZ(1) KTZ(2) KTZ(3)	V99G2506C V99G2507C V99G2508C	Z GYRO-TORQUER SCALE FACTOR; 1 PER IMU	HANG_CALA I-LOAD	SCALAR	1 +/- 0.2	DEG/HR/ DEG/HR	3.125 1.04
DOZ(1) DOZ(2) DOZ(3)	V99U2582C V99U2583C V99U2584C	Z GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	HANG_CALA I-LOAD PFLT_CALA	SCALAR	+/-6	DEG/HR /G	3.125 1.04
BYZ(1) BYZ(2) BYZ(3)	V99H2599C V99H2600C V99H2601C	Y GYRO MISALIGNMENT TOWARD Z REFERENCE; 1 PER IMU	HANG_CALA HANG_CALB I-LOAD	SCALAR	+/-0.05	RAD	3.125 1.04
BZX(1) BZX(2) BZX(3)	V99H2602C V99H2603C V99H2604C	Z GYRO MISALIGNMENT TOWARD X REFERENCE; 1 PER IMU	HANG_CALA HANG_CALB I-LOAD	SCALAR	+/-0.05	RAD	3.125 1.04
BZY(1) BZY(2) BZY(3)	V99H2605C V99H2606C V99H2607C	Z GYRO MISALIGNMENT TOWARD Y REFERENCE; 1 PER IMU	HANG_CALA HANG_CALB I-LOAD	SCALAR	+/-0.05	RAD	3.125 1.04
BXY(1) BXY(2) BXY(3)	V99H2590C V99H2591C V99H2592C	X GYRO MISALIGNMENT TOWARD Y REFERENCE; 1 PER IMU	HANG_CALA I-LOAD	SCALAR	+/-0.05	RAD	3.125 1.04
BXZ(1) BXZ(2) BXZ(3)	V99H2593C V99H2594C V99H2595C	X GYRO MISALIGNMENT TOWARD Z REFERENCE; 1 PER IMU	HANG_CALA HANG_CALB I-LOAD	SCALAR	+/-0.05	RAD	3.125 1.04
BYX(1) BYX(2) BYX(3)	V99H2596C V99H2597C V99H2598C	Y GYRO MISALIGNMENT TOWARD X REFERENCE; 1 PER IMU	HANG_CALA I-LOAD	SCALAR	+/-0.05	RAD	3.125 1.04

Table 4.5.2.2-1. GYO\_COMP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
DFX(1) DFX(2) DFX(3)	V99R2560C V99R2561C V99R2562C	X GYRO RESTRAINT 1 PER IMU	HANG_CALA PFLT_CALA I-LOAD IMU_UPLINK	SCALAR	+/-10	DEG/HR	3.125 1.04
DFY(1) DFY(2) DFY(3)	V99R2563C V99R2564C V99R2565C	Y GYRO RESTRAINT 1 PER IMU	HANG_CALA PFLT_CALA I-LOAD IMU_UPLINK	SCALAR	+/-10	DEG/HR	3.125 1.04
DFZ(1) DFZ(2) DFZ(3)	V99R2566C V99R2567C V99R2568C	Z GYRO RESTRAINT 1 PER IMU	HANG_CALA PFLT_CALA I-LOAD IMU_UPLINK	SCALAR	+/-10	DEG/HR	3.125 1.04
DIX(1) DIX(2) DIX(3)	V99U2570C V99U2571C V99U2572C	X GYRO INPUT AXIS MASS UNBAL; 1 PER IMU	HANG_CALA I-LOAD	SCALAR	+/-6	DEG/HR /G	3.125 1.04
DIZ(1) DIZ(2) DIZ(3)	V99U2573C V99U2574C V99U2575C	Z GYRO INPUT AXIS MASS UNBAL; 1 PER IMU	HANG_CALA I-LOAD	SCALAR	+/-6	DEG/HR /G	3.125 1.04
DSX(1) DSX(2) DSX(3)	V99U2576C V99U2577C V99U2578C	X GYRO SPIN AXIS MASS UNBAL; 1 PER IMU	HANG_CALA I-LOAD PFLT_CALA	SCALAR	+/-6	DEG/HR /G	3.125
DSZ(1) DSZ(2) DSZ(3)	V99U2579C V99U2580C V99U2581C	Z GYRO SPIN AXIS MASS UNBAL; 1 PER IMU	HANG_CALA I-LOAD PFLT_CALA	SCALAR	+/-6	DEG/HR /G	3.125 1.04

Table 4.5.2.2-2. GYO\_COMP Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
GTX		COMPENSATED TORQUING RATE CMD; 1 PER IMU	GYO_TORQ	SCALAR	+/-100	DEG/HR	3.125 1.04
GTY		COMPENSATED TORQUING RATE CMD; 1 PER IMU	GYO_TORQ	SCALAR	+/-100	DEG/HR	3.125 1.04
GTZ		COMPENSATED TORQUING RATE CMD; 1 PER IMU	GYO_TORQ	SCALAR	+/-100	DEG/HR	3.12 1.04
DVTX		X-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04
DVTY		Y-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04
DVTZ		Z-AXIS DELTA VELOCITY OVER TORQUING CYCLE; 1 PER IMU	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 1.04

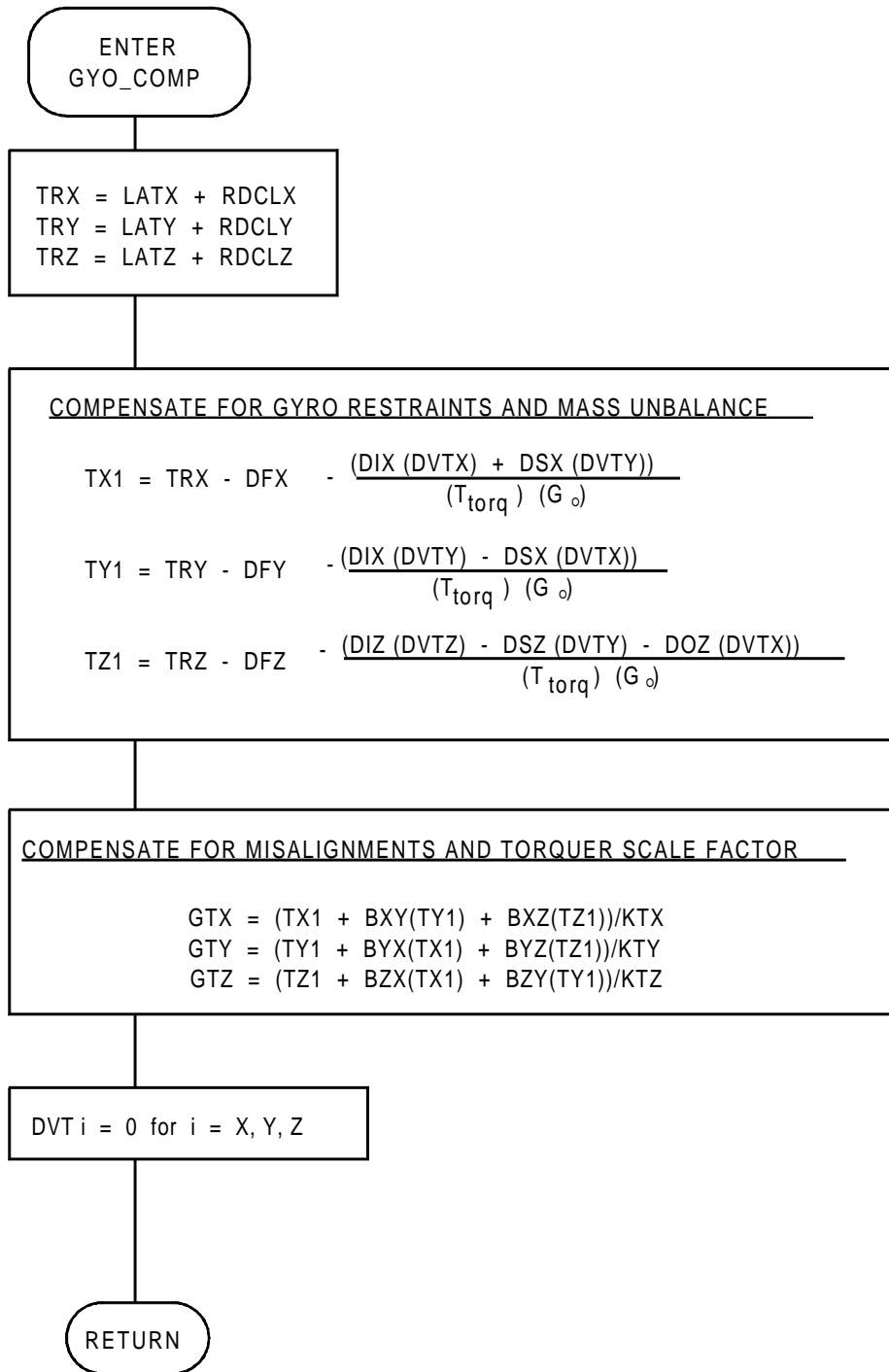


FIGURE 4.5.2.2-1. GYO\_COMP Flow Diagram

### 4.5.2.3 Accelerometer Pulse Transformation (ACP\_TRSF).

The purpose of the ACP\_TRSF module is to transform velocities from cluster-to-NWU reference coordinates during calibration and alignment and to M50 coordinates after platform release.

A. Functional Requirements. The ACP\_TRSF module performs the following functions:

1. During ground mode, transform the sensed velocity from cluster-to-NWU reference coordinates and subtract local gravity from the vertical component.
2. During flight mode, transform the sensed velocity from cluster-to-M50 reference coordinates and provide accumulated sensed velocity in M50 coordinates.
3. Perform an accelerometer under limit (zero limit) check to protect against a three-axis accelerometer failure for each IMU that is selected and in OPERATE during ground operations, or for each IMU that is in OPERATE and selected as part of the redundant set (RM) during flight operations. Perform at BITE\_SUM rate.

B. Interface Requirements. The input/output interfaces associated with the ACP\_TRSF module are listed in Tables 4.5.2.3-1 and 4.5.2.3-2.

C. Detailed Requirements. The following set of equations and sequence of computations are needed to perform the ACP\_TRSF functions and are required for each applicable IMU:

1. Form a normalized acceleration ( $A_N$ ) for each IMU as follows:

$$A_N = \sqrt{\left(\frac{DVX}{DT}\right)^2 + \left(\frac{DVY}{DT}\right)^2 + \left(\frac{DVZ}{DT}\right)^2}$$

where DT is the execution time interval of the ACP\_TRSF module.

- a. If VUL\_BITE flag is enabled, then proceed to step b; else proceed to step c.
  - b. If one or more  $A_N > 1.93 \text{ ft/sec}^2$ , then proceed to step b1; else proceed to step c.
  - bl. If  $A_N < 1.61 \text{ ft/sec}^2$  for one and only one IMU, then set VUL\_FAIL flag for the IMU that failed; else reset VUL\_FAIL flag for the appropriate IMU.
  - c. If more than one IMU  $A_N$  is greater than  $1.93 \text{ ft/sec}^2$ , then enable VUL\_BITE flag; else disable VUL\_BITE flag.
  - d. If VUL\_FAIL flag or FAIL\_VEL\_OV\_LIM flag is set, then set FAIL\_VEL\_LIM flag; else reset FAIL\_VEL\_LIM flag.
2. If REFS\_RDY, proceed to step 5; otherwise, compute the velocity in NWU reference coordinates as follows:

$$\begin{bmatrix} PN \\ PW \\ PUP \end{bmatrix} = [T_R^{PC}]^T \begin{bmatrix} DVX \\ DVY \\ DVZ \end{bmatrix}$$

where PN, PW, and PUP are the north, west, and up components of sensed changes in velocity, respectively, over the last IMU major cycle; DVX, DVY, and DVZ are the X, Y and Z components of sensed velocity in cluster coordinates; and  $[T_C^{M50}]$  is the transformation from the NWU coordinates to the present cluster coordinates.

3. Compensate the vertical component of sensed velocity by subtracting the local gravity contribution as follows:

$$PUP = PUP - (G) (DELTT)$$

DELTT is the time interval between the read times of the last input data used by successive executions of this module.

4. Terminate ACP\_TRSF processing for this cycle.
5. Compute the velocity in M50 reference coordinates as follows:

$$\bar{D}\bar{E}LVEL50 = [T_C^{M50}] \begin{bmatrix} DVX \\ DVY \\ DVZ \end{bmatrix}$$

where DELVELM50 is the sensed change in velocity over the last DELTT time interval, and  $[T_C^{M50}]$  is the transformation from cluster-to-M50 reference coordinates.

6. Compute the total accumulated velocity.

$$\bar{V}\bar{E}LSUMM50 = \bar{V}\bar{E}LSUMM50 + \bar{D}\bar{E}LVELM50$$

During noninertial operation, the ACP\_TRSF module shall be executed at the IMU major cycle rate when required. During INERTIAL, this module shall be executed in accordance with the requirements of Sections 4.5.4.6 and 4.5.4.5.2. During GN&C 9, step 1 is to be executed at least at a 1.04-Hz rate. During all other OPS sequences, step 1 shall be executed at least at a 1.04-Hz rate and on demand from BITE\_SUM at 6.25 Hz (on RM demand).

A suggested design flow which satisfies the ACP\_TRSF requirements is shown in Figure 4.5.2.3-1.

Table 4.5.2.3-1. ACP\_TRSF Inputs

Name	MSID	Description	Source	Input Type	Signal Range	Units	Rate (Hz)
$T_C^{M50}$	V99U3450C through V99U3476C	TRANSFORMATION: CLUSTER TO M50; 1 PER IMU	GC_ALIGN1 ORBIT_AL	MATRIX	+/-1	NA	OD
$T_R^{PC}$		TRANSFORMATION: REF(NWU) TO PRESENT CLUSTER; 1 PER IMU	T_UPDATE IMU_ATT GC_ALIGN1	MATRIX	+/-1	NA	3.125
G_SITE_N (N = 1-9)	V96A7002C	ACCELERATION DUE TO LOCAL GRAVITY	I-LOAD	SCALAR	32.08 TO 32.21	FT/SEC/ SEC	3.125
INERTIAL	V95X0001X	IN INERTIAL SUBMODE (IMU)	GC_ALIGN1	LOGICAL	0, 1	NA	3.125
REFS_RDY	V95X0780X	REFSMAT COMPUTATION COMPLETED	GC_ALIGN1	LOGICAL	0,1	NA	OD
DVX(1)	V99U2860C	IMU-1 X-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
DVX(2)	V99U2861C	IMU-2 X-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
DVX(3)	V99U2862C	IMU-3 X-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
DVY(1)	V99U2863C	IMU-1 Y-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
DVY(2)	V99U2864C	IMU-2 Y-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
DVY(3)	V99U2865C	IMU-3 Y-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
DVZ(1)	V99U2866C	IMU-1 Z-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
DVZ(2)	V99U2867C	IMU-2 Z-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
DVZ(3)	V99U2868C	IMU-3 Z-AXIS DELTA VEL MAJOR CYCLE	ACP_COMP	SCALAR	+/-240	FT/SEC	3.125 OD
VELSUMM50X(1)	V95L0065C	IMU-1 ACUM SENSED CHANGE X VEL	CONSTANT	SCALAR	0	FT/SEC	OD
VELSUMM50Y(1)	V95L0066C	IMU-1 ACUM SENSED CHANGE Y VEL	CONSTANT	SCALAR	0	FT/SEC	OD
VELSUMM50Z(1)	V95L0067C	IMU-1 ACUM SENSED CHANGE Z VEL	CONSTANT	SCALAR	0	FT/SEC	OD
VELSUMM50X(2)	V95L1065C	IMU-2 ACUM SENSED CHANGE X VEL	CONSTANT	SCALAR	0	FT/SEC	OD
VELSUMM50Y(2)	V95L1066C	IMU-2 ACUM SENSED CHANGE Y VEL	CONSTANT	SCALAR	0	FT/SEC	OD
VELSUMM50Z(2)	V95L1067C	IMU-2 ACUM SENSED CHANGE Z VEL	CONSTANT	SCALAR	0	FT/SEC	OD
VELSUMM50X(3)	V95L2065C	IMU-3 ACUM SENSED CHANGE X VEL	CONSTANT	SCALAR	0	FT/SEC	OD
VELSUMM50Y(3)	V95L2066C	IMU-3 ACUM SENSED CHANGE Y VEL	CONSTANT	SCALAR	0	FT/SEC	OD
VELSUMM50Z(3)	V95L2067C	IMU-3 ACUM SENSED CHANGE Z VEL	CONSTANT	SCALAR	0	FT/SEC	OD
FAIL_VEL_OV_LIM(1)		IMU-1 VELOCITY OVER LIMIT FAIL	ACP_ACUM	LOGICAL	0, 1	NA	OD
FAIL_VEL_OV_LIM(2)		IMU-2 VELOCITY OVER LIMIT FAIL	ACP_ACUM	LOGICAL	0, 1	NA	OD
FAIL_VEL_OV_LIM(3)		IMU-3 VELOCITY OVER LIMIT FAIL	ACP_ACUM	LOGICAL	0, 1	NA	OD

Note: VEL SUMM50X(1) THROUGH VELSUMM50Z(3) are double precision.



Table 4.5.2.3-2. ACP\_TRSF Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
PN(1)	V99U2830C	IMU-1 NORTH DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
PN(2)	V99U2831C	IMU-2 NORTH DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
PN(3)	V99U2832C	IMU-3 NORTH DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
PW(1)	V99U2833C	IMU-1 WEST DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
PW(2)	V99U2834C	IMU-2 WEST DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
PW(3)	V99U2835C	IMU-3 WEST DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
PUP(1)	V99U2836C	IMU-1 UP DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
PUP(2)	V99U2837C	IMU-2 UP DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
PUP(3)	V99U2838C	IMU-3 UP DEL VEL OVER MAJ CYCLE	LSF_FILR, TLM	SCALAR	+/-30.0	FT/SEC	3.125
VELSUMM50X(1)	V95L0065C	IMU-1 ACUM SENSED CHANGE X VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
VELSUMM50X(2)	V95L1065C	IMU-2 ACUM SENSED CHANGE X VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
VELSUMM50X(3)	V95L2065C	IMU-3 ACUM SENSED CHANGE X VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
VELSUMM50Y(1)	V95L0066C	IMU-1 ACUM SENSED CHANGE Y VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
VELSUMM50Y(2)	V95L1066C	IMU-2 ACUM SENSED CHANGE Y VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
VELSUMM50Y(3)	V95L2066C	IMU-3 ACUM SENSED CHANGE Y VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
VELSUMM50Z(1)	V95L0067C	IMU-1 ACUM SENSED CHANGE Z VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
VELSUMM50Z(2)	V95L1067C	IMU-2 ACUM SENSED CHANGE Z VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
VELSUMM50Z(3)	V95L2067C	IMU-3 ACUM SENSED CHANGE Z VEL	RM, NAV, TLM	SCALAR	+/-10**6	FT/SEC	OD
DELVELM50X(1)	V99L3267C	IMU-1 SENSED CHANGE IN X VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD
DELVELM50X(2)	V99L3268C	IMU-2 SENSED CHANGE IN X VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD
DELVELM50X(3)	V99L3269C	IMU-3 SENSED CHANGE IN X VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD
DELVELM50Y(1)	V99L3270C	IMU-1 SENSED CHANGE IN Y VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD
DELVELM50Y(2)	V99L3271C	IMU-2 SENSED CHANGE IN Y VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD
DELVELM50Y(3)	V99L3272C	IMU-3 SENSED CHANGE IN Y VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD
DELVELM50Z(1)	V99L3273C	IMU-1 SENSED CHANGE IN Z VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD
DELVELM50Z(2)	V99L3274C	IMU-2 SENSED CHANGE IN Z VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD
DELVELM50Z(3)	V99L3275C	IMU-3 SENSED CHANGE IN Z VELOCITY	DISP_SUP, TLM	SCALAR	+/-240	FT/SEC	OD

Table 4.5.2.3-2. ACP\_TRSF Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
FAIL_VEL_LIM(1)	V95X0035X	IMU-1 VELOCITY LIMIT FAIL	BITE_SUM DISP_SUP, TLM	LOGICAL	0,1	NA	OD
FAIL_VEL_LIM(2)	V95X1035X	IMU-2 VELOCITY LIMIT FAIL	BITE_SUM DISP_SUP, TLM	LOGICAL	0,1	NA	OD
FAIL_VEL_LIM(3)	V95X2035X	IMU-3 VELOCITY LIMIT FAIL	BITE_SUM DISP_SUP, TLM	LOGICAL	0,1	NA	OD

Note: VEL SUMM50X(1) THROUGH VELSUMM50Z(3) are double precision.

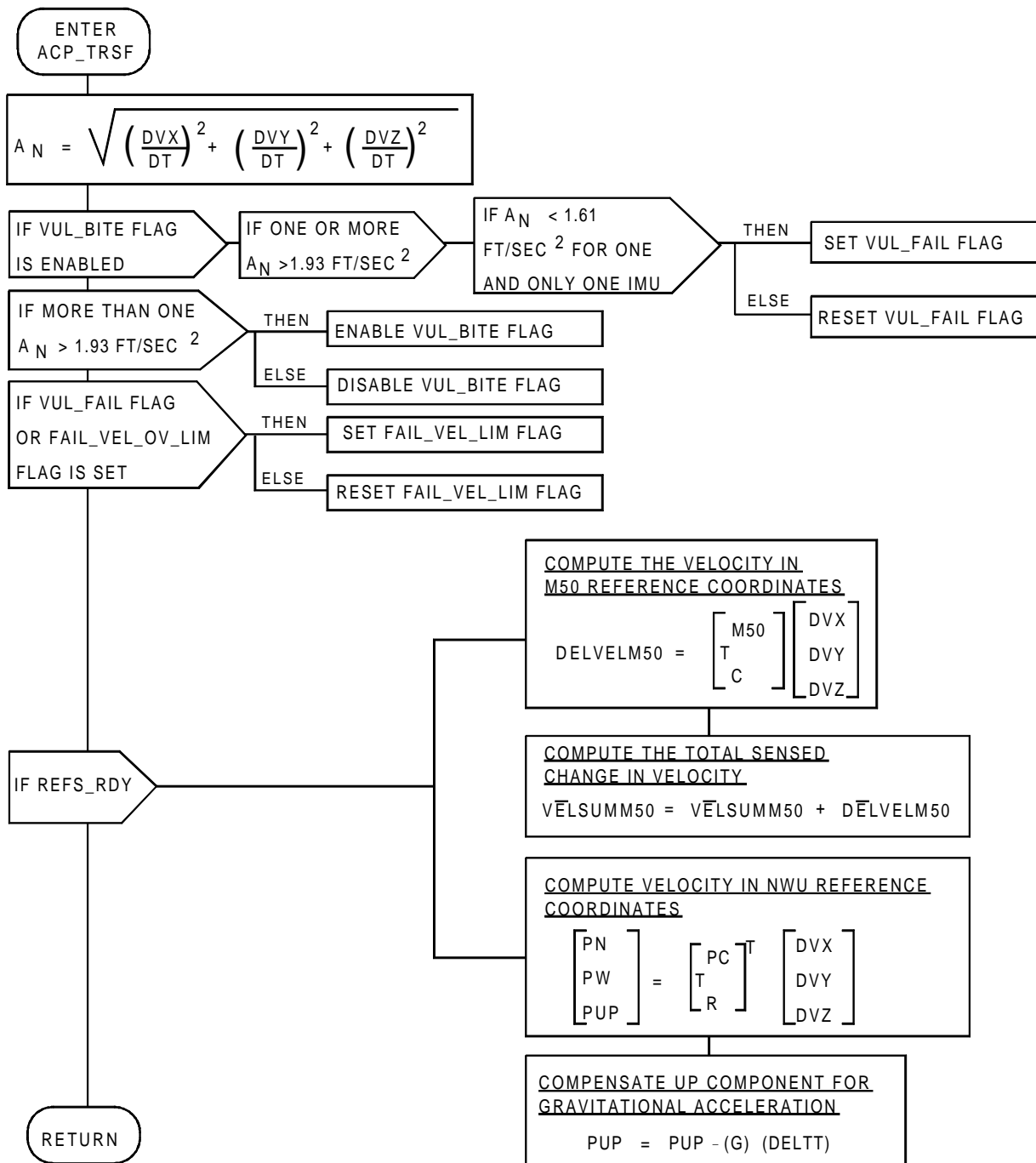


FIGURE 4.5.2.3-1. ACP\_TRSF Flow Diagram

#### 4.5.2.4 Reference NWU-to-Cluster Transformation Update (T\_UPDATE).

The purpose of the T\_UPDATE module is to update the reference NWU-to-cluster transformation to account for platform torquing rates relative to the reference coordinate system.

A. Functional Requirement. The T\_UPDATE module performs the following function:

Update the transformation from reference NWU-to-cluster coordinates accounting for the applied torquing rates including earth's rate and excess rate components.

B. Interface Requirements. The input/output interfaces associated with the T\_UPDATE module are listed in Tables 4.5.2.4-1 and 4.5.2.4-2.

C. Detailed Requirements. The following set of equations and sequence of computations are required to perform the T\_UPDATE function for each applicable IMU:

1. Compute the quaternion angular displacements since the last update as a function of the excess torquing rate component as follows:

$$TN = (ERN) (DELTT)/RAD$$

$$TW = (ERW) (DELTT)/RAD$$

$$TUP = (ERU) (DELTT)/RAD$$

where ERN, ERW, and ERU are the north, west and up components of the excess rate torquing commands; DELTT is the time interval between the read times of the input data associated with the last nth (8th) minor cycle completed prior to the start of the current major cycle and the last nth minor cycle completed prior to the start of the previous major cycle; RAD is the conversion factor from radians to arc seconds.

2. Update the reference NWU-to-cluster transformation as follows:

$$\begin{aligned} & \left[ T_R^{PC} \right]_{NEW} = \\ & \left[ T_R^{PC} \right]_{OLD} \begin{bmatrix} 1 - 1/2(TW^2 + TUP^2) & TUP + 1/2(TN)(TW) & -TW + 1/2(TN)(TUP) \\ -TUP + 1/2(TN)TW & 1 - 1/2(TN^2 + TUP^2) & TN + 1/2(TW)(TUP) \\ TW + 1/2(TN)(TUP) & -TN + 1/2(TW)(TUP) & 1 - 1/2(TN^2 + TW^2) \end{bmatrix} \end{aligned}$$

where  $\left[ T_R^{PC} \right]_{OLD}$  is the previous reference NWU-to-cluster transformation and  $\left[ T_R^{PC} \right]_{NEW}$  is the updated reference NWU-to-cluster transformation and is the updated reference NWU-to-cluster transformation. The computations shall be performed in double precisions; however, the  $\left[ T_R^{PC} \right]$  output can be truncated to single precision. Note that  $\left[ T_R^{PC} \right]_{OLD}$  is to be saved in double precision.

The T\_UPDATE module shall be executed at the IMU major cycle rate when required. A suggested design flow which satisfies the T\_UPDATE requirements is shown in Figure 4.5.2.4-1.

Table 4.5.2.4-1. T_UPDATE Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	HANG_CALC HANG_CALA HANG_CALB PFLT_CALA GC_ALIGN SINE_EXRTE	SCALAR	+/-65	DEG/HR	3.125
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	HANG_CALC HANG_CALA HANG_CALB PFLT_CALA GC_ALIGN SINE_EXRTE	SCALAR	+/-65	DEG/HR	3.125
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	HANG_CALC HANG_CALA HANG_CALB PFLT_CALA GC_ALIGN SINE_EXRTE	SCALAR	+/-65	DEG/HR	3.125
RAD	V96U7006C	CONVERSION FACTOR TO CONVERT RADIANS TO ARC-SECONDS	CONSTANT	SCALAR	206264.8	ARC-SEC /RAD	OD 3.125
T <sub>R</sub> <sup>PC</sup>		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER; 1 PER IMU	HANG_CALC HANG_CALA HANG_CALB PFLT_CALA GC_ALIGN	MATRIX	+/-1	NA	3.125

Table 4.5.2.4-2. T_UPDATE Outputs							
Name	MML No.	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
T <sub>R</sub> <sup>PC</sup>		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER; 1 PER IMU	ACP_TRSF TOR_TRSF CL_CLRATE SINE_EXRTE GC_ALIGN	MATRIX	-1 to 1	NA	3.125

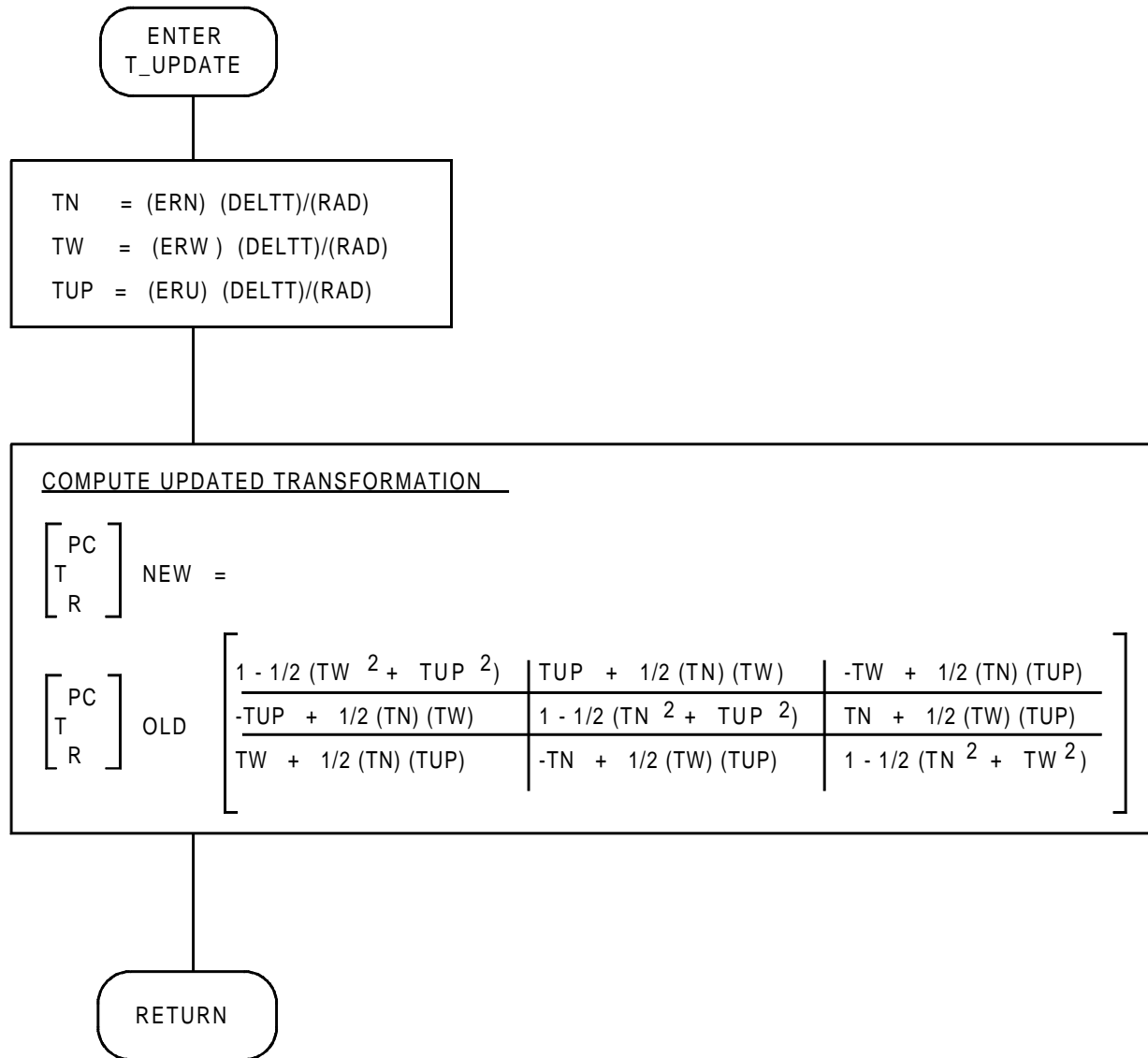


FIGURE 4.5.2.4-1. T\_UPDATE Flow Diagram

#### 4.5.2.5 Torque Rate Transformation (TOR\_TRSF).

The purpose of the TOR\_TRSF module is to transform the desired torquing rate commands in NWU reference coordinates through the reference-to-cluster transformation to obtain torquing rate commands in cluster coordinates.

A. Functional Requirement. The TOR\_TRSF module performs the following function:

Compute the total desired torquing rate commands in NWU coordinates and transform the torquing rate commands to cluster coordinates.

B. Interface Requirements. The input/output interfaces associated with the TOR\_TRSF module are listed in Tables 4.5.2.5-1 and 4.5.2.5-2.

C. Detailed Requirements. The following set of equations and sequence of computations are needed to perform the TOR\_TRSF function and are required for each applicable IMU:

1. Compute the total desired torquing rate command in NWU coordinates as a function of the north and up components of the earth rate and the north, west, and up components of the excess rate torquing commands as follows:

$$RDRN = WN + ERN$$

$$RDRW = ERW$$

$$RDRU = WU + ERU$$

where RDRN, RDRW, and RDRU are the total desired torquing rate commands in north, west, and up components, respectively; WN and WU are the north and up components of the earth rate and ERN, ERW, and ERU are the north, west, and up components of the excess rate torquing command.

2. Transform the total desired torquing rate command to cluster coordinates as follows:

$$\begin{bmatrix} RDCLX \\ RDCLY \\ RDCLZ \end{bmatrix} = [T_R^{PC}] \begin{bmatrix} RDRN \\ RDRW \\ RDRU \end{bmatrix}$$

where  $[T_R^{PC}]$  is the transformation from NWU to present cluster; and RDCLX, RDCLY, and RDCLZ are the X, Y, and Z components, respectively, of the desired torquing rate command in cluster coordinates.

The TOR\_TRSF module shall be executed at the IMU major cycle rate or the rate specified in paragraph 4.5.4.5.2 when required. A suggested design flow which satisfies the TOR\_TRSF requirements is shown in Figure 4.5.2.5-1.

Table 4.5.2.5-1. TOR_TRSF Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
T <sub>R</sub> <sup>PC</sup>		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER; 1 PER IMU	PFLT_CALA T_UPDATE GC_ALIGN GC_ALIGN1	MATRIX	+/-1	NA	3.125
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	PFLT_CALA HANG_CALA HANG_CALB HANG_CALC GC_ALIGN GC_ALIGN1 SINE_EXRTE	SCALAR	+/-65	DEG/HR	3.125
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	PFLT_CALA HANG_CALA HANG_CALB HANG_CALC GC_ALIGN GC_ALIGN1 SINE_EXRTE	SCALAR	+/-65	DEG/HR	3.125
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	PFLT_CALA HANG_CALA HANG_CALB HANG_CALC GC_ALIGN GC_ALIGN1 SINE_EXRTE	SCALAR	+/-65	DEG/HR	3.125
WN	V96R7026C	NORTH COMP OF EARTH'S RATE	I-LOAD	SCALAR	0-15.2	DEG/HR	3.125
WU	V96R7027C	UP COMP OF EARTH'S RATE	I-LOAD	SCALAR	0-15.2	DEG/HR	3.125

Table 4.5.2.5-2. TOR_TRSF Outputs							
Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
RDCLX		DESIRED X-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	3.125
RDCLY		DESIRED Y-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	3.125
RDCLZ		DESIRED Z-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	3.125



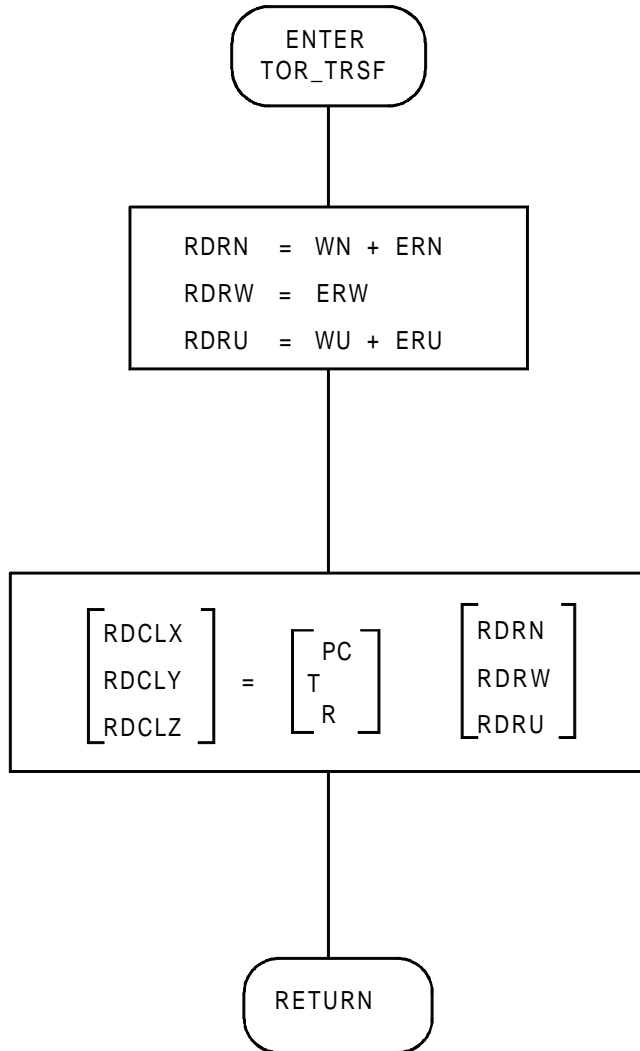


FIGURE 4.5.2.5-1. TOR\_TRSF Flow Diagram

#### 4.5.2.6 Large Angle Torquing (LAT\_FUNC).

The purpose of the LAT\_FUNC module is to rotate the cluster from its present orientation to any desired orientation with respect to a given reference.

A. Functional Requirements. The LAT\_FUNC module performs the following functions:

1. Compute the present cluster-to-desired cluster transformation.
2. Determine the direction and duration of the required slew commands.
3. Perform a bidirectional slew to remove slew direction sensitivity effects.
4. Command digital torquing rates when the cluster is sufficiently close to the desired orientation.
5. Terminate all digital torquing and provide an indicator that this function is complete.

B. Interface Requirements. The input/output interfaces associated with the LAT\_FUNC module are listed in Tables 4.5.2.6-1 and 4.5.2.6-2.

C. Detailed Requirements. The following set of equations and sequence of computations are needed to perform the LAT\_FUNC, and are required for each IMU to be repositioned.

1. On the first pass since the most recent scheduling of this module, set RDCLX, RDCLY, RDCLZ, and TSLEWP equal to zero. Also, set the applicable large angle torquing complete flag = 0.
2. If a previous pass has initiated the functions of step 6 or 7, skip to step 6 or 7 as applicable. If a previous pass has initiated the function of step 5 and the last calculated slew time has not expired, then skip to step 5. Otherwise, do the following to establish a new slew time for step 5 or initiate step 6 as required.
  - a. If this module has been called by On-Orbit Alignment (R\_PLANE = 1):
    - Call the TNB\_CL function (Section 4.5.2.8) for the reference IMU (REFER).
    - Compute the navigation base-to-desired cluster transformation for the nonreference IMU's:

$$\left[ T_{NB}^{DC} \right] = \left[ T_{PC(REFER)}^{DC} \right] \left[ T_{NB}^{PC} \right]$$

Where  $\left[ T_{PC(REFER)}^{DC} \right]$  is provided by the On-Orbit Alignment submodule for the nonreference IMU's and  $\left[ T_{NB}^{PC} \right]$  is the output of the above call for the reference IMU.

- b. Determine the Nav base-to-present cluster transformation,  $\left[ T_{NB}^{PC} \right]$ , for the IMU's to be aligned by utilizing the TNB\_CL function as defined in Section 4.5.2.8. Compute the transformation from present cluster-to-desired cluster as follows:

$$\left[ T_{PC}^{DC} \right] = \left[ T_{NB}^{DC} \right] \left[ T_{NB}^{PC} \right]^T$$

- c. Compute the differences between the off-diagonal elements:

$$LT(1) = T_{PC}^{DC} (3,2) - T_{PC}^{DC} (2,3)$$

$$LT(2) = T_{PC}^{DC} (1,3) - T_{PC}^{DC} (3,1)$$

$$LT(3) = T_{PC}^{DC} (2,1) - T_{PC}^{DC} (1,2)$$

- d. Sum the absolute differences:

$$SUM = |LT(1)| + |LT(2)| + |LT(3)|$$

where SUM is the sum of the absolute value of the differences of the off-diagonal elements.

- e. Compute the sum of the diagonal elements as follows:

$$LT = T_{PC}^{DC} (1,1) + T_{PC}^{DC} (2,2) + T_{PC}^{DC} (3,3)$$

- f. Test the sum to determine if there is approximately 180-degree rotation as follows:

If  $SUM \geq 0.0001$  or  $LD > 0$  (not approximately 180-degree rotation), then proceed to step 2g; otherwise, change  $[T_{PC}^{DC}]$  by three small angle rotations to ensure determination of the direction of slew as shown below and return to step 2c.

$$[T_{PC}^{DC}]_{NEW} = [TLIT][T_{PC}^{DC}]_{OLD}$$

where TLIT is a rotation matrix defined in Table 4.5.2.6-1.

- g. Determine if the current orientation is sufficiently close to the desired orientation to terminate the analog slew:

$$\text{If } ABS(LD - 3) < LAT\_C1,$$

then proceed to step 6 to initiate the bidirectional slew; otherwise do step 3 to establish a slew time.

3. Compare the sum of the diagonal elements to the limits to establish the slew time as follows:

If  $ABS(LD - 3) \geq LAT\_C1$ , then slew time = TSLEW1 sec

If  $ABS(LD - 3) < LAT\_C2$ , then slew time = TSLEW2 sec

If  $ABS(LD - 3) < LAT\_C3$ , then slew time = TSLEW3 sec

If  $ABS(LD - 3) < LAT\_C4$ , then slew time = TSLEW4 sec

4. Set the appropriate slew discretizes based on the maximum DOT product as follows:

a. Compute the DOT products as follows:

$$\text{DOT}(1) = |\text{LT}(1)|$$

$$\text{DOT}(2) = |\text{LT}(2)|$$

$$\text{DOT}(3) = |\text{LT}(3)|$$

$$\text{DOT}(4) = .707(|\text{LT}(1)| + |\text{LT}(2)|)$$

$$\text{DOT}(5) = .707(|\text{LT}(1)| + |\text{LT}(3)|)$$

$$\text{DOT}(6) = .707(|\text{LT}(2)| + |\text{LT}(3)|)$$

$$\text{DOT}(7) = .577(|\text{LT}(1)| + |\text{LT}(2)| + |\text{LT}(3)|)$$

Set MAX = maximum of DOT(K) for K = 1 to 7

b. If DOT(1) = MAX, then set X<sup>+</sup> slew bit = 1 if LT(1) is positive.

Set X<sup>-</sup> slew bit = 1 if LT(1) is negative.

Set all other bits to zero and proceed to step 5; else proceed to step 4c.

c. If DOT(2) = MAX, then set Y<sup>+</sup> slew bit = 1 if LT(2) is positive.

Set Y<sup>-</sup> slew bit = 1 if LT(2) is negative.

Set all other bits to zero and proceed to step 5; else proceed to step 4d.

d. If DOT(3) = MAX, then set Z<sup>+</sup> slew bit = 1 if LT(3) is positive.

Set Z<sup>-</sup> slew bit = 1 if LT(3) is negative.

Set all other bits to zero and proceed to step 5; else proceed to step 4e.

e. If DOT(4) = MAX, then set X<sup>+</sup> slew bit = 1 if LT(1) is positive.

Set X<sup>-</sup> slew bit = 1 if LT(1) is negative.

Set Y<sup>+</sup> slew bit = 1 if LT(2) is positive.

Set Y<sup>-</sup> slew bit = 1 if LT(2) is negative.

Set all other bits to zero and proceed to step 5; else proceed to step 4f.

- f. If  $\text{DOT}(5) = \text{MAX}$ , then set  $X^+$  slew bit = 1 if  $\text{LT}(1)$  is positive.  
Set  $X^-$  slew bit = 1 if  $\text{LT}(1)$  is negative.  
Set  $Z^+$  slew bit = 1 if  $\text{LT}(3)$  is positive.  
Set  $Z^-$  slew bit = 1 if  $\text{LT}(3)$  is negative.  
Set all other bits to zero and proceed to step 5; else proceed to step 4g.
- g. If  $\text{DOT}(6) = \text{MAX}$ , then set  $Y^+$  slew bit = 1 if  $\text{LT}(2)$  is positive.  
Set  $Y^-$  slew bit = 1 if  $\text{LT}(2)$  is negative.  
Set  $Z^+$  slew bit = 1 if  $\text{LT}(3)$  is positive.  
Set  $Z^-$  slew bit = 1 if  $\text{LT}(3)$  is negative.  
Set all other bits to zero and proceed to step 5; else proceed to step 4h.
- h. If  $\text{LT}(1)$  is positive, set  $X^+$  slew bit = 1.  
If  $\text{LT}(1)$  is negative, set  $X^-$  slew bit = 1.  
If  $\text{LT}(2)$  is positive, set  $Y^+$  slew bit = 1.  
If  $\text{LT}(2)$  is negative, set  $Y^-$  slew bit = 1.  
If  $\text{LT}(3)$  is positive, set  $Z^+$  slew bit = 1.  
If  $\text{LT}(3)$  is negative, set  $Z^-$  slew bit = 1.  
Set all other slew bits to zero and proceed to step 5.
5. Maintain the slew bit setting of step 4 and exit when the slew time established in step 3 has expired.
6. Slew all axes positive for  $\text{TSLEW}5$  seconds and then slew all axes negative for  $\text{TSLEW}5$  seconds to eliminate slew direction sensitivity effects. During this period ( $2\text{TSLEW}5$  seconds), no other functions of this module are to be performed. Upon completion of this bidirectional slewing period, set all slew bits to zero and execute step 7. (For positive slew, all  $\text{SLEW}_i\text{POS} = 1$  and all  $\text{SLEW}_i\text{NEG} = 0$ . For negative slew, the opposite is the case.)
7. Perform the following proportional digital rate torquing function for each subsequent pass until the digital torquing function has been performed at least  $\text{DTTIM}$  seconds for all IMU's being repositioned.
  - a. Compute  $[T_{\text{PC}}^{\text{DC}}]$  as in step 2a (if on orbit) and step 2b.
  - b. Compute the off-diagonal differences as in step 2c.

- c. Compute the negative of the RSS of the off-diagonal element of  $[T_{PC}^{DC}]$  minus 0.00001.

$$LATD = - [LT(1)^2 + LT(2)^2 + LT(3)^2]^{1/2} - 0.00001.$$

- d. Proportion the digital rates as follows:

$$LATX = \frac{LT(1) (MAX\_TORQ)}{LATD}$$

$$LATY = \frac{LT(2) (MAX\_TORQ)}{LATD}$$

$$LATZ = \frac{LT(3) (MAX\_TORQ)}{LATD}$$

If the submode is not PLAT\_POS, compute these rates every cycle for at least DTTIM seconds. As the DTTIM time expires for each IMU, set the appropriate 'LATCOMP' flag. When all IMU's have been torqued for DTTIM seconds, terminate this function (except for PLAT\_POS). LATX, LATY, and LATZ must be set equal to zero. If the submode is PLAT\_POS, continue this digital torquing function indefinitely until terminated by change of submode.

D. Special Considerations. It should be noted that much of the coding required for step 2 above can also be utilized for step 7. Also, there are on-orbit unique requirements that need not be implemented in GN&C OPS-9.

During noninertial operations, the LAT\_FUNC module shall be executed at the IMU major cycle rate when required. During INERTIAL and on-orbit operations, this module shall be executed at the rate specified in the applicable submode.

A suggested design flow that satisfies the LAT\_FUNC requirements is shown in Figure 4.5.2.6-1.

Table 4.5.2.6-1. LAT\_FUNC Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
T <sub>PC</sub> NB	V99U3405C THRU V99U3431C	TRANSFORMATION: NAVIGATION BASE TO PRESENT CLUSTER; 1 PER IMU	TNB_CL	MATRIX	+/-1	NA	3.125
T <sub>DC</sub> NB	V99U3350C THRU V99U3376C	TRANSFORMATION: NAVIGATION BASE TO DESIRED CLUSTER; 1 PER IMU	HANG_CALA HANG_CALB PFLT_CALA HANG_CALC GC_ALIGN	MATRIX	+/-1	NA	3.125
LAT_C1	V96U7008C	LAT C1 CONSTANT	K-LOAD	SCALAR	0.00032	NA	OD
LAT_C2	V96U7009C	LAT C2 CONSTANT	K-LOAD	SCALAR	0.30000	NA	OD
LAT_C3	V96U7010C	LAT C3 CONSTANT	K-LOAD	SCALAR	0.03000	NA	OD
LAT_C4	V96U7011C	LAT C4 CONSTANT	K-LOAD	SCALAR	0.0013	NA	OD
MAX_TORQ	V96U7005C	MAX DIGITAL TORQUING RATE FOR LAT	I-LOAD	SCALAR	80(GNC9) 25 (OPS2&3)	DEG/ HR	OD
TSLEW1	V96W7022C	SLEW TIME NO. 1	K-LOAD	SCALAR	19.84	SEC	OD
TSLEW2	V96W7023C	SLEW TIME NO. 2	K-LOAD	SCALAR	5.12	SEC	OD
TSLEW3	V96W7024C	SLEW TIME NO. 3	K-LOAD	SCALAR	0.64	SEC	OD
TSLEW4	V96W7025C	SLEW TIME NO. 4	K-LOAD	SCALAR	0.32	SEC	OD
TSLEW5	V96W7095C	SLEW TIME NO. 5	K-LOAD	SCALAR	19.84	SEC	OD
T <sub>DC</sub> PC (REFER)		TRANSFORMATION: PRESENT CLUSTER TO DESIRED CLUSTER;1 PER IMU NEW REFERENCE IMU	ORBIT_AL	MATRIX	+/-1	NA	OD
TLIT	V96U7012C THRU V96U7020C	SMALL ANGLE ROTATION MATRIX	K-LOAD	MATRIX	FOR (ROW COLUMN) 11 = 0.9997 12 = -0.01714 13 = 0.01775 21 = 0.01748 22 = 0.9997 23 = -0.01714 31 = -0.01745 32 = 0.01775 33 = 0.9997	NA	OD
DTTIM	V96W7001C	LAT DIGITAL TORQUING TIME	I-LOAD	SCALAR	89.92 (GNC 9) 160 (OPS2&3)	SEC	OD
R_PLANE		ROTATING PLANE OPTION FLAG	ORBIT_AL	LOGICAL	0,1	NA	OD
REFER		REFERENCE ALIGN IMU NO	ORBIT_AL	INTEGER	1,2,3	NA	OD

Table 4.5.2.6-2. LAT\_FUNC Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
SLEW_X_POS(1)	V71K2542B	IMU-1 SLEW X POS CMD WD2 B1	IMU-1	LOGICAL	0,1	NA	OD
SLEW_X_POS(2)	V71K3542B	IMU-2 SLEW X POS CMD WD2 B1	IMU-2	LOGICAL	0,1	NA	OD
SLEW_X_POS(3)	V71K4542B	IMU-3 SLEW X POS CMD WD2 B1	IMU-3	LOGICAL	0,1	NA	OD
SLEW_Y_POS(1)	V71K2544B	IMU-1 SLEW Y POS CMD WD2 B3	IMU-1	LOGICAL	0,1	NA	OD
SLEW_Y_POS(2)	V71K3544B	IMU-2 SLEW Y POS CMD WD2 B3	IMU-2	LOGICAL	0,1	NA	OD
SLEW_Y_POS(3)	V71K4544B	IMU-3 SLEW Y POS CMD WD2 B3	IMU-3	LOGICAL	0,1	NA	OD
SLEW_Z_POS(1)	V71K2546B	IMU-1 SLEW Z POS CMD WD2 B5	IMU-1	LOGICAL	0,1	NA	OD
SLEW_Z_POS(2)	V71K3546B	IMU-2 SLEW Z POS CMD WD2 B5	IMU-2	LOGICAL	0,1	NA	OD
SLEW_Z_POS(3)	V71K4546B	IMU-3 SLEW Z POS CMD WD2 B5	IMU-3	LOGICAL	0,1	NA	OD
SLEW_X_NEG(1)	V71K2543B	IMU-1 SLEW X NEG CMD WD2 B2	IMU-1	LOGICAL	0,1	NA	OD
SLEW_X_NEG(2)	V71K3543B	IMU-2 SLEW X NEG CMD WD2 B2	IMU-2	LOGICAL	0,1	NA	OD
SLEW_X_NEG(3)	V71K4543B	IMU-3 SLEW X NEG CMD WD2 B2	IMU-3	LOGICAL	0,1	NA	OD
SLEW_Y_NEG(1)	V71K2545B	IMU-1 SLEW Y NEG CMD WD2 B4	IMU-1	LOGICAL	0,1	NA	OD
SLEW_Y_NEG(2)	V71K3545B	IMU-2 SLEW Y NEG CMD WD2 B4	IMU-2	LOGICAL	0,1	NA	OD
SLEW_Y_NEG(3)	V71K4545B	IMU-3 SLEW Y NEG CMD WD2 B4	IMU-3	LOGICAL	0,1	NA	OD
SLEW_Z_NEG(1)	V71K2547B	IMU-1 SLEW Z NEG CMD WD2 B6	IMU-1	LOGICAL	0,1	NA	OD
SLEW_Z_NEG(2)	V71K3547B	IMU-2 SLEW Z NEG CMD WD2 B6	IMU-2	LOGICAL	0,1	NA	OD
SLEW_Z_NEG(3)	V71K4547B	IMU-3 SLEW Z NEG CMD WD2 B6	IMU-3	LOGICAL	0,1	NA	OD
LATX		LAT X DIGITAL TORQUING RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/ HR	OD
LATY		LAT Y DIGITAL TORQUING RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/ HR	OD
LATZ		LAT Z DIGITAL TORQUING RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/ HR	OD
LATCOMP(1)	V95X0085X	IMU-1 LARGE ANGLE TORQ COMPLETE	GC_ALIGN HANG_CALA HANG_CALB HANG_CALC ORBIT_AL PFLT_CALA TLM	LOGICAL	0,1	NA	ONCE
LATCOMP(2)	V95X1085X	IMU-2 LARGE ANGLE TORQ COMPLETE	GC_ALIGN HANG_CALA HANG_CALB HANG_CALC ORBIT_AL PFLT_CALA TLM	LOGICAL	0,1	NA	ONCE
LATCOMP(3)	V95X2085X	IMU-3 LARGE ANGLE TORQ COMPLETE	GC_ALIGN HANG_CALA HANG_CALB HANG_CALC ORBIT_AL PFLT_CALA TLM	LOGICAL	0,1	NA	ONCE
RDCLX		DESIRED X-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/ HR	ONCE
RDCLY		DESIRED Y-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/ HR	ONCE
RDCLZ		DESIRED Z-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/ HR	ONCE
T <sub>DC</sub> PC		TRANSFORMATION: PRESENT CLUSTER TO DESIRED CLUSTER; 1 PER IMU BEING REPOSITIONED	ORBIT_AL	MATRIX	+/-1	NA	OD



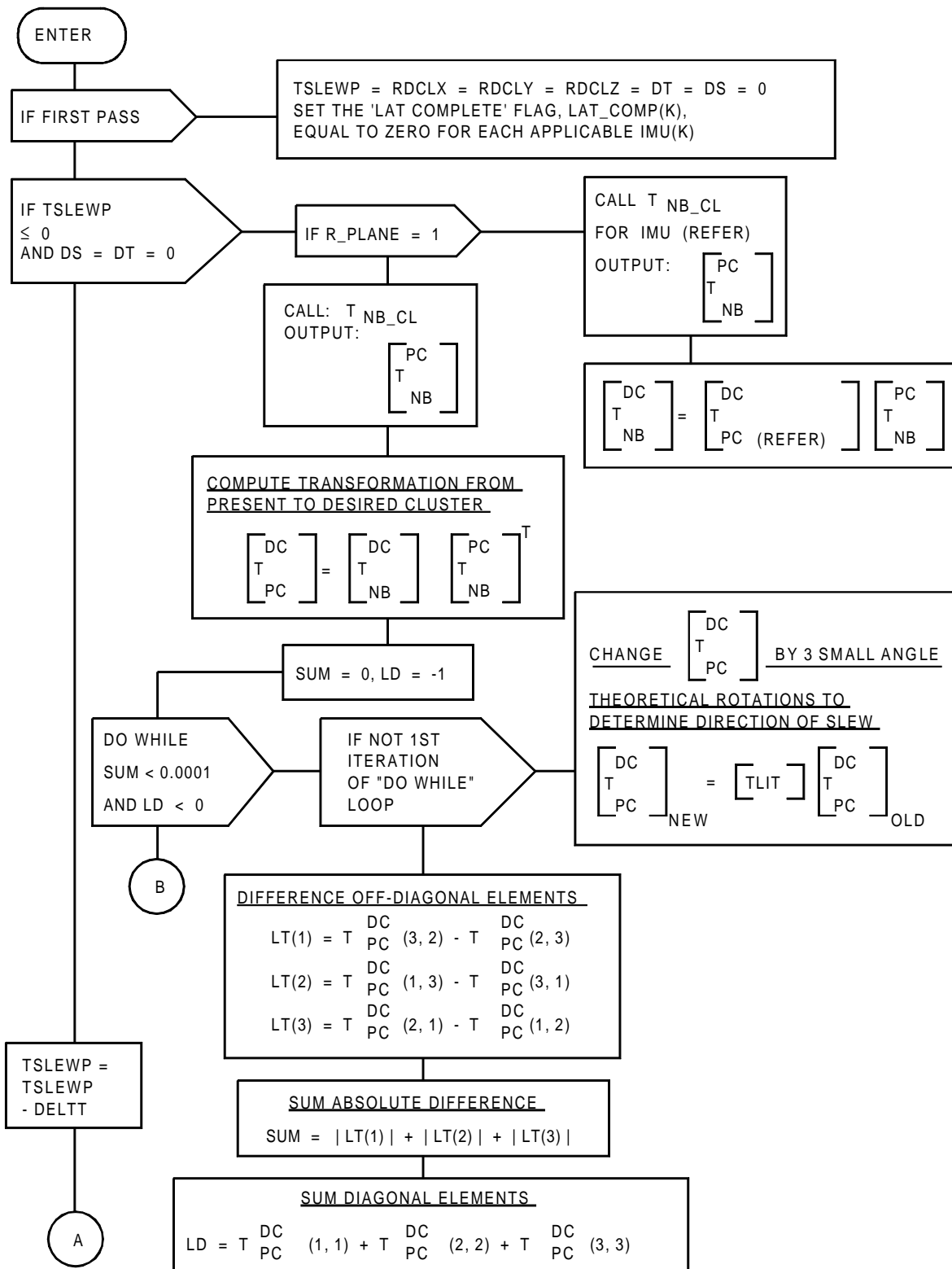


FIGURE 4.5.2.6-1.(1) LAT\_FUNC Flow Diagram (Sheet 1 of 5)

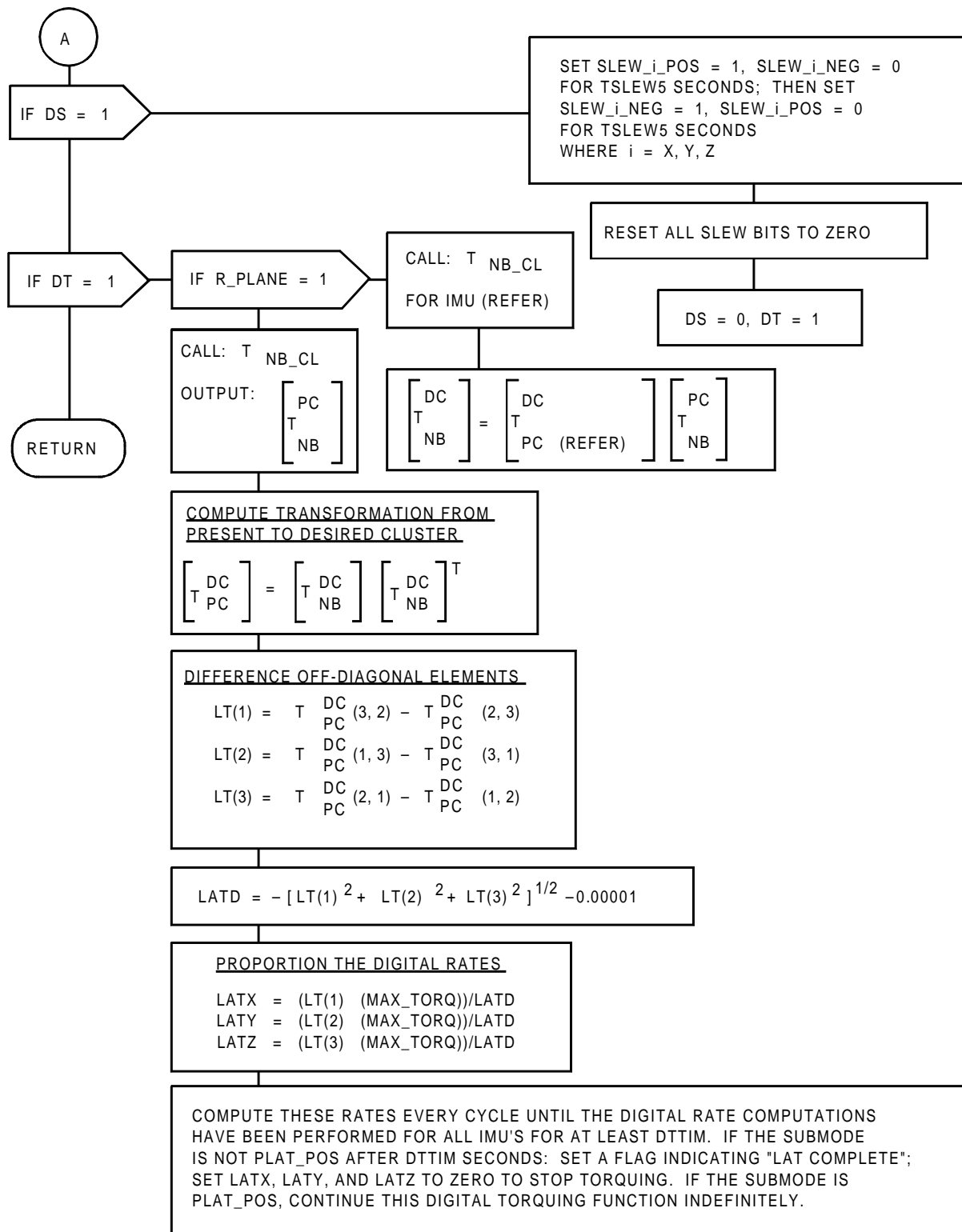


FIGURE 4.5.2.6-1.(2) LAT\_FUNC Flow Diagram (Sheet 2 of 5)

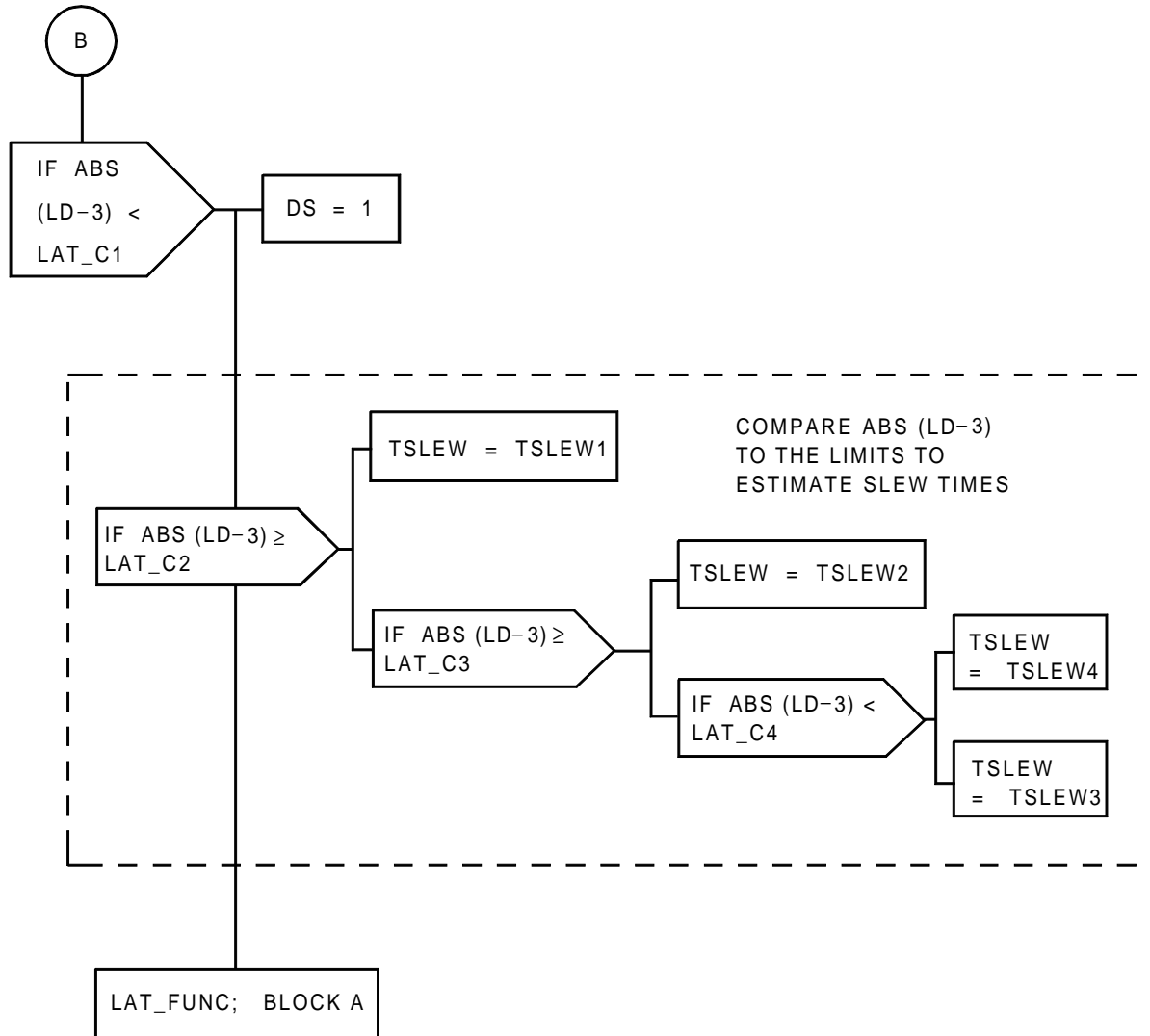


FIGURE 4.5.2.6-1.(3) LAT\_FUNC Flow Diagram (Sheet 3 of 5)

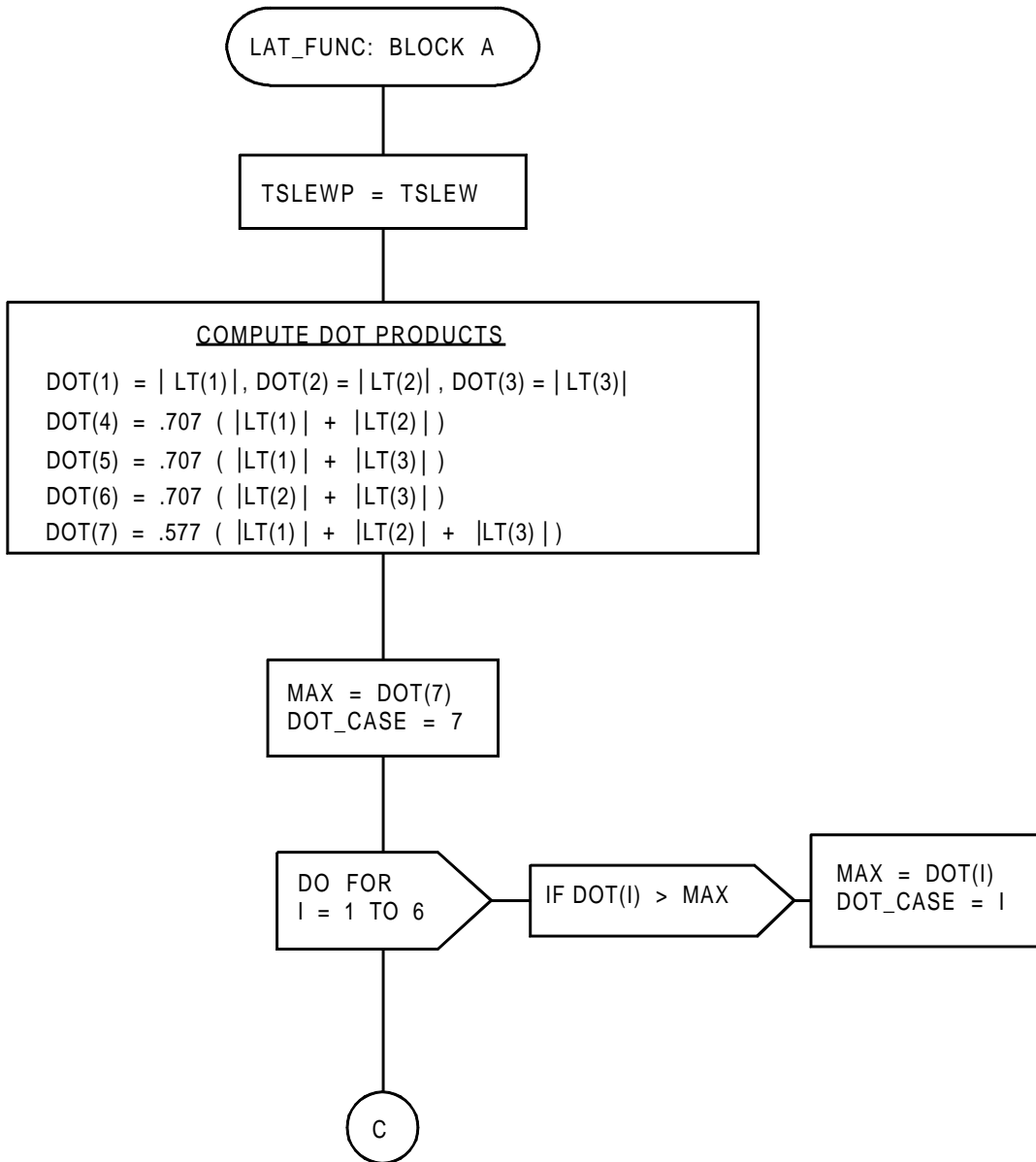


FIGURE 4.5.2.6-1.(4) LAT\_FUNC Flow Diagram (Sheet 4 of 5)

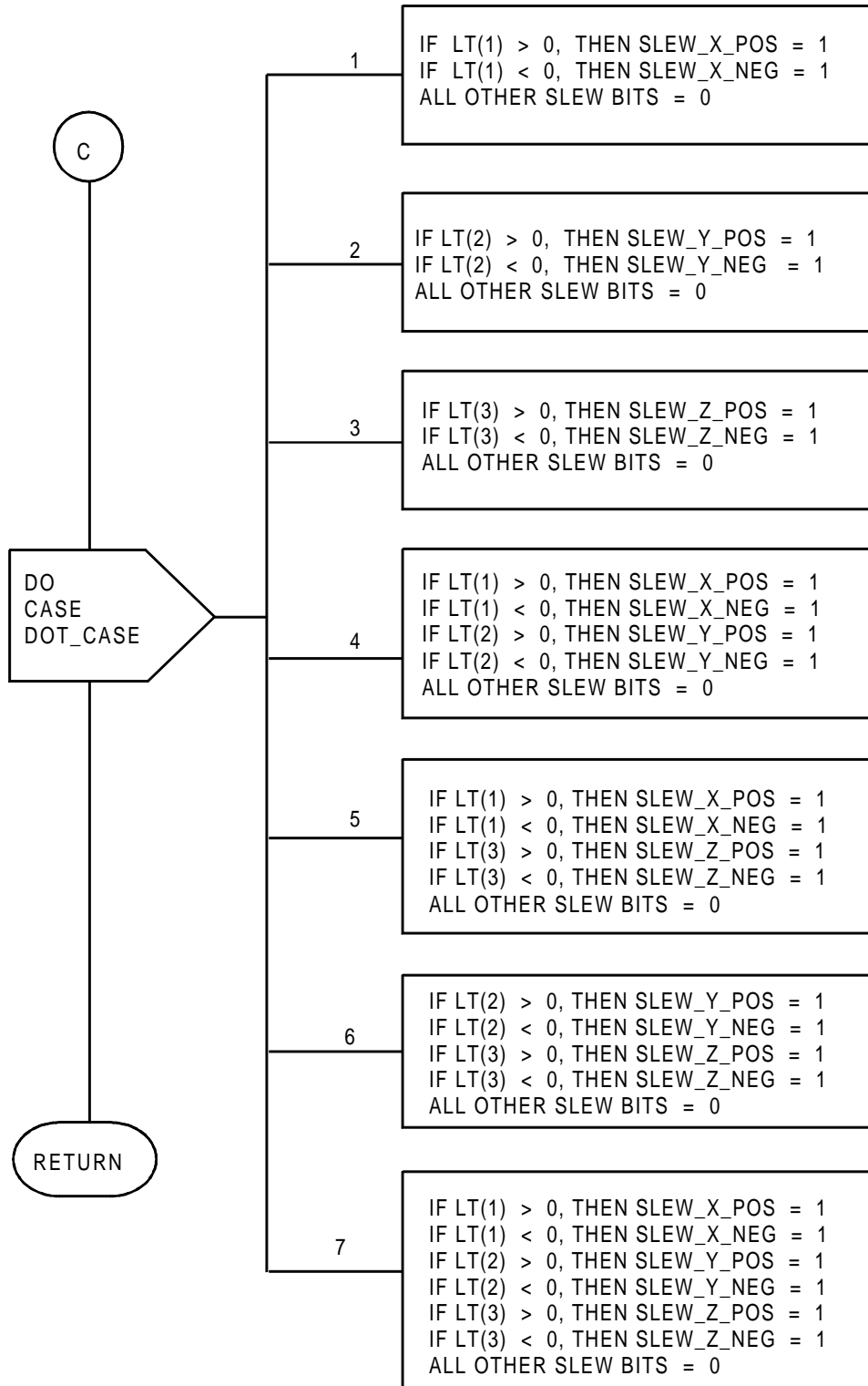


FIGURE 4.5.2.6-1.(5) LAT\_FUNC Flow Diagram (Sheet 5 of 5)

#### 4.5.2.7 Least Squares Fit (LSF\_FILR).

The purpose of the LSF\_FILR module is to provide the estimates of tilt and tilt rate necessary for the calibration and alignment functions.

A. Functional Requirements. The LSF\_FILR module performs the following functions:

1. Compute an estimate of platform acceleration (tilt) in NWU reference coordinates.
2. Compute an estimate of platform tilt rates in NWU reference coordinates.

B. Interface Requirements. The input/output interfaces associated with the LSF\_FILR module are shown in Tables 4.5.2.7-1 and 4.5.2.7-2.

C. Detailed Requirements. The following set of equations and sequence of computations are needed to perform the LSF\_FILR functions and are required for each applicable IMU.

1. If this is not the first pass since the most recent scheduling of this module, proceed to step 2. Otherwise initialize all variables to zero as follows:

$VDT(K) = 0$ ,  $VTDT(K) = 0$ ,  $VTTDT(K) = 0$ ,  $THETA(K) = 0$ ,  $THSET(K) = 0$ ,  $VF(K) = 0$  and  $TI = 0$ , for  $K = 1, 2, 3$ . Exit for the first pass.

The LSF\_FILR variables are updated on an iterative basis and must therefore be saved for use in subsequent cycles.

2. Compute final time of the integration interval and set initial velocity as follows:

$$TF = TI + DELTT, \bar{VI} = \bar{VF}$$

DELTT is the time interval between the read times of the last input data used by successive executions of this module.

3. If TF is greater than or equal to TO, then bias the initial velocity as follows:

$VI(K) = VI(K) - THSET(K) (TI)$  for  $K = 1, 2, 3$   
Otherwise, proceed to step 4.

4. Compute the final velocity over the integration interval as the sum of the initial velocity and the change in velocity in reference coordinates since the last update as follows:

$$VF(1) = VI(1) + PN$$

$$VF(2) = VI(2) + PW$$

$$VF(3) = VI(3) + PUP$$

5. If the final integration time interval, TF, is less than TO, proceed to step 6; otherwise, bias the final velocity by the estimated acceleration as follows:

$$VF(1) = (VI(1) + PN) - THETA(1) (DELTT)$$

$$VF(2) = (VI(2) + PW) - THETA(2) (DELTT)$$

$$VF(3) = (VI(3) + PUP) - THETA(3) (DELTT)$$

6. Compute estimates of the integrals of V(t), tV(t), and t<sup>2</sup>V(t) over the time interval from t = 0 to t = TF as follows:

$$VDT(K)_N = VDT(K)_{N-1} + \frac{[VF(K) + VI(K)]}{2} DELTT$$

$$VTDT(K)_N = VTDT(K)_{N-1} + \left[ \frac{VI(K) - VF(K)}{6} \right]$$

$$(TF^2 + TF(TI) + TI^2) - (VI(K) (TI^2) - VF(K)(TF^2))/2$$

$$VTTDT(K)_N = VTTDT(K)_{N-1} + \frac{[VI(K) - VF(K)]}{12} (TF^3 + TF^2 (TI) + TI^2$$

$$(TF) + TI^3) - (VI(K) (TI^3) - VF(K)(TF^3)) / 3$$

where VDT, VTDT, and VTTDT are approximations to the integrals of V(t), tV(t), and t<sup>2</sup>V(t) and must be saved for use on the next cycle. Terms designated by ( )<sub>N</sub>, ( )<sub>N-1</sub> denote the values of ( ) on the Nth and N-1th passes through the LSF\_FILR.

7. If the final integration time interval is less than TO, proceed to step 8; otherwise, bias the estimated integrals of V(t), tV(t) and t<sup>2</sup>V(t) as follows:

$$VDT(K)_N = VDT(K)_N - (THSET(K) TI^2)/2$$

$$VTDT(K)_N = VTDT(K)_N - (THSET(K) TI^3)/3$$

$$VTTDT(K)_N = VTTDT(K)_N - (THSET(K) TI^4)/4$$

for K = 1, 2, 3

and save VDT, VTDT, and VTTDT as in step 6.

8. Compute the estimated deviation of the actual acceleration and the estimated acceleration and compute an estimate of the drift (tilt rate).

$$\text{THSET}(K) = 4(-9(\text{TF})^2 (\text{VDT}(K)) + 48(\text{TF}) (\text{VTDT}(K)) \\ - 45(\text{VTTDT}(K)))/\text{TF}^4$$

$$\text{ETD}(K) = 180 (\text{TF}^2 \frac{[\text{VDT}(K)]}{6} - \text{TF}(\text{VTDT}(K)) + \text{VTTDT}(K)) / \text{TF}^5$$

$$\text{ETD}(K) = 2(\text{ETD}(K))(\text{RAD}) / (\text{G})$$

for K = 1, 2, 3

Note: The computation of ETD(K) is not required each iteration but must be made in the final iteration of each scheduling of this submode.

9. a. Compute an estimate of the acceleration in ft/sec<sup>2</sup> (acceleration at the time of LSF\_FILR function initialization) as follows:

If  $\text{TF} < \text{TO}$ , then  $\text{THETA}(K) = \text{THSET}(K)$ ;  
otherwise,  $\text{THETA}(K) = \text{THETA}(K) + \text{THSET}(K)$  for K = 1, 2, 3.

- b. Set  $\text{TI} = \text{TF}$ .

This module shall be executed at the major cycle rate when required or at the rate specified by GC\_ALIGN1 in paragraph 4.5.4.5.2. Refer to Section 4.1.4A, second paragraph, for requirements regarding bypassing of the LSF\_FILR module for the first three cycles of the currently applicable sequence. A suggested design flow which satisfies the LSF\_FILR requirements is shown in Figure 4.5.2.7-1.



Table 4.5.2.7-1. LSF\_FILR Input

Name	MSID	Description	Source	Input Type	Signal Range	Units	Rate (Hz)
PN(1)	V99U2830C	IMU-1 NORTH DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
PN(2)	V99U2831C	IMU-2 NORTH DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
PN(3)	V99U2832C	IMU-3 NORTH DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
PW(1)	V99U2833C	IMU-1 WEST DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
PW(2)	V99U2834C	IMU-2 WEST DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
PW(3)	V99U2835C	IMU-3 WEST DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
PUP(1)	V99U2836C	IMU-1 UP DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
PUP(2)	V99U2837C	IMU-2 UP DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
PUP(3)	V99U2838C	IMU-3 UP DEL VEL OVER MAJ CYCLE	ACP_TRSF	SCALAR	+/-30.0	FT/ SEC	OD
TO	V96W7021C	THETA INITIALIZATION TIME CONSTANT	CONSTANT	SCALAR	1.280	SEC	OD
G_SITE_N (N=1-9)	V96A7002C	LOCAL GRAVITY VALUE	I-LOAD	SCALAR	32.08- 32.21	FT/ SEC /SEC	OD
RAD	V96U7006C	CONVERSION FACTOR TO CONVERT RADIANS TO ARC-SECONDS	CONSTANT	SCALAR	206264.8	ARC- SEC/ RAD	OD

Table 4.5.2.7-2. LSF\_FILR Output

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
THETA1(1)	V99U3220C	IMU-1 NORTH COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC	OD
THETA2(1)	V99U3221C	IMU-2 NORTH COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC	OD
THETA3(1)	V99U3222C	IMU-3 NORTH COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC	OD
THETA1(2)	V99U3223C	IMU-1 WEST COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC	OD
THETA2(2)	V99U3224C	IMU-2 WEST COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC	OD
THETA3(2)	V99U3225C	IMU-3 WEST COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC	OD
THETA1(3)	V99U3226C	IMU-1 UP COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC	OD
THETA2(3)	V99U3227C	IMU-2 UP COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC	OD

Table 4.5.2.7-2. LSF\_FILR Output

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
THETA3(3)	V99U3228C	IMU-3 UP COMP EST ACC VECTOR	TLM IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	SCALAR	+/-70	FT/ SEC/ SEC/	OD
ETD	V99U2845C THRU V99U2853C	LSF ESTIMATED DRIFT VECTOR NWU ORDER; 1 PER IMU	IMU_ATT HANG_CALA HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1 TLM	VECTOR	+/-100	DEG/ HR	OD

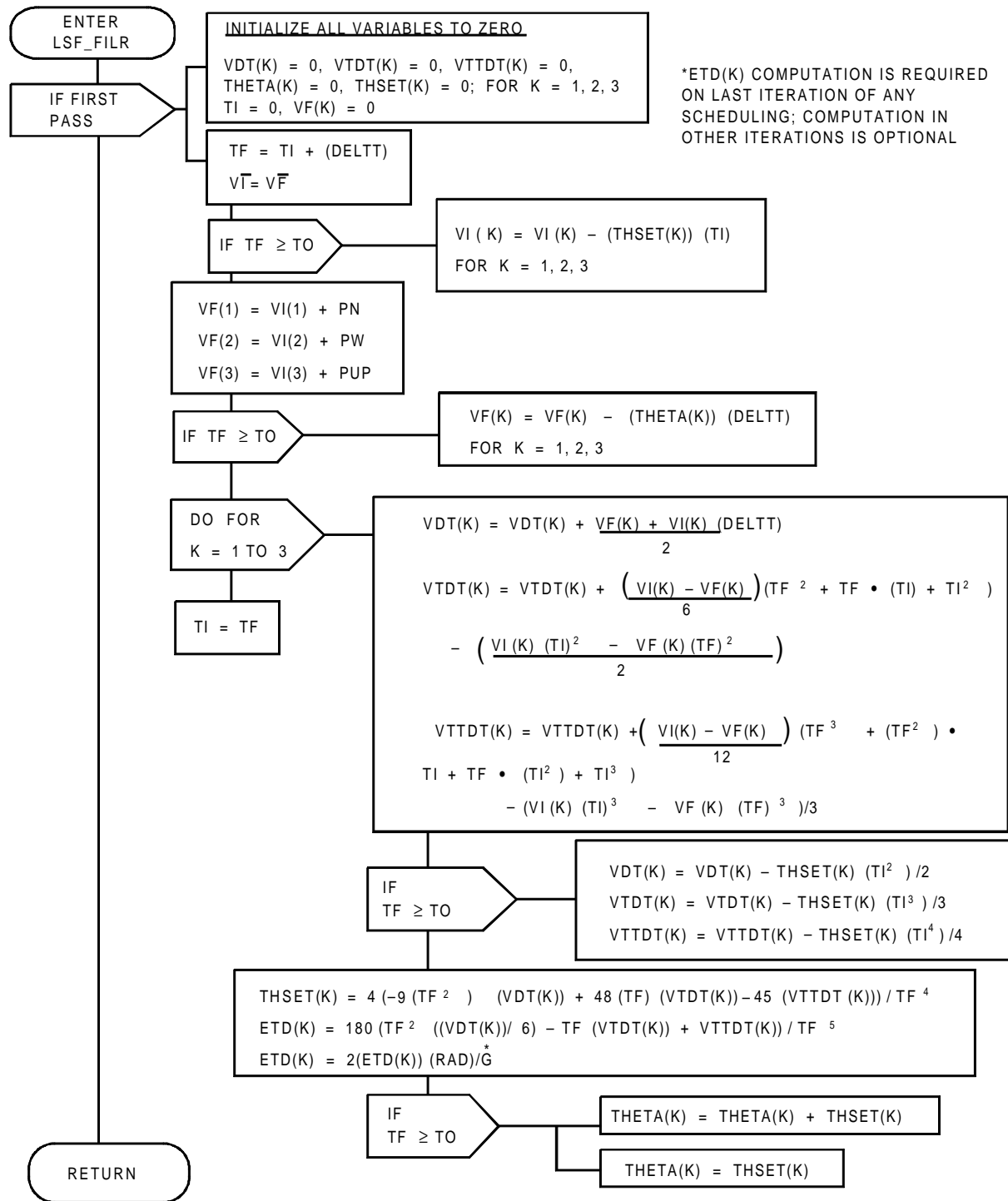


FIGURE 4.5.2.7-1. LSF\_FILR Flow Diagram

#### 4.5.2.8 Navigation Base-to-Cluster Transformation (TNB\_CL).

The purpose of the TNB\_CL module is to compute the transformation matrix from navigation base-to-present cluster coordinates.

A. Functional Requirement. The TNB\_CL module performs the following function:

Compute the transformation (rotation) matrix from navigation base-to-cluster coordinates using resolver angle readings.

B. Interface Requirements. The input/output interfaces associated with the TNB\_CL module are listed in Tables 4.5.2.8-1 and 4.5.2.8-2.

C. Detailed Requirements. The following sequence of equations and computations are needed to perform the TNB\_CL function and are required for each applicable IMU:

1. Compute the compensated resolver angles in radians as follows:

If call is from other than the Star Tracker DATA\_FILR module:

$$OR = \frac{ORANG}{RADDEG}$$

$$P = \frac{PANG}{RADDEG}$$

$$AZ = \frac{AZANG}{RADDEG}$$

$$IR = \frac{IRANG}{RADDEG}$$

If call is from the Star Tracker DATA\_FILR:

$$OR = \frac{ORAVG21}{RADDEG}$$

$$P = \frac{PAVG21}{RADDEG}$$

$$AZ = \frac{AZAVG21}{RADDEG}$$

$$IR = \frac{IRAVG21}{RADDEG}$$

where OR, P, AZ, and IR are the outer roll, pitch, azimuth, and inner roll compensated resolver angles in radians. 1/RADDEG is the conversion factor from degrees to radians.

2. a. Compute the navigation base-to-outer roll gimbal transformation:

$$[T_{NB}^{RL}] = TAZ(-RGAO)TPT(-RGPO)[T_{NB}^{CASE}]$$

where:

$$TAZ(-RGAO) = \begin{bmatrix} \cos(RGAO) & -\sin(RGAO) & 0 \\ \sin(RGAO) & \cos(RGAO) & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$TPT(-RGPO) = \begin{bmatrix} \cos(RGPO) & 0 & \sin(RGPO) \\ 0 & 1 & 0 \\ -\sin(RGPO) & 0 & \cos(RGPO) \end{bmatrix}$$

Note: This computation may be performed only the first time through this module in any one submode.

- b. Compute the transformation from navigation base-to-present cluster coordinates as follows:

$$[T_{NB}^{PC}] = \begin{bmatrix} CAZ & -SAZ & 0 \\ SAZ & CAZ & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & CIR & -SIR \\ 0 & SIR & CIR \end{bmatrix} \begin{bmatrix} CP & 0 & SP \\ 0 & 1 & 0 \\ -SP & 0 & CP \end{bmatrix}$$

$$\begin{bmatrix} 1 & -DP & 0 \\ DP & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & COR & -SOR \\ 0 & SOR & COR \end{bmatrix} [T_{NB}^{RL}]$$

where SAZ = SIN(AZ), SP = SIN(P), SOR = SIN(OR), SIR = SIN(IR), CAZ = COS(AZ), CP = COS(P), COR = COS(OR), CIR = COS(IR); DP is the nonorthogonality between the outer roll and pitch axes (non-varying).

The TNB\_CL module shall be executed on demand as required to support the using functions. A suggested design flow that satisfies the TNB\_CL requirements is shown in Figure 4.5.2.8-1.

Table 4.5.2.8-1. TNB\_CL Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
AZANG(1)	V95H0051C	IMU-1 COMP AZIMUTH RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
AZANG(2)	V95H1051C	IMU-2 COMP AZIMUTH RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
AZANG(3)	V95H2051C	IMU-3 COMP AZIMUTH RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
IRANG(1)	V95H0053C	IMU-1 COMP INNER ROLL RES ANGLE	RES_PROC	SCALAR	0-15 345-360	DEG	OD
IRANG(2)	V95H1053C	IMU-2 COMP INNER ROLL RES ANGLE	RES_PROC	SCALAR	0-15 345-360	DEG	OD
IRANG(3)	V95H2053C	IMU-3 COMP INNER ROLL RES ANGLE	RES_PROC	SCALAR	0-15 345-360	DEG	OD
ORANG(1)	V95H0054C	IMU-1 COMP OUTER ROLL RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
ORANG(2)	V95H1054C	IMU-2 COMP OUTER ROLL RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
ORANG(3)	V95H2054C	IMU-3 COMP OUTER ROLL RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
PANG(1)	V95H0050C	IMU-1 COMP PITCH RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
PANG(2)	V95H1050C	IMU-2 COMP PITCH RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
PANG(3)	V95H2050C	IMU-3 COMP PITCH RES ANGLE	RES_PROC	SCALAR	0-360	DEG	OD
T <sup>CASE</sup> NB	V96U7132C V96U7158C	TRANSFORMATION: NAV BASE TO IMU ROLL AXIS; 1 PER IMU	I-LOAD	MATRIX	+1/-1	NA	OD
DP(1)	V99H2660C	IMU-1 ROLL/PITCH NONORTHOGONALITY	HANG_CALB COMPOOL	SCALAR	+/-0.006	RAD	OD
DP(2)	V99H2661C	IMU-2 ROLL/PITCH NONORTHOGONALITY	HANG_CALB COMPOOL	SCALAR	+/-0.006	RAD	OD
DP(3)	V99H2662C	IMU-3 ROLL/PITCH NONORTHOGONALITY	HANG_CALB COMPOOL	SCALAR	+/-0.006	RAD	OD
RADDEG	V96U7007C	CONVERSION FACTOR FROM RADIANS TO DEGREES	CONSTANT	SCALAR	57.29578	DEG/ RAD	OD
RGAO(1)	V99U9559C	IMU-1 ROLL GIMBAL AZIMUTH OFFSET	I-LOAD	SCALAR	+5	RAD	OD
RGAO(2)	V99U9560C	IMU-2 ROLL GIMBAL AZIMUTH OFFSET	I-LOAD	SCALAR	+5	RAD	OD
RGAO(3)	V99U9561C	IMU-3 ROLL GIMBAL AZIMUTH OFFSET	I-LOAD	SCALAR	+5	RAD	OD
RGPO(1)	V99U9562C	IMU-1 ROLL GIMBAL PITCH OFFSET	I-LOAD	SCALAR	+5	RAD	OD
RGPO(2)	V99U9563C	IMU-2 ROLL GIMBAL PITCH OFFSET	I-LOAD	SCALAR	+5	RAD	OD
RGPO(3)	V99U9564C	IMU-3 ROLL GIMBAL PITCH OFFSET	I-LOAD	SCALAR	+5	RAD	OD
ORAVG21(1)		IMU-1 OUTER ROLL ANG 21 SPL AVG	RES_PROC	SCALAR	0 - 360	DEG	OD
ORAVG21(2)		IMU-2 OUTER ROLL ANG 21 SPL AVG	RES_PROC	SCALAR	0 - 360	DEG	OD
ORAVG21(3)		IMU-3 OUTER ROLL ANG 21 SPL AVG	RES_PROC	SCALAR	0 - 360	DEG	OD
PAVG21(1)		IMU-1 PITCH ANG 21 SPL AVG	RES_PROC	SCALAR	0 - 360	DEG	OD
PAVG21(2)		IMU-2 PITCH ANG 21 SPL AVG	RES_PROC	SCALAR	0 - 360	DEG	OD
PAVG21(3)		IMU-3 PITCH ANG 21 SPL AVG	RES_PROC	SCALAR	0 - 360	DEG	OD
AZAVG21(1)		IMU-1 AZ ANG 21 SPL AVG	RES_PROC	SCALAR	0 - 360	DEG	OD
AZAVG21(2)		IMU-2 AZ ANG 21 SPL AVG	RES_PROC	SCALAR	0 - 360	DEG	OD

Table 4.5.2.8-1. TNB\_CL Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
AZAVG21(3)		IMU-3 AZ ANG 21 SPL AVG	RES_PROC	SCALAR	0 – 360	DEG	OD
IRAVG21(1)		IMU-1 INNER ROLL ANG 21 SPL AVG	RES_PROC	SCALAR	0 – 360	DEG	OD
IRAVG21(2)		IMU-2 INNER ROLL ANG 21 SPL AVG	RES_PROC	SCALAR	0 – 360	DEG	OD
IRAVG21(3)		IMU-3 INNER ROLL ANG 21 SPL AVG	RES_PROC	SCALAR	0 – 360	DEG	OD

Table 4.5.2.8-2. TNB\_CL Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
T <sub>NB</sub> <sup>PC</sup>	V99U3405C THRU V99U3431C	TRANSFORMATION: NAVIGATION BASE TO PRESENT CLUSTER; 1 PER IMU	LAT_FUNC IMU_ATT CL_CLRATE ORBIT_AL TLM ST SOP	MATRIX	+/-1	NA	OD



\* WHEN CALLED BY STAR TRACKER SOP ORAVG21, PAVG21, AZAVG21, AND IRAVG21 REPLACE ORANG, PANG, AZANG, AND IRANG

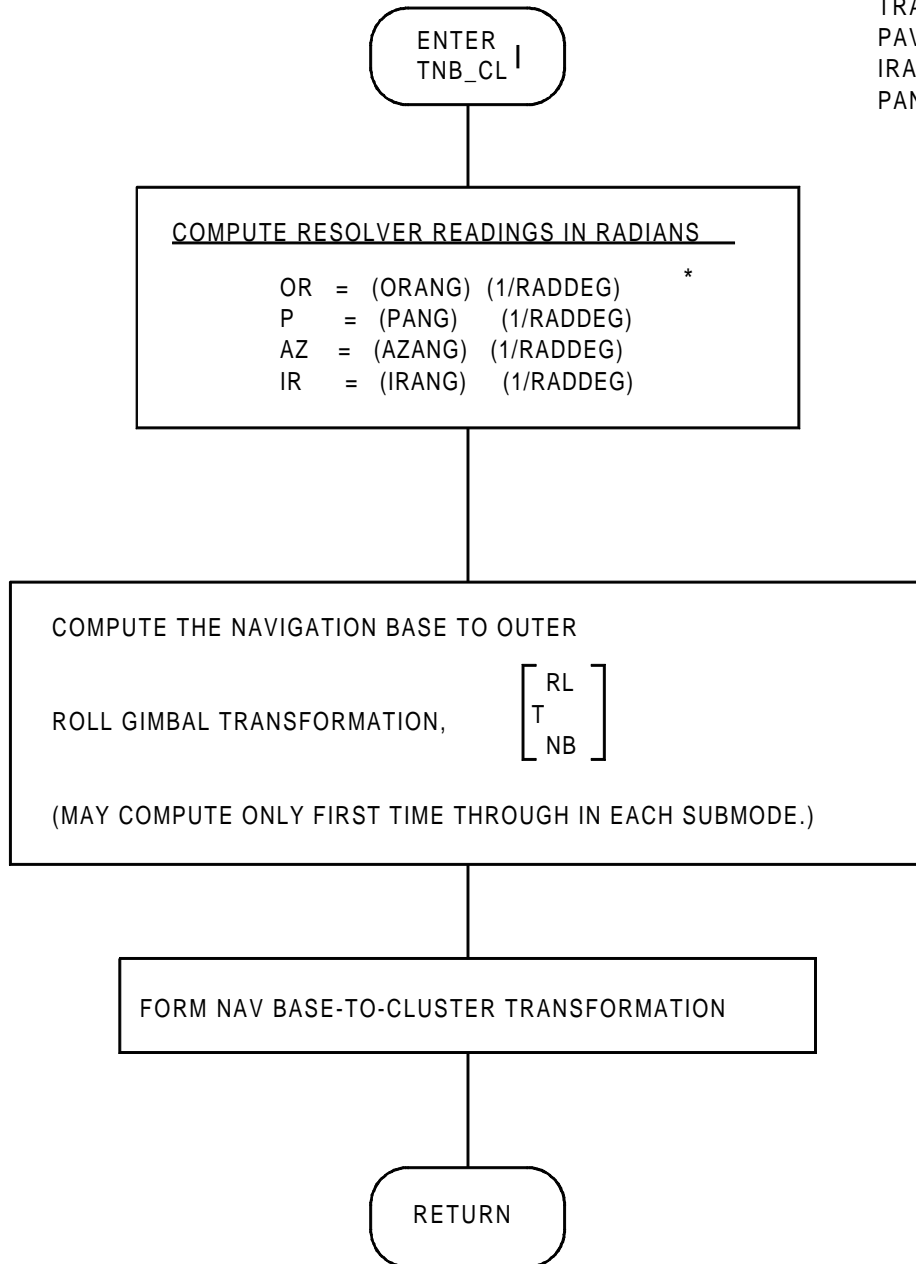


FIGURE 4.5.2.8-1. TNB\_CL Flow Diagram

#### 4.5.2.9 Cluster-to-Cluster Relative Rate Computation (CL\_CLRATE).

The purpose of the CL\_CLRATE module is to compute a relative rate vector and a relative misalignment estimate between two IMU clusters.

A. Functional Requirements. The CL\_CLRATE module performs the following functions for each applicable i, j cluster pair specified by the using program submodule.

1. Compute the relative rate vector between two IMU clusters i and j in specified reference frame.
2. Compute the relative misalignment estimate between clusters i and j in reference coordinates.

B. Interface Requirements. The input/output interfaces associated with the CL\_CLRATE module are listed in Tables 4.5.2.9-1 and 4.5.2.9-2.

C. Detailed Requirements. The following sequence of operations is required for each applicable IMU-to-IMU (i, j) combination.

1. Determine the navigation base-to-present cluster (i) transformation by calling the TNB\_CL module.
2. Determine the navigation base-to-present cluster (j) transformation by calling the TNB\_CL module.
3. a. Form the cluster (i)-to-cluster (j) reference transformation utilizing the i, j inputs from the TNB\_CL module and the reference NWU-to-present cluster i, j transformations from the T\_UPDATE module:

$$\begin{bmatrix} T_{Ci}^{CjR} \end{bmatrix} = \begin{bmatrix} T_R^{PC(i)} \end{bmatrix}^T \begin{bmatrix} T_{NB}^{PC(i)} \end{bmatrix} \begin{bmatrix} T_{NB}^{PC(j)} \end{bmatrix}^T \begin{bmatrix} T_R^{PC(j)} \end{bmatrix}$$

- b. Form the relative attitude error vector as follows:

$$\overline{PHI}_{i\ jn} = \begin{bmatrix} -TCiCjR(2,3) \\ TCiCjR(1,3) \\ -TCiCjR(1,2) \end{bmatrix}$$

4. If this is the first pass since the most recent scheduling, initialize the following parameters as indicated and exit:

$$\overline{R} = \overline{S} = \overline{0}$$

$$\overline{PHI}_{i\ jn-1} = \overline{PHI}_{i\ jn}$$

5. Update filter variables as follows:

$$\bar{R} = \bar{R} + 1/2 (\bar{PHI}_{ijn} + \bar{PHI}_{ijn} - 1) (\Delta T)$$

$$\bar{S} = \bar{S} + 1/2 [\bar{PHI}_{ijn} (TF_n)^2 - \bar{PHI}_{ijn} - 1 (TF_{n-1})^2] - 1/6 (\bar{PHI}_{ijn} - \bar{PHI}_{ijn-1}) [TF_n^2 + (TF_n)(TF_{n-1}) + (TF_{n-1})^2]$$

where  $\Delta T$  is the time interval since the last filter update;  $TF_n$  is the time since filter initialization,  $TF_{n-1}$  is  $TF_n - \Delta T$ ; and  $\bar{PHI}_{ijn} - 1$  is  $\bar{PHI}_{ijn}$  from the previous cycle.

6. Compute the misalignment (corresponding to initial misalignment at the time of filter initialization) and estimate the relative drift rate during the filtering period as follows:

$$\bar{PHI}_{ij} = \frac{1}{TF_n^2} [(4TF_n) (\bar{R}) - 6(\bar{S})]$$

$$\bar{PHI}_{Dij} = \frac{12}{TF_n^3} [-(TF_n/2) \bar{R} + \bar{S}]$$

As previously indicated, this module is to be initialized to assure that the filter outputs are zero on the initial pass since the most recent scheduling. This initialization, as well as the timing requirements inherent to steps 5 and 6, may be satisfied external to this module if efficient programming indicates. The times associated with steps 5 and 6 relate to the data samples, not to the actual time of computation. Therefore, for other than a synchronous system, the delta and filter times must be directly derived from the resolver data read time associated with the minor cycle resolver processing.

The CL\_CLRATE module shall be executed at the major cycle rate when required. A suggested design flow which satisfies the CL\_CLRATE requirements is shown in Figure 4.5.2.9-1. This design flow assumes synchronous operation.

Table 4.5.2.9-1 CL_CLRATE Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
$T_{NB}^{PC(i)}$		TRANSFORMATION: NAV BASE TO PRESENT CLUSTER I	TNB_CL	MATRIX	+/-1	NA	3.125
$T_{NB}^{PC(j)}$		TRANSFORMATION: NAV BASE TO PRESENT CLUSTER J	TNB_CL	MATRIX	+/-1	NA	3.125
$T_R^{PC(i)}$		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER I	T_UPDATE HANG_CALC GC_ALIGN HANG_CALB	MATRIX	+/-1	NA	3.125
$T_R^{PC(j)}$		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER J	T_UPDATE HANG_CALC GC_ALIGN HANG_CALB	MATRIX	+/-1	NA	3.125

Table 4.5.2.9-2. CL\_CLRATE Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
PHIij	V99U3571C THRU V99U3579C	MISALIGNMENT VECTOR BETWEEN CLUSTERS I AND J; 1 PER IMU PAIR	GC_ALIGN HANG_CALC TLM	VECTOR	+/-1	RAD	3.125
PHIDij	V99U3581C THRU V99U3589C	RELATIVE RATE VECTOR BETWEEN CLUSTERS I AND J; 1 PER IMU PAIR	GC_ALIGN HANG_CALB HANG_CALC TLM	VECTOR	+/-1	RAD/ SEC	3.125

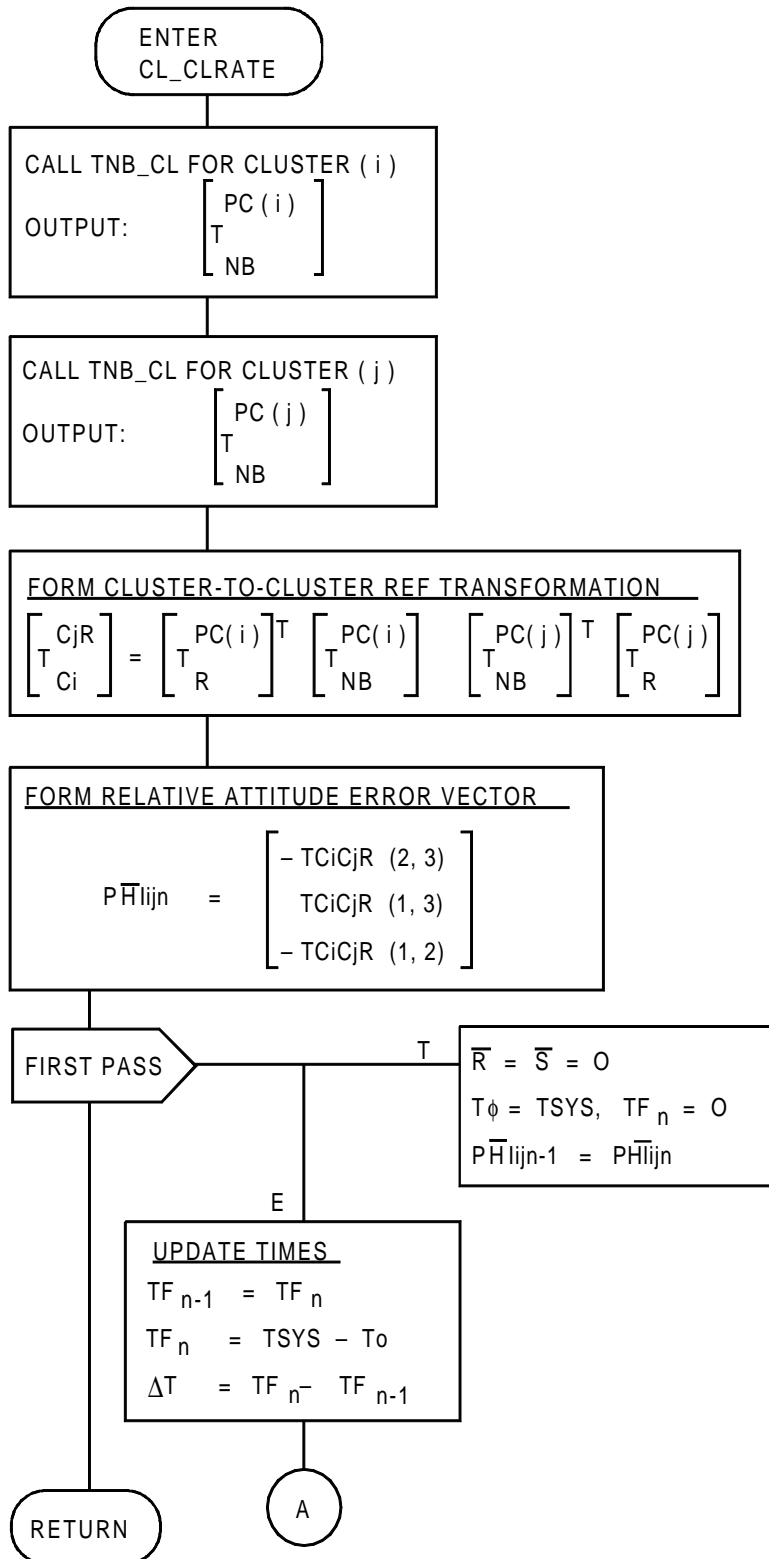


FIGURE 4.5.2.9-1.(1) CL\_CLRATE Flow Diagram (Sheet 1 of 2)

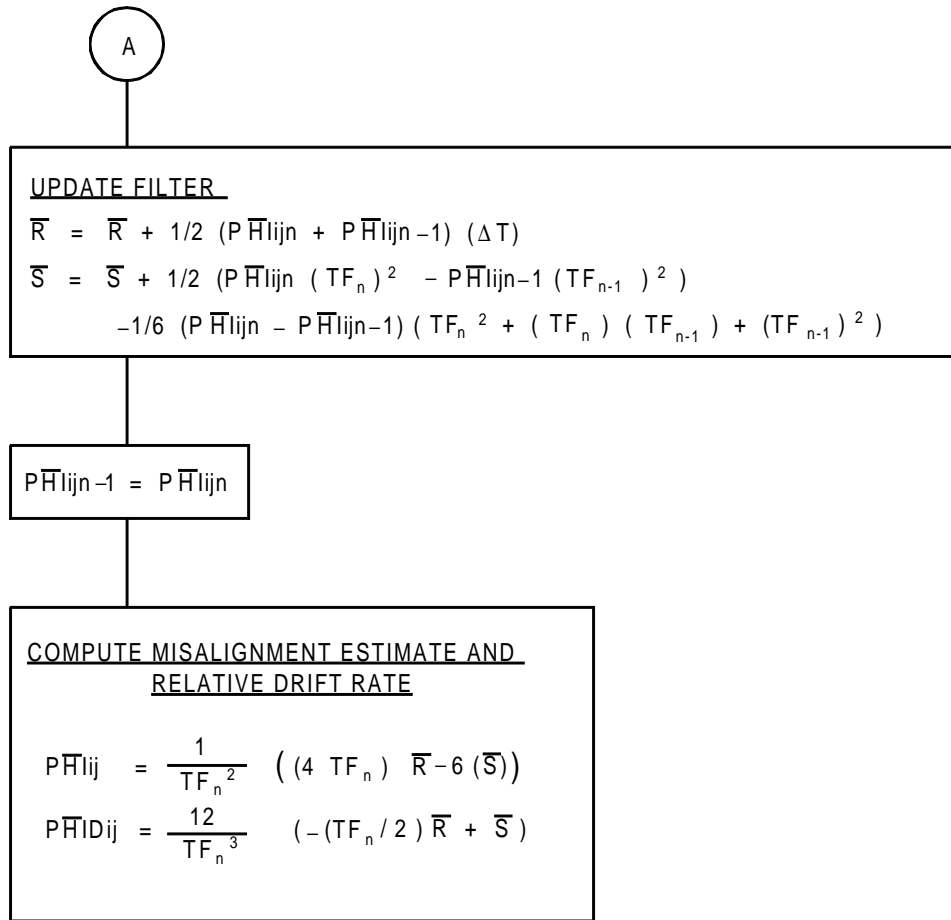


FIGURE 4.5.2.9-1.(2) CL\_CLRATE Flow Diagram (Sheet 2 of 2)

#### 4.5.2.10 Sinusoidal Excess Rate (SINE\_EXRTE).

The purpose of the Sinusoidal Excess Rate module is to provide sinusoidal excess rates on specified cluster coordinate axes in NWU coordinates.

- A. Functional Requirements. The SINE\_EXRTE module performs the following functions:
1. Compute the sinusoidal excess rates on the specified cluster coordinate axes in NWU coordinates.
  2. Add the sinusoidal excess rates to the initial excess rates to form total excess rates.
- B. Interface Requirements. The input/output interfaces associated with the SINE\_EXRTE module are listed in Tables 4.5.2.10–1 and 4.5.2.10–2.
- C. Detailed Requirements. The following equations and sequence of computations are required for each applicable IMU:
1. Compute the sinusoidal portion of the excess rate in cluster coordinates as follows:

$$\overline{ERS}_{PC} = AMP[SIN(WR(T))] (PFLAG)$$

where AMP is the sinusoidal excess rate amplitude; WR is the sinusoidal rate frequency; PFLAG is the three–element vector flag specifying the cluster axes which will have the sinusoidal rates applied; and T is the time since the beginning of the applicable ground sequence. (T shall be equal to zero on the first pass and shall be incremented by 320 msec for each subsequent pass.)

2. Transform the sinusoidal excess rate vector to reference NWU coordinates as follows:

$$\overline{ERS}_{NWU} = \left[ T_R^{PC} \right]^T \overline{ERS}_{PC}$$

$\left[ T_R^{PC} \right]$  is the transformation from reference NWU–to–cluster coordinates.

3. Compute the components of the total excess rate vector as follows:

$$ERN = ERNI + ERS_N$$

$$ERW = ERWI + ERS_W$$

$$ERU = ERUI + ERS_U$$

where  $ERS_N$ ,  $ERS_W$ ,  $ERS_U$  are components of the vector  $ERS_{NWU}$ ; and ERNI, ERWI, and ERUI are the initial excess rate values input from HANG\_CALB.

This module shall be executed at the major cycle rate when required. A suggested design flow which satisfies the SINE\_EXRTE requirements is shown in Figure 4.5.2.10–1

Table 4.5.2.10-1. SINE_EXRTE Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
PFLAG		3-ELEMENT VECTOR FLAG DESIGNATING THE CLUSTER AXES TO APPLY SINUSOIDAL EXCESS RATES(ELEMENTS 1, 2, 3 CORRESPOND TO THE X, Y, Z CLUSTER AXIS, RESPECTIVELY); 1 PER IMU	HANG_CALB	VECTOR	0,1	NA	3.125
AMP	V96U7035C	SINUSOIDAL EXCESS RATE AMPLITUDE	K-LOAD	SCALAR	15.0	DEG/HR	3.125
WR	V96U7180C	SINUSOIDAL EXCESS RATE FREQUENCY	K-LOAD	SCALAR	0.5235987	RAD/SEC	3.125
$T_R^{PC}$		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER; 1 PER IMU	HANG_CALB T_UPDATE	SCALAR	+/-45	DEG/HR	3.125
ERNI		INITIAL NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	HANG_CALB	SCALAR	+/-45	DEG/HR	3.125
ERWI		INITIAL WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	HANG_CALB	SCALAR	+/-45	DEG/HR	3.125
ERUI		INITIAL UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	HANG_CALB	SCALAR	+/-45	DEG/HR	3.125

Table 4.5.2.10-2. SINE_EXRTE Outputs							
Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF T_UPDATE	SCALAR	+/-65	DEG/HR	3.125
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF T_UPDATE	SCALAR	+/-65	DEG/HR	3.125
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF T_UPDATE	SCALAR	+/-65	DEG/HR	3.125



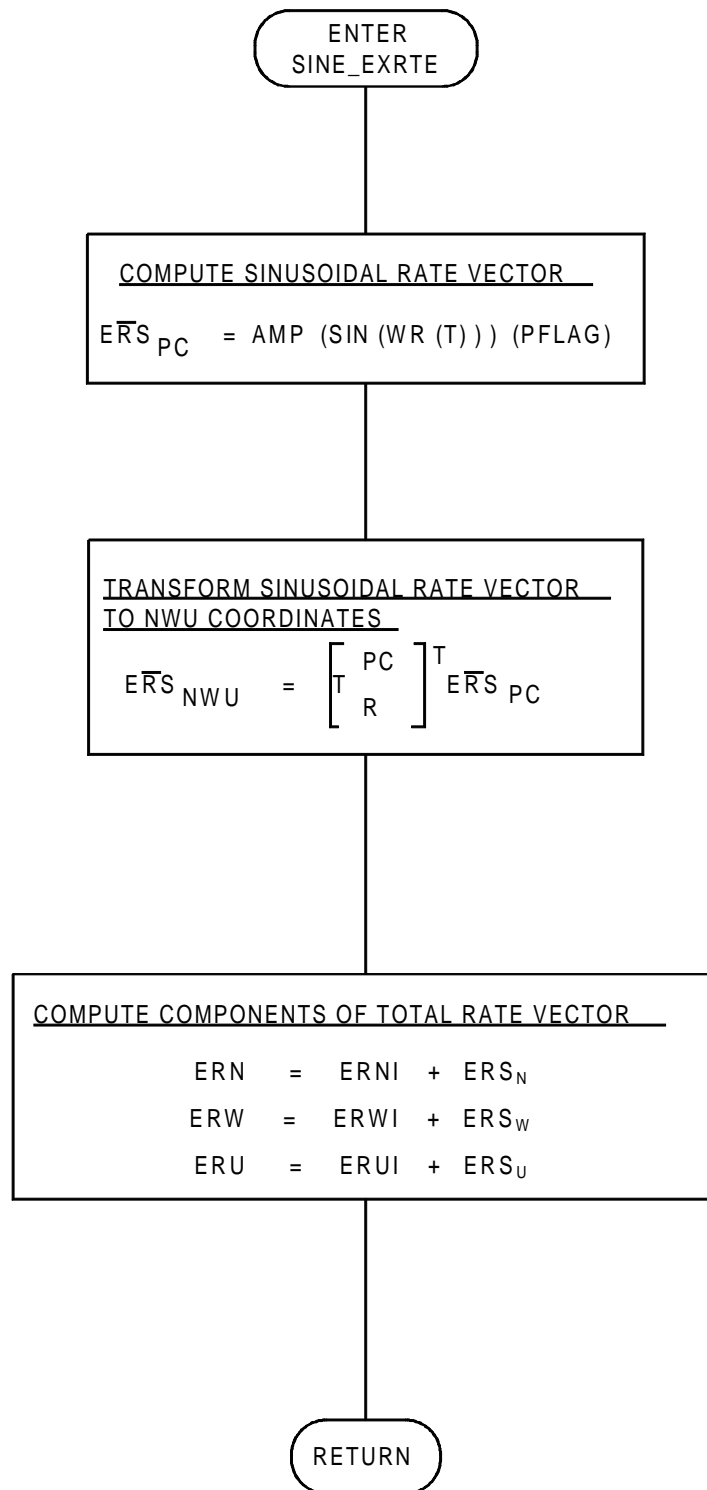


FIGURE 4.5.2.10-1. SINE\_EXRTE Flow Diagram

#### 4.5.2.11 IMU Uplink Interface (IMU\_UPLINK).

The purpose of the IMU\_UPLINK module is to provide the interface and special processing required to utilize certain ground uplinked parameters.

A. Functional Requirements. The IMU\_UPLINK module performs the following functions:

1. Determine if new IMU data have been uplinked and made available.
2. Move the new data from the uplink buffers into the appropriate COMPOOL locations as defined below.

B. Interface Requirements. The input/output interfaces associated with IMU\_UPLINK module are listed in Tables 4.5.2.11-1 and 4.5.2.11-2.

C. Detailed Requirements. The following set of equations and sequences are needed to perform the IMU\_UPLINK function.

1. If the Uplink OP Code is for the IMU REFSMAT Load (0001000) and IMU alignment is not in progress, replace the values of  $\left[ T_{M50}^{DC} \right]$  for each IMU with the appropriate uplinked values. If IMU alignment is in progress, ignore this uplink load.
2. If the Uplink OP Code is for the IMU Gyro Bias Load (0010010), replace the values of DFX, DFY, DFZ for each IMU with the appropriate uplinked values.
3. If the Uplink OP Code is for the IMU Accelerometer Bias Load (0010011), replace the values of KOX, KOY, KOZ for each IMU with the appropriate uplinked values.
4. If the Uplink OP Code is for the IMU Accelerometer Scale Factor Load (0100110), replace the values of KIX, KIY, KIZ for each IMU with the appropriate uplinked values.

The IMU REFSMAT, ACCELEROMETER SCALE FACTOR, and ACCELEROMETER BIAS LOADS shall be supported during OPS 2 and OPS 3 (MM301 only). The IMU GYRO BIAS LOAD shall be supported during OPS 1 (MM101 only), OPS 2, and OPS 3 (MM301 only).

Table 4.5.2.11-1. IMU\_UPLINK Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
$T_{M50}^{DC}$	V96U7185C THRU V96U7211C	TRANSFORMATION: M50 TO DESIRED ORIENTATION; 1 PER IMU	UPLINK	MATRIX	+/-1	NA	OD
KO <sub>i</sub> (UP)	V99G2530C THRU V99G2538C	LOW-GAIN ACCELEROMETER BIAS, i=X, Y, Z; 1 SET PER IMU	UPLINK	SCALAR	+/-10**5	MICRO-G	OD
DFX(UP)	V99R2560C V99R2561C V99R2562C	Y GYRO RESTRAINT; 1 PER IMU	UPLINK	SCALAR	+/-10	DEG/HR	OD
DFY(UP)	V99R2563C V99R2564C V99R2565C	X GYRO RESTRAINT; 1 PER IMU	UPLINK	SCALAR	+/-10	DEG/HR	OD
DFZ(UP)	V99R2566C V99R2567C V99R2568C	Z GYRO RESTRAINT; 1 PER IMU	UPLINK	SCALAR	+/-10	DEG/HR	OD
UP_OP_CODE	V96J3521C	UPLINK OP CODE (LOAD)	UPLINK				OD
KO <sub>i</sub>	V99G2530C THRU V99G2538C	LOW-GAIN ACCELEROMETER BIAS, i=X, Y, Z; 1 SET PER IMU	HANG_CALA PFLT_CALA	SCALAR	+/-10**5	MICRO-G	OD
DFX	V99R2560C V99R2561C V99R2562C	X GRYO RESTRAINT; 1 PER IMU	HANG_CALA PFLT_CALA	SCALAR	+/-10	DEG/HR	OD
DFY	V99R2563C V99R2564C V99R2565C	Y GYRO RESTRAINT; 1 PER IMU	HANG_CALA PFLT_CALA	SCALAR	+/-10	DEG/HR	OD
DFZ	V99R2566C V99R2567C V99R2568C	Z GYRO RESTRAINT; 1 PER IMU	HANG_CALA PFLT_CALA	SCALAR	+/-10	DEG/HR	OD
ALIGN_IN_PRO	V95X0583X	ALIGN IN PROGRESS	DISP_SUP	LOGICAL	0,1	NA	OD
K <sub>i</sub> (UP)	V99A2520C THRU V99A2528C	LOW-GAIN ACCELEROMETER SCALE FACTOR i = X, Y, Z; 1 SET PER IMU	UPLINK	SCALAR	+/- 300,000	μG/G	OD
K <sub>i</sub>	V99A2520C THRU V99A2528C	LOW-GAIN ACCELEROMETER SCALE FACTOR i = X, Y, Z; 1 SET PER IMU	HANG_CALA PFLT_CALA	SCALAR	+/- 300,000	μG/G	OD

Table 4.5.2.11-2. IMU_UPLINK Outputs							
Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
T <sub>M50</sub> <sup>DC</sup>	V96U7185C THRU V96U7211C	TRANSFORMATION: M50 TO DESIRED ORIENTATION; 1 PER IMU	COMPOOL	MATRIX	+/-1	NA	OD
KOi	V99G2530C THRU V99G2538C	LOW-GAIN ACCELEROMETER BIAS; i=X, Y, Z; 1 SET PER IMU	COMPOOL TLM	SCALAR	+/-10**5	MICRO-G	OD
DFX	V99R2560C V99R2561C V99R2562C	X GYRO RESTRAINT; 1 PER IMU	COMPOOL TLM	SCALAR	+/-10	DEG/HR	OD
DFY	V99R2563C V99R2564C V99R2565C	Y GYRO RESTRAINT; 1 PER IMU	COMPOOL TLM	SCALAR	+/-10	DEG/HR	OD
DFZ	V99R2566C V99R2567C V99R2568C	Z GYRO RESTRAINT; 1 PER IMU	COMPOOL TLM	SCALAR	+/-10	DEG/HR	OD
Kli	V99A2520C THRU V99A2528C	LOW-GAIN ACCELEROMETER SCALE FACTOR i = X, Y, Z; 1 SET PER IMU	COMPOOL TLM	SCALAR	+/- 300,000	μG/G	OD

#### 4.5.2.12 Redundant Gyro Monitor Compensation (RGM\_COMP).

The redundant gyro monitor measures the inertial drift rate of the IMU platform about the redundant axis of the dual-axis Z gyro. The redundant axis nominally lies on the plane formed by X and Y gyros and 12 degrees away from the X gyro input axis for the KT-70 and 26.5 degrees away from the X gyro input axis for the HAINS. The purpose of the RGM\_COMP module is to compensate the redundant gyro rate for redundant gyro errors and commanded rates in support of the redundant gyro monitor BITE and its calibration.

A. Functional Requirements. The RGM\_COMP module performs the following functions for each applicable IMU:

1. Compensate the raw redundant gyro rate for redundant gyro restraint drift and mass unbalance drift.
2. During calibration and alignment, compensate for the commanded rate.
3. Filter and smooth the compensated redundant gyro rate.

B. Interface Requirements. The input/output interfaces associated with the RGM\_COMP module are listed in Tables 4.5.2.12-1 and 4.5.2.12-2.

C. Detailed Requirements. The following sequence of operations is required for each applicable IMU:

1. On the first pass after the most recent scheduling of this module, perform the following initialization:

$$\text{DELTA\_OMEGA\_R} = 0$$

$$\text{OMEGA\_R\_BUFFER}_{\text{prev}} = 0$$

2. If a commfault occurs, compensate the buffered redundant gyro rates by assuming that the missed data represents a rate change equal to that sensed on the previous cycle:

$$\text{OMEGA\_R\_BUFFER} = \text{OMEGA\_R\_BUFFER}_{\text{prev}} + \text{DELTA\_OMEGA\_R}$$

Otherwise, buffer the raw redundant gyro rate data as:

$$\text{OMEGA\_R\_BUFFER} = \text{OMEGA\_R}$$

3. Compensate the raw redundant gyro rate for the redundant gyro restraint drift and mass unbalance drift as follows:

- (a) Compute the following mass unbalance drift every  $T_{\text{torq}}$  seconds:

$$\text{DGR} = \frac{(\text{DIR})(\text{DVTX}) + (\text{DOR})(\text{DVTY}) + (\text{DSR})(\text{DVTZ})}{(T_{\text{torq}})(G_o)}$$

where  $T_{\text{torq}}$  is the gyro torquing computation cycle time and takes on values of 320 msec for ground operations and 960 msec for INERTIAL operation.

- (b) Compensate the raw redundant gyro rate for the redundant gyro restraint drift and mass unbalance drift as follows:

$$\text{WRC} = \text{OMEGA\_R\_BUFFER} - \text{DFR} - \text{DGR} \pm \text{DDFR}^*$$

\*Subtract DDFR if OMEGA\_R is positive. Add DDFR if OMEGA\_R is negative.

- (c) Compute the difference between the present and previous buffered redundant gyro rates:

$$\text{DELTA\_OMEGA\_R} = \text{OMEGA\_R\_BUFFER} - \text{OMEGA\_R\_BUFFER}_{\text{prev}}$$

- (d) Save the present buffered redundant gyro rate:

$$\text{OMEGA\_R\_BUFFER}_{\text{prev}} = \text{OMEGA\_R\_BUFFER}$$

4. If REFSMAT's have not been computed, compensate the redundant gyro rate for the commanded rate as follows:

$$\text{WRC} = \text{WRC} - (\text{KXR})(\text{RDCLX}) - (\text{KYR})(\text{RDCLY}) - (\text{KZR})(\text{RDCLZ})$$

5. Filter and smooth the redundant gyro monitor output as follows:

- (a) On the first pass since the most recent scheduling of RGM\_COMP module, initialize the previous filtered output as follows:

$$\text{WRFC}_{\text{prev}} = 0$$

- (b) Compute the current filtered redundant gyro monitor output as follows:

$$\text{WRFC} = (\text{TRGM1})(\text{WRFC}_{\text{prev}}) + (\text{TRGM2})(\text{WRC})$$

- (c) Save the current output for next pass

$$WRCF_{prev} = WRCF$$

During noninertial operation, RGM\_COMP shall be executed at the IMU major cycle rate when required. During INERTIAL operations, steps 1, 2, 3(b), 3(c), 3(d), and 5 shall be executed at 6.25 Hz while step 3(a) shall be executed at the GYRO\_COMP execution rate of 1.04 Hz. However, if OPS transition “catchup” torquing is in progress or if on-orbit alignment option 1 or 2 is in progress during INERTIAL operations, RGM\_COMP module shall not be executed.

A suggested design flow that satisfies the RGM\_COMP requirements is shown in Figure 4.5.2.12-1.

Table 4.5.2.12-1. RGM\_COMP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Unit	Rate (Hz)
OMEGA_R(1)	V71R2040B	GN IMU-1 OMEGA R WD2	IMU-1	SCALAR	±120	DEG/HR	3.125 6.25
OMEGA_R(2)	V71R3040B	GN IMU-2 OMEGA R WD2	IMU-2	SCALAR	±120	DEG/HR	3.125 6.25
OMEGA_R(3)	V71R4040B	GN IMU-3 OMEGA R WD2	IMU-3	SCALAR	±120	DEG/HR	3.125 6.25
DIR	V99U5955C V99U5956C V99U5957C	REDUNDANT GYRO INPUT AXIS MASS UNBALANCE; 1 PER IMU	HANG_CALA PFLT_CALA COMPOOL	SCALAR	±6	DEG/HR/G	3.125 1.04
DOR	V99U5958C V99U5959C V99U5960C	REDUNDANT GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	HANG_CALA PFLT_CALA COMPOOL	SCALAR	±6	DEG/HR/G	3.125 1.04
DSR	V99U5961C V99U5962C V99U5963C	REDUNDANT GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	HANG_CALA PFLT_CALA COMPOOL	SCALAR	±6	DEG/HR/G	3.125 1.04
DFR	V99U5952C V99U5953C V99U5954C	REDUNDANT GYRO RESTRAINT: 1 PER IMU	HANG_CALA PFLT_CALA COMPOOL	SCALAR	±10	DEG/HR	3.125 6.25
KXR	V99U5964C V99U5965C V99U5966C	REDUNDANT GYRO X SCALE FACTOR; 1 PER IMU	HANG_CALA PFLT_CALA COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	3.125
KYR	V99U5967C V99U5968C V99U5969C	REDUNDANT GYRO Y SCALE FACTOR; 1 PER IMU	HANG_CALA PFLT_CALA COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	3.125
KZR	V99U5970C V99U5971C V99U5972C	REDUNDANT GYRO Z SCALE FACTOR; 1 PER IMU	HANG_CALA PFLT_CALA COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	3.125
DVTX		X AXIS DELTA VELOCITY OVER TORQUING CYCLE, 1 PER IMU	ACP_COMP	SCALAR	±240	FT/SEC	3.125 1.56
DVTY		Y AXIS DELTA VELOCITY OVER TORQUING CYCLE, 1 PER IMU	ACP_COMP	SCALAR	±240	FT/SEC	3.125 1.56
DVTZ		Z AXIS DELTA VELOCITY OVER TORQUING CYCLE, 1 PER IMU	ACP_COMP	SCALAR	±240	FT/SEC	3.125 1.56
RDCLX		DESIRED X-AXIS TORQUE RATE; 1 PER IMU	TOR_TRSF	SCALAR	±80	DEG/HR	3.125
RDCLY		DESIRED Y-AXIS TORQUE RATE; 1 PER IMU	TOR_TRSF	SCALAR	±80	DEG/HR	3.125
RDCLZ		DESIRED Z-AXIS TORQUE RATE; 1 PER IMU	TOR_TRSF	SCALAR	±80	DEG/HR	3.125
G <sub>o</sub>	V90A7622C	STANDARD ACCELERATION DUE TO GRAVITY	CONSTANT	SCALAR	32.17 4048	FT/SEC <sup>2</sup>	OD
TRGM1	V99U5973C	RGM FILTER CONSTANT 1	COMPOOL	SCALAR	0.995	N/A	3.125 6.25

Table 4.5.2.12-1. RGM_COMP Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Unit	Rate (Hz)
TRGM2	V99U5974C	RGM FILTER CONSTANT 2	COMPOOL	SCALAR	0.005	N.A	3.125 6.25
INERTIAL	V95X0001X	IN INERTIAL MODE (IMU)	GC_ALIGN1	LOGICAL	0,1	N/A	OD
REFS_RDY	V95X0780X	REFSMAT COMPUTATION COMPLETED	GC_ALIGN1	LOGICAL	0,1	N/A	OD
IMU_CF	V91X3101X V91X3131X V91X3161X	IMU COMMFAULT; (1 PER IMU)	FCOS	LOGICAL	0,1	N/A	6.25 3.125
DDFR	V99U5870C V99U5871C V99U5872C	RGM DELTA RESTRAINT 1 PER IMU	HANG_CALA PFLT_CALA COMPOOL	SCALAR	±10	DEG/HR	3.125 6.25

Table 4.5.2.12-2. RGM_COMP Outputs							
Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
WRCF(1)	V95R0660C	IMU-1 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	IMU_BITE HANG_CALA PFLT_CALA TLM, IMU RM	SCALAR	±120	DEG/HR	3.125 6.25
WRCF(2)	V95R0661C	IMU-2 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	IMU_BITE HANG_CALA PFLT_CALA TLM, IMU RM	SCALAR	±120	DEG/HR	3.125 6.25
WRCF(3)	V95R0662C	IMU-3 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	IMU_BITE HANG_CALA PFLT_CALA TLM, IMU RM	SCALAR	±120	DEG/HR	3.125 6.25

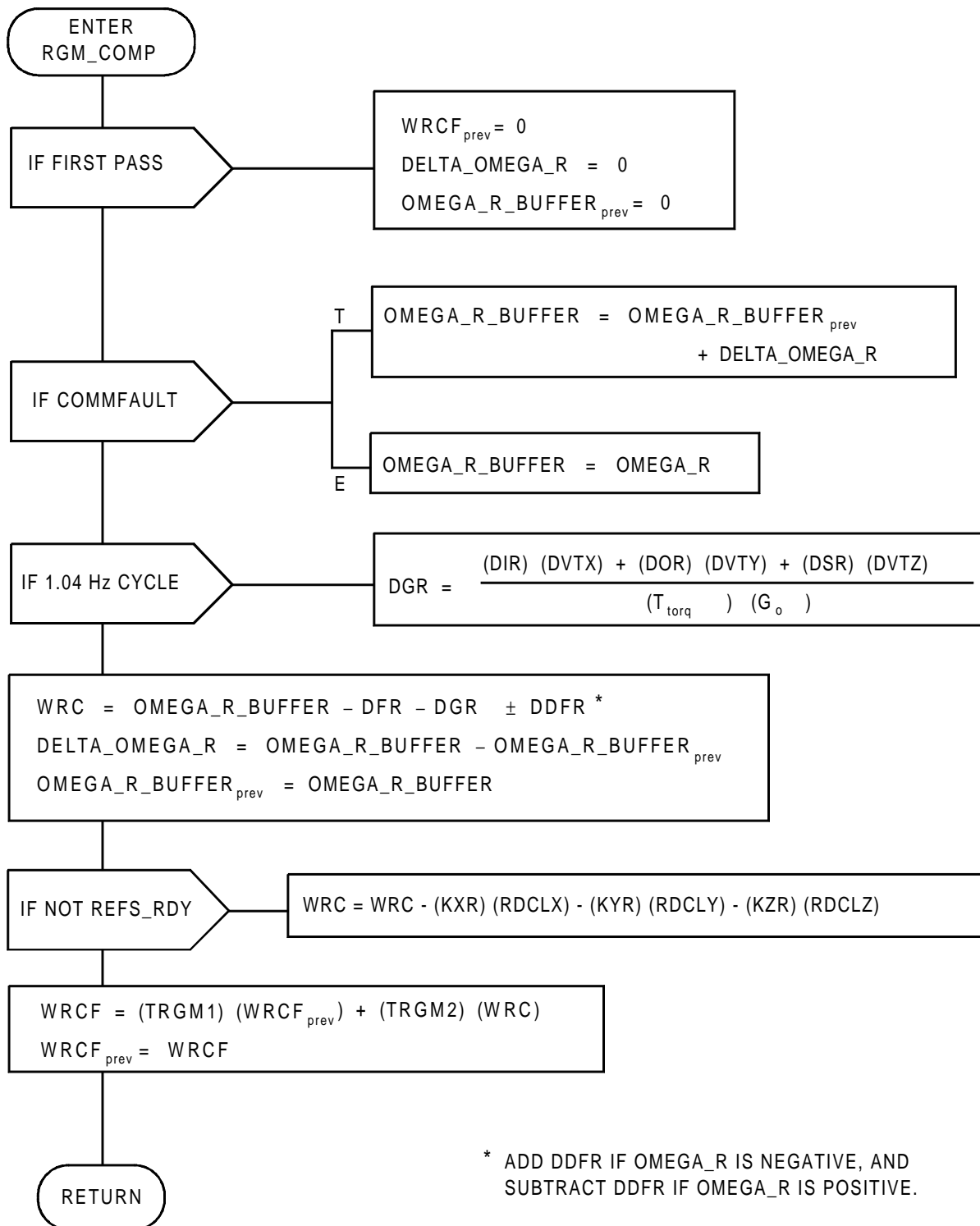


FIGURE 4.5.2.12-1. RGM\_COMP Flow Diagram



### 4.5.3 Support Modules

The purpose of this section is to present the requirements for certain special functions which do not fit the previously defined categories.

#### 4.5.3.1 Display Support (DISP\_SUP).

The purpose of the DISP\_SUP module is to present the display related IMU SOP requirements that are not specifically satisfied by the other modules and submodes defined in this document. This includes all processing which is required exclusively to support the IMU SOP/DISPLAY(SPEC) interface requirements.

A. Functional Requirements. The DISP\_SUP module performs the following functions:

1. Determine the operate status of the IMU's and schedule the required operate support software accordingly.
2. Monitor the submode control requests from the IMU display functions and schedule and control the required submode.
3. Monitor the submode requests and command IMU's to STANDBY or OPERATE as required.
4. Monitor the in-operate discrete from each IMU and indicate OPERATE or STANDBY to DISPLAYS.
5. Determine when IMU power is on and report power, temperature, and Bite Status to DISPLAYS.
6. Provide the IMU Mode Status Words, the IMU output discrettes, and a software BITE summary in octal format to the DISPLAYS.
7. Normalize the sensed change in cluster (and M50 inertial) velocities to 1 second and provide to DISPLAYS.
8. Compute the RSS of sensed change in velocity (normalized to 1 second) and provide to DISPLAYS.
9. Provide IMU selected status, masking in progress and submode in progress discrettes to DISPLAYS.
10. Summarize the GC\_ALIGN and GC\_ALIGN1 fail flags into single ALIGN\_FAIL for DISPLAYS.
11. Provide an interface between IMU processing and BTU Readiness Test to prevent interference between processes.
12. Monitor the IMU BITE MASK requests from the IMU Align Display and set/reset the BITE MASK WORDS as required.

B. Interface Requirements. The input/output interfaces associated with DISP\_SUP module are listed in Tables 4.5.3.1-1 and 4.5.3.1-2.

C. Detailed Requirements. DISP\_SUP shall perform the following for each IMU in no particular order.

The display support module shall be executed at the basic display frequency whenever an IMU related display is active. Not all requirements are applicable to each display. The table below identifies which is applicable for each. Note that certain functions (1, 6, 10, 11 below) are required, when appropriate, even though display may have been dropped.

Display/Spec (Level B Ref)	Applicable Para 4.5.3.1C Item
Preflight IMU Control/Monitor (VU, Para 5.1.8)	1, 2, 4a, 5, 6, 7, 8
IMU On-Orbit Align (GN&C Para 6.26)	1, 3, 4b, 4c, 5, 9, 10, 11, 12,13

1. If the in-operate discrete from the IMU's equals one or if the OPERATE mode has been requested for greater than T\_OP\_LIMIT (elapsed time since most recent operate request) seconds, schedule the required "operate support" software. This software consists of the minor cycle processing (as specified in Section 4.5.1) and the default submode (TERM/IDLE in preflight or INERTIAL On-Orbit).

Any IMU which satisfies the above criteria is considered to be "inoperate" for all subsequent software submode scheduling purposes.

2. a. Monitor the following submode commands from DISPLAYS and schedule the appropriate submode for the selected IMU's when true, where IMU\_i\_SEL (i = 1, 2, 3) defines the selected IMU's.

ATT DET COMMAND  
 HANGAR CAL A COMMAND  
 HANGAR CAL B COMMAND  
 HANGAR CAL C COMMAND  
 PREFLT CAL COMMAND  
 GYROCOMPASS COMMAND  
 TERM/IDLE COMMAND  
 PLATFORM POS COMMAND

- b. For each IMU selected (IMU\_i\_SEL = 1), set the corresponding IMU\_i\_SEL\_STATUS = 1.
  - c. Upon receipt of a TERM/IDLE command, reset all IMU\_i\_SEL and IMU\_i\_SEL\_STATUS to logic 0.
3. If an alignment is not in progress and any of the command option indicators have been changed, set the appropriate OPTION flag and set the Orbit Align display feedback indicators. OPTION is used, subsequently, by Orbit IMU Align to determine which alignment mode is to be scheduled by the Orbit Alignment Specialist, and to calculate IMU torque angles for display.

If ALIGN\_IN\_PRO = 0, and a change has occurred in any of the alignment option command indicators (ITEM\_13, ITEM\_14, or ITEM\_15), set MATRIX\_UPDATE = 0 and proceed to step a (below). Otherwise skip a, b, and c; and proceed to the next step.

- a. If ITEM\_13 = 1 (IMU platform alignment based on star data) perform the following steps, (i) through (iv). Otherwise proceed to step b (below).
  - (i) Set OPTION = 1.
  - (ii) Set the feedback indicator STAR\_ALIGN = 1.
  - (iii) Set the feedback indicator IMUR = 0, to blank the ref IMU field (to the right of Item 14 on the Orbit Align display).
  - (iv) Proceed to step c (below).
- b. Perform the following steps, (i) through (iv), to facilitate IMU platform alignment based on data from a reference IMU (ITEM\_14 = 1, 2, or 3).
  - (i) Set OPTION = 2.
  - (ii) Set the feedback indicator IMUR = ITEM\_14.
  - (iii) Set the feedback indicator STAR\_ALIGN = 0.
  - (iv) Proceed to step c (below).
- c. If ITEM\_15 = 1, perform the following steps, (i) through (iii), to specify alignment without platform repositioning, using the selected data source.
  - (i) If OPTION = 1, set OPTION = 3.
  - (ii) If OPTION = 2, set OPTION = 4.
  - (iii) Set the feedback indicator MATRIX\_UPDATE = 1.

4. Monitor the four IMU temperature discretes:

PLATFORM TEMP READY  
PLATFORM TEMP SAFE  
CAPRI TEMP READY\*  
CAPRI TEMP SAFE\*

\* Note: HAINS CAPRI TEMP discretes are set true (=1) when power is applied to HAINS IMU.

- a. If any are true, set PWR\_ON = 1 for the appropriate IMU's. If all are false, set PWR\_ON = 0 for the appropriate IMU's.
  - b. If all are true, set TEMP\_STATUS = 0 (OK). If any TEMP\_SAFE discrete is false, set TEMP\_STATUS = 1 (HI). If both TEMP\_SAFE discretes are true and any TEMP\_READY discrete is false, set TEMP\_STATUS = 2 (LO).
  - c. If any are true and IMU\_FAIL\_IND is false, set IMU\_i\_STAT = 0 (BLANK). If any are true and IMU\_FAIL\_IND is true, set IMU\_i\_STAT = 1 (BITE). If all are false, set IMU\_i\_STAT = 2 (OFF).
5. Monitor the OPERATE/STANDBY requests from DISPLAYS and set the OPERATE command discrete as required.

If request is OPERATE, OPER\_CMD = 1. If request is STANDBY, OPER\_CMD = 0.

If the request is OPERATE and BTU\_TEST = 1 and all IMU's are in STANDBY, then OPER\_CMD = 0.

6. Format the IMU/IMU SOP data as follows:

- a. Form discrete inputs from each powered up IMU into a binary word:

HDW\_BITE1 = IN\_OPERATE (MSB)  
CAPRI\_TEMP\_RDY\*  
PLAT\_TEMP\_RDY  
CAPRI\_TEMP\_SAFE\*  
PLAT\_TEMP\_SAFE  
PRESS/COMM\_GOOD\*\* (LSB)

\* Note: HAINS CAPRI TEMP discrettes are set true (=1) when power is applied to HAINS IMU.

\*\* Note: Dual discrete dependant upon IMU. For KT-70 it is PRESSURE GOOD, for HAINS it is COMMUNICATION GOOD.

- b. For each IMU that has been commanded to OPERATE (see step 5 above), form the 16 bits of the mode/status word from the IMU into a binary word, HDW\_BITE2. The most significant bit corresponds to IMU\_GOOD, the least significant bit corresponds to D5 discrete (see paragraph 4.1.1.B for mode/status word definition).

Note that this word is required for IMU's commanded to OPERATE as well as those that have achieved OPERATE.

- c. For each IMU in OPERATE, form a binary word from IMU SOP data as follows:

S/W\_BITE = FAIL\_RED\_RTE (MSB)  
FAIL\_IR\_NULL  
FAIL\_RES\_LIM  
FAIL\_VEL\_LIM  
FAIL\_ECHO\_2  
FAIL\_ECHO\_1  
FAIL\_ACCL\_SF (LSB)

7. Normalize the sensed change in cluster velocities to 1 second.

$$\Delta V_n = \frac{DV_n}{MC} \text{ for } n = X, Y, Z,$$

where DV<sub>n</sub> = the major cycle cluster velocities DV<sub>X</sub>, DV<sub>Y</sub>, DV<sub>Z</sub> from ACP\_COMP and MC is set as follows:

- MC = 0.320 When NOT INERTIAL
- MC = 0.960 When REFS\_RDY
- MC = 0.960 For TERM / IDLE
- MC = 0.160 When INERTIAL and not REFS\_RDY

Compute the RSS of the sensed change in velocity:

$$RSS = [(\Delta V_X)^2 + (\Delta V_Y)^2 + (\Delta V_Z)^2]^{1/2}$$

When transitioning between submodes, ΔV<sub>n</sub> and RSS shall stabilize within two seconds of initiating the new submode.

8. Provide the IMU CONTROL MONITOR display with an alignment fail indicator: If any FAIL\_AC or FAIL\_GC is true, set ALIGN\_FAIL = 1; else set ALIGN\_FAIL = 0
9. Normalize the sensed velocity change in M50 coordinates to 1 second.

$$DVM50n = \frac{DELVELM50n}{0.960} \text{ for } n = X, Y, Z$$

where DELVELM50n are the velocities from the ACP\_TRSF module and 0.960 is the accelerometer sample period.

10. When alignment complete is received from on-orbit alignment module default to the STAR\_ALIGN mode. Set STAR\_ALIGN = 1, IMUR = 0, and MATRIX\_UPDATE = 0. Also, set OPTION = 1.
11. If ITEM\_16 is executed, set ORB\_AL\_COMP(K) = 0, where K = 1,2,3 according to which ALIMU(K) = 1. Also, set the Align in Progress flag to logic 1. When “all” ORB\_AL\_COMP(K) = 1, reset ITEM\_16 and reset the Align in Progress flag to logic 0. “All” means all selected IMU’s in OPERATE.
12. When a keyboard request to terminate an IMU alignment option in progress is received, perform the following:
  - a. Terminate alignment processing for submode option that was selected.
  - b. Zero the slew commands.
  - c. Zero the following variables: LATX, LATY, LATZ.
  - d. Set all ORB\_AL\_COMP(K) = 0, reset ITEM\_16 asterisk. Set STAR\_ALIGN = 1, IMUR = 0, and MATRIX\_UPDATE = 0. Also, set OPTION = 1 and initiate the processing in Section 4.5.4.7.C.1.

Note that the monitoring of ORB\_AL\_COMP and the associated reset action is required even if the IMU ALIGN display is dropped prior to completing the alignment.

13. Items 24, 25 and 26 on the IMU align display allow the crew to set/reset the IMU\_BITE\_MASK for IMU 1, 2 and 3 respectively. Each 14 bit mask must be initialized to all ones and shall remain the same unless set/reset by the crew. Each mask shall be carried across all OPS transitions. If item 24, 25 or 26 is executed, do the following for the appropriate IMU i, where i = 1, 2 or 3:
- Form the new bite mask as follows: If IMU\_BITE\_MASK is all ones then set IMU\_BITE\_MASK to the complement of the corresponding IMU\_BITE\_STATUS Word (IMU\_BITE\_MASK (i) =  $\overline{\text{IMU\_BITE\_STATUS (i)}}$ ); otherwise, set IMU\_BITE\_MASK to all ones.
  - If the new bite mask is all ones, set IMU\_i\_MASK\_STAT = 0; otherwise, set IMU\_i\_MASK\_STAT = 1.

To accommodate display requirements, and to constrain implementation, the 14 bit BITE status and mask words shall reside, left justified, in 16 bit memory words. The two least significant bits of these memory words shall be initialized, and shall remain, off in the status words and on in the mask words.

Table 4.5.3.1-1. DISP\_SUP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
ATT_DET_CMD	V93X6303X	ATT DET COMMAND	DISPLAYS	LOGICAL	0, 1	NA	OD
HANG_CALC_CMD	V93X6042X	HANGAR CAL C COMMAND	DISPLAYS	LOGICAL	0, 1	NA	OD
HANG_CALB_CMD	V93X6041X	HANGAR CAL B COMMAND	DISPLAYS	LOGICAL	0, 1	NA	OD
HANG_CALA_CMD	V93X6040X	HANGAR CAL A COMMAND	DISPLAYS	LOGICAL	0, 1	NA	OD
PRFLT_CAL_CMD	V93X6045X	PREFLIGHT CAL COMMAND	DISPLAYS	LOGICAL	0, 1	NA	OD
ALIGN_CMD	V93X6047X	GYROCOMPASS COMMAND	DISPLAYS	LOGICAL	0, 1	NA	OD
TERM_IDLE_CMD	V93X6055X	TERM/IDLE COMMAND	DISPLAYS	LOGICAL	0, 1	NA	OD
PLAT_POS_REQ	V93X6052X	PLATFORM POSITIONING SUBMODE COMMAND	DISPLAYS	LOGICAL	0, 1	NA	OD
IMU_1_SEL	V93X6026X	IMU-1 SELECT	DISPLAYS	LOGICAL	0, 1	NA	OD
IMU_2_SEL	V93X6027X	IMU-2 SELECT	DISPLAYS	LOGICAL	0, 1	NA	OD
IMU_3_SEL	V93X6028X	IMU-3 SELECT	DISPLAYS	LOGICAL	0, 1	NA	OD
PLAT_TEMP_SAFE(1)	V71X2405X	IMU-1 PLATFORM TEMP SAFE	IMU-1	DISCRETE	0, 1	NA	OD
PLAT_TEMP_SAFE(2)	V71X3405X	IMU-2 PLATFORM TEMP SAFE	IMU-2	DISCRETE	0, 1	NA	OD
PLAT_TEMP_SAFE(3)	V71X4405X	IMU-3 PLATFORM TEMP SAFE	IMU-3	DISCRETE	0, 1	NA	OD
CAPRI_TEMP_SAFE(1)*	V71X2407X	IMU-1 CAPRI TEMP SAFE	IMU-1	DISCRETE	0, 1	NA	OD
CAPRI_TEMP_SAFE(2)*	V71X3407X	IMU-2 CAPRI TEMP SAFE	IMU-2	DISCRETE	0, 1	NA	OD
CAPRI_TEMP_SAFE(3)*	V71X4407X	IMU-3 CAPRI TEMP SAFE	IMU-3	DISCRETE	0, 1	NA	OD
PLAT_TEMP_RDY(1)	V71X2404X	IMU-1 PLATFORM TEMP RDY	IMU-1	DISCRETE	0, 1	NA	OD
PLAT_TEMP_RDY(2)	V71X3404X	IMU-2 PLATFORM TEMP RDY	IMU-2	DISCRETE	0, 1	NA	OD
PLAT_TEMP_RDY(3)	V71X4404X	IMU-3 PLATFORM TEMP RDY	IMU-3	DISCRETE	0, 1	NA	OD
CAPRI_TEMP_RDY(1)*	V71X2406X	IMU-1 CAPRI TEMP READY	IMU-1	DISCRETE	0, 1	NA	OD
CAPRI_TEMP_RDY(2)*	V71X3406X	IMU-2 CAPRI TEMP READY	IMU-2	DISCRETE	0, 1	NA	OD
CAPRI_TEMP_RDY(3)*	V71X4406X	IMU-3 CAPRI TEMP READY	IMU-3	DISCRETE	0, 1	NA	OD
IN_OPERATE(1)	V71X2403XB	IMU-1 IN OPERATE MODE	IMU-1	LOGICAL	0, 1	NA	OD
IN_OPERATE(2)	V71X3403XB	IMU-2 IN OPERATE MODE	IMU-2	LOGICAL	0, 1	NA	OD

Table 4.5.3.1-1. DISP\_SUP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
IN_OPERATE(3)	V71X4403XB	IMU-3 IN OPERATE MODE	IMU-3	LOGICAL	0, 1	NA	OD
PRESS/COMM_GOOD (1)**	V71X2401X	IMU-1 PRESSURE/COMMUNICATION GOOD	IMU-1	DISCRETE	0, 1	NA	OD
PRESS/COMM_GOOD (2)**	V71X3401X	IMU-2 PRESSURE/COMMUNICATION GOOD	IMU-2	DISCRETE	0, 1	NA	OD
PRESS/COMM_GOOD (3)**	V71X4401X	IMU-3 PRESSURE/COMMUNICATION GOOD	IMU-3	DISCRETE	0, 1	NA	OD
MODE_BITE(1)	V71M2020P	IMU-1 MODE STATUS WD1	IMU-1	LOGICAL	16 BITS	NA	OD
MODE_BITE(2)	V71M3020P	IMU-2 MODE STATUS WD1	IMU-2	LOGICAL	16 BITS	NA	OD
MODE_BITE(3)	V71M4020P	IMU-3 MODE STATUS WD1	IMU-3	LOGICAL	16 BITS	NA	OD
IMU_BITE_STATUS(1)	V95J0029B	IMU-1 BITE STATUS WORD	BITE_SUM	LOGICAL	16 BITS	NA	OD
IMU_BITE_STATUS(2)	V95J1029B	IMU-2 BITE STATUS WORD	BITE_SUM	LOGICAL	16 BITS	NA	OD
IMU_BITE_STATUS(3)	V95J2029B	IMU-3 BITE STATUS WORD	BITE_SUM	LOGICAL	16 BITS	NA	OD
MASK_CMD(1)	V93X6717X	IMU-1 BITE MASK CMD	DISPLAY	LOGICAL	0, 1	NA	OD
MASK_CMD(2)	V93X6718X	IMU-2 BITE MASK CMD	DISPLAY	LOGICAL	0, 1	NA	OD
MASK_CMD(3)	V93X6719X	IMU-3 BITE MASK CMD	DISPLAY	LOGICAL	0, 1	NA	OD
ITEM_10	V93X6755X	ALIGN IMU-1	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
ITEM_11	V93X6756X	ALIGN IMU-2	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
ITEM_12	V93X6757X	ALIGN IMU-3	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
ITEM_13	V93X6765X	STAR ALIGN OPTION	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
ITEM_14	V93J6767C	IMU/IMU OPTION	IMU ALIGN DISPLAY (6.26)	INTEGER	0, 1, 2, 3	NA	OD
ITEM_15	V93X6771X	MATRIX ALIGN OPTION	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
ITEM_16	V93X6770X	EXECUTE ALIGN OPTION SEL	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
ITEM_17	V93X6773X	TERMINATE ALIGN IN PROGRESS CMD	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
FAIL_ECHO_1(1)	V95X0030X	IMU-1 WORD 13 ECHO FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD
FAIL_ECHO_1(2)	V95X1030X	IMU-2 WORD 13 ECHO FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD
FAIL_ECHO_1(3)	V95X2030X	IMU-3 WORD 13 ECHO FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD
FAIL_ECHO_2(1)	V95X0031X	IMU-1 WORD 14 ECHO FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD
FAIL_ECHO_2(2)	V95X1031X	IMU-2 WORD 14 ECHO FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD
FAIL_ECHO_2(3)	V95X2031X	IMU-3 WORD 14 ECHO FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD
FAIL_IR_NULL(1)	V95X0034X	IMU-1 INNER RESOLVER NULL FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD

Table 4.5.3.1-1. DISP\_SUP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
FAIL_IR_NULL(2)	V95X1034X	IMU-2 INNER RESOLVER NULL FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD
FAIL_IR_NULL(3)	V95X2034X	IMU-3 INNER RESOLVER NULL FAIL	IMU_BITE	LOGICAL	0, 1	NA	OD
FAIL_VEL_LIM(1)	V95X0035X	IMU-1 VELOCITY LIMIT FAIL	ACP_TRSF	LOGICAL	0, 1	NA	OD
FAIL_VEL_LIM(2)	V95X1035X	IMU-2 VELOCITY LIMIT FAIL	ACP_TRSF	LOGICAL	0, 1	NA	OD
FAIL_VEL_LIM(3)	V95X2035X	IMU-3 VELOCITY LIMIT FAIL	ACP_TRSF	LOGICAL	0, 1	NA	OD
FAIL_RES_LIM(1)	V95X0037X	IMU-1 RESOLVER LIMIT FAIL	RES_PROC	LOGICAL	0, 1	NA	OD
FAIL_RES_LIM(2)	V95X1037X	IMU-2 RESOLVER LIMIT FAIL	RES_PROC	LOGICAL	0, 1	NA	OD
FAIL_RES_LIM(3)	V95X2037X	IMU-3 RESOLVER LIMIT FAIL	RES_PROC	LOGICAL	0, 1	NA	OD
FAIL_ACCEL_SF(1)	V95X0081X	IMU-1 ACC/CAPRI SF FAIL	ACP_ACUM	LOGICAL	0, 1	NA	OD
FAIL_ACCEL_SF(2)	V95X1081X	IMU-2 ACC/CAPRI SF FAIL	ACP_ACUM	LOGICAL	0, 1	NA	OD
FAIL_ACCEL_SF(3)	V95X2081X	IMU-3 ACC/CAPRI SF FAIL	ACP_ACUM	LOGICAL	0, 1	NA	OD
OPER/STBY(1)	V93X6020X	IMU-1 OPERATE/STBY REQUEST	GRND IMU CNTL MON DISPLAY (V5.1.8)	LOGICAL	0, 1	NA	OD
OPER/STBY(2)	V93X6021X	IMU-2 OPERATE/STBY REQUEST	GRND IMU CNTL MON DISPLAY (V5.1.8)	LOGICAL	0, 1	NA	OD
OPER/STBY(3)	V93X6022X	IMU-3 OPERATE/STBY REQUEST	GRND IMU CNTL MON DISPLAY (V5.1.8)	LOGICAL	0, 1	NA	OD
ORB_AL_COMP(1)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-1	ORBIT_AL	LOGICAL	0, 1	NA	OD
ORB_AL_COMP(2)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-2	ORBIT_AL	LOGICAL	0, 1	NA	OD
ORB_AL_COMP(3)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-3	ORBIT_AL	LOGICAL	0, 1	NA	OD
DVX(1)	V99U2860C	IMU-1 X-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25
DVX(2)	V99U2861C	IMU-2 X-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25
DVX(3)	V99U2862C	IMU-3 X-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25
DVY(1)	V99U2863C	IMU-1 Y-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25
DVY(2)	V99U2864C	IMU-2 Y-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25
DVY(3)	V99U2865C	IMU-3 Y-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25
DVZ(1)	V99U2866C	IMU-1 Z-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25



Table 4.5.3.1-1. DISP\_SUP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
DVZ(2)	V99U2867C	IMU-2 Z-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25
DVZ(3)	V99U2868C	IMU-3 Z-AXIS DELTA VEL MAJ CY	ACP_COMP	SCALAR	+/-240	FT/SEC	OD 3.1 25
OPERATE_REQ(1)	V93X6705X	IMU-1 OPERATE CMD	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
OPERATE_REQ(2)	V93X6706X	IMU-2 OPERATE CMD	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
OPERATE_REQ(3)	V93X6707X	IMU-3 OPERATE CMD	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
	V93X6701X	IMU-1 STANDBY CMD	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
	V93X6702X	IMU-2 STANDBY CMD	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
	V93X6703X	IMU-3 STANDBY CMD	IMU ALIGN DISPLAY (6.26)	LOGICAL	0, 1	NA	OD
DELVELM50X(1)	V99L3267C	IMU-1 SENSED CHANGE IN X VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
DELVELM50X(2)	V99L3268C	IMU-2 SENSED CHANGE IN X VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
DELVELM50X(3)	V99L3269C	IMU-3 SENSED CHANGE IN X VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
DELVELM50Y(1)	V99L3270C	IMU-1 SENSED CHANGE IN Y VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
DELVELM50Y(2)	V99L3271C	IMU-2 SENSED CHANGE IN Y VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
DELVELM50Y(3)	V99L3272C	IMU-3 SENSED CHANGE IN Y VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
DELVELM50Z(1)	V99L3273C	IMU-1 SENSED CHANGE IN Z VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
DELVELM50Z(2)	V99L3274C	IMU-2 SENSED CHANGE IN Z VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
DELVELM50Z(3)	V99L3275C	IMU-3 SENSED CHANGE IN Z VELOCITY	ACP_TRSF	SCALAR	+/-240	FT/SEC	OD
FAIL_AC (1)	V95X0777X	IMU-1 ALIGNMENT CORRECTION LIMITED	GC_ALIGN1	LOGICAL	0,1	NA	OD
FAIL_AC (2)	V95X0778X	IMU-2 ALIGNMENT CORRECTION LIMITED	GC_ALIGN1	LOGICAL	0,1	NA	OD
FAIL_AC (3)	V95X0779X	IMU-3 ALIGNMENT CORRECTION LIMITED	GC_ALIGN1	LOGICAL	0,1	NA	OD
FAIL_GC	V99X3280X	GYROCOMPASS FAIL	GC_ALIGN	LOGICAL	0, 1	NA	OD
T_OP_LIMIT	V90W7623C	TIME IN OPERATE TEST LIMIT	CONSTANT	SCALAR	300	SEC	OD
GO	V90A7622C	STANDARD ACCELERATION DUE TO GRAVITY	CONSTANT	SCALAR	32.174048	FT/SEC/ SEC/G	OD
INERTIAL	V95X0001X	IN INERTIAL MODE (IMU)	GC_ALIGN1	LOGICAL	0,1	NA	ON CE

Table 4.5.3.1-1. DISP\_SUP Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
IMU_FAIL_IND(1)	V95X0023X	IMU-1 FAILURE INDICATOR	BITE_SUM	LOGICAL	0, 1	NA	OD
IMU_FAIL_IND(2)	V95X1023X	IMU-2 FAILURE INDICATOR	BITE_SUM	LOGICAL	0, 1	NA	OD
IMU_FAIL_IND(3)	V95X2023X	IMU-3 FAILURE INDICATOR	BITE_SUM	LOGICAL	0, 1	NA	OD
REFS_RDY	V95X0780X	REFSMAT COMPUTATION COMPLETED	GC_ALIGN1	LOGICAL	0,1	NA	* **

\* Note: HAINS CAPRI TEMP discrettes are set true (=1) when power is applied to the HAINS IMU.

\*\* Note: Dual discrete dependent upon IMU. For KT-70 it is PRESSURE GOOD, for HAINS it is COMMUNICATION GOOD.

Table 4.5.3.1-2. DISP\_SUP Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
PWR_ON(1)	V95X0020X	IMU-1 POWER ON	GRND IMU CNTL MON DISPLAY (V5.1.8)	LOGICAL	0, 1	NA	OD
PWR_ON(2)	V95X1020X	IMU-2 POWER ON	GRND IMU CNTL MON DISPLAY (V5.1.8)	LOGICAL	0, 1	NA	OD
PWR_ON(3)	V95X2020X	IMU-3 POWER ON	GRND IMU CNTL MON DISPLAY (V5.1.8)	LOGICAL	0, 1	NA	OD
OPER_CMD(1)	V71K2576XB	IMU-1 OPERATE MODE CMD	IMU-1,TLM	DISCRETE	0, 1	NA	OD
OPER_CMD(2)	V71K3576XB	IMU-2 OPERATE MODE CMD	IMU-2,TLM	DISCRETE	0, 1	NA	OD
OPER_CMD(3)	V71K4576XB	IMU-3 OPERATE MODE CMD	IMU-3,TLM	DISCRETE	0, 1	NA	OD
HDW_BITE1(1)	V95Q0076C	IMU-1 HEX DISCRETE WORD	GRND IMU CNTL MON DISPLAY (V5.1.8),TLM	INTEGER	0-3F	NA	OD
HDW_BITE1(2)	V95Q1076C	IMU-2 HEX DISCRETE WORD	GRND IMU CNTL MON DISPLAY (V5.1.8),TLM	INTEGER	0-3F	NA	OD
HDW_BITE1(3)	V95Q2076C	IMU-3 HEX DISCRETE WORD	GRND IMU CNTL MON DISPLAY (V5.1.8),TLM	INTEGER	0-3F	NA	OD
HDW_BITE2(1)	V95Q0077C	IMU-1 HEX MODE/BITE STATUS WORD	GRND IMU CNTL MON DISPLAY (V5.1.8),TLM	INTEGER	0-FFFF	NA	OD
HDW_BITE2(2)	V95Q1077C	IMU-2 HEX MODE/BITE STATUS WORD	GRND IMU CNTL MON DISPLAY (V5.1.8),TLM	INTEGER	0-FFFF	NA	OD
HDW_BITE2(3)	V95Q2077C	IMU-3 HEX MODE/BITE STATUS WORD	GRND IMU CNTL MON DISPLAY (V5.1.8),TLM	INTEGER	0-FFFF	NA	OD

Table 4.5.3.1-2. DISP_SUP Outputs							
Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
VRSS(1)	V95L0060C	IMU-1 SENSED CHANGE IN VELOCITY (1 SEC)	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
VRSS(2)	V95L1060C	IMU-2 SENSED CHANGE IN VELOCITY (1 SEC)	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT SEC/ SEC	OD
VRSS(3)	V95L2060C	IMU-3 SENSED CHANGE IN VELOCITY (1 SEC)	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVX_1SEC(1)	V95L0056C	IMU-1 X-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVX_1SEC(2)	V95L1056C	IMU-2 X-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVX_1SEC(3)	V95L2056C	IMU-3 X-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVY_1SEC(1)	V95L0057C	IMU-1 Y-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVY_1SEC(2)	V95L1057C	IMU-2 Y-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVY_1SEC(3)	V95L2057C	IMU-3 Y-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVZ_1SEC(1)	V95L0058C	IMU-1 Z-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVZ_1SEC(2)	V95L1058C	IMU-2 Z-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
DVZ_1SEC(3)	V95L2058C	IMU-3 Z-Axis DEL VEL OVER 1 SEC	GRND IMU CNTL MON DISPLAY (V5.1.8)	SCALAR	+/-32.2	FT/ SEC/ SEC	OD
OPTION		IMU REALIGNMENT OPTION NUMBER	ORBIT_AL	INTEGER	1, 2, 3, 4	NA	OD
ORB_AL_COMP(1)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-1	ORBIT_AL	LOGICAL	0, 1	NA	OD
ORB_AL_COMP(2)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-2	ORBIT_AL	LOGICAL	0, 1	NA	OD

Table 4.5.3.1-2. DISP\_SUP Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
ORB_AL_COMP(3)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-3	ORBIT_AL	LOGICAL	0, 1	NA	OD
S/W_BITE(1)	V95X0046X	IMU-1 SW BITE STATUS	DISPLAY	INTEGER	0,7F	NA	OD
S/W_BITE(2)	V95X1046X	IMU-2 SW BITE STATUS	DISPLAY	INTEGER	0,7F	NA	OD
S/W_BITE(3)	V95X2046X	IMU-3 SW BITE STATUS	DISPLAY	INTEGER	0,7F	NA	OD
ALIGN_FAIL	V95X0008X	GYROCOMPASS ALIGN FAIL	DISPLAY	LOGICAL	0, 1	NA	OD
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	DISPLAY IMU_BITE HANG_CALA HANG_CALB HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	LOGICAL	0, 1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	DISPLAY IMU_BITE HANG_CALA HANG_CALB HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	LOGICAL	0, 1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	DISPLAY IMU_BITE HANG_CALA HANG_CALB HANG_CALC PFLT_CALA GC_ALIGN GC_ALIGN1	LOGICAL	0, 1	NA	OD
TEMP_STATUS(1)	V95J0621C	IMU-1 TEMP STATUS	IMU ALIGN DISPLAY (6.26), TLM	INTEGER	0,1,2	NA	OD
TEMP_STATUS(2)	V95J0622C	IMU-2 TEMP STATUS	IMU ALIGN DISPLAY (6.26), TLM	INTEGER	0,1,2	NA	OD
TEMP_STATUS(3)	V95J0623C	IMU-3 TEMP STATUS	IMU ALIGN DISPLAY (6.26), TLM	INTEGER	0,1,2	NA	OD
ALIGN_IN_PRO	V95X0583X	ALIGN IN PROGRESS	IMU ALIGN DISPLAY (6.26), TLM	LOGICAL	0, 1	NA	OD
DVM50X(1)	V95L0631C	IMU-1 M50 X AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD
DVM50X(2)	V95L0632C	IMU-2 M50 X AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD
DVM50X(3)	V95L0633C	IMU-3 M50 X AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD
DVM50Y(1)	V95L0634C	IMU-1 M50 Y AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD

Table 4.5.3.1-2. DISP\_SUP Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
DVM50Y(2)	V95L0635C	IMU-2 M50 Y AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD
DVM50Y(3)	V95L0636C	IMU-3 M50 Y AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD
DVM50Z(1)	V95L0637C	IMU-1 M50 Z AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD
DVM50Z(2)	V95L0638C	IMU-2 M50 Z AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD
DVM50Z(3)	V95L0639C	IMU-3 M50 Z AXIS DEL V OVER 1 SEC	IMU ALIGN DISPLAY (6.26), TLM DISPLAY (6.26), TLM	SCALAR	+/- 9.999	FT/ SEC/ SEC	OD
IMU_1_STAT	V95J0615C	IMU-1 PWR/BITE STATUS	IMU ALIGN DISPLAY (6.26), TLM DISPLAY (6.26)	INTEGER	0,1,2	NA	OD
IMU_2_STAT	V95J0616C	IMU-2 PWR/BITE STATUS	IMU ALIGN DISPLAY (6.26), TLM DISPLAY (6.26)	INTEGER	0,1,2	NA	OD
IMU_3_STAT	V95J0617C	IMU-3 PWR/BITE STATUS	IMU ALIGN DISPLAY (6.26), TLM DISPLAY (6.26)	INTEGER	0,1,2	NA	OD
STAR_ALIGN	V95X0600X	STAR ALIGN OPTION SELECTED	IMU ALIGN DISPLAY (6.26), TLM	LOGICAL	0, 1	NA	OD
IMUR	V95U0603C	IMU/IMU OPTION SELECTED	IMU ALIGN DISPLAY (6.26), TLM, ORBIT_AL	INTEGER	0, 3	NA	OD
MATRIX_UPDATE	V95X0645X	MATRIX UPDATE OPTION SELECTED	IMU ALIGN DISPLAY (6.26), TLM	LOGICAL	0, 1	NA	OD
IMU1_MASK_STAT	V95X0026X	IMU-1 BITE MASK IN EFFECT	IMU ALIGN DISPLAY(6.26)	LOGICAL	0,1	NA	OD
IMU2_MASK_STAT	V95X1026X	IMU-2 BITE MASK IN EFFECT	IMU ALIGN DISPLAY(6.26)	LOGICAL	0,1	NA	OD
IMU3_MASK_STAT	V95X2026X	IMU-3 BITE MASK IN EFFECT	IMU ALIGN DISPLAY(6.26)	LOGICAL	0,1	NA	OD
IMU_BITE_MASK(1)	V95J0028B	IMU-1 BITE MASK WORD	BITE_SUM	LOGICAL	16 BITS	NA	OD
IMU_BITE_MASK(2)	V95J1028B	IMU-2 BITE MASK WORD	BITE_SUM	LOGICAL	16 BITS	NA	OD
IMU_BITE_MASK(3)	V95J2028B	IMU-3 BITE MASK WORD	BITE_SUM	LOGICAL	16 BITS	NA	OD

#### **4.5.4 IMU SOP Submodes**

The purpose of this section is to define the requirements necessary to support the various submodes of IMU hardware/software operation. A summary of the functions inherent to each selectable submode can be found in Section 4.1.2. It should be noted that each submode is scheduled by the IMU Control Specialist Function in response to a keyboard entry.

The following is a summary of the Preflight IMU Control Specialist Function moding:

The TERM/IDLE submode is scheduled on any transition from STANDBY to OPERATE, whenever a previously selected submode runs to completion or an insufficient number of selected IMU's are in OPERATE to support the selected submode, and in response to a keyboard request. All other submodes are scheduled only in response to the appropriate keyboard commands. The TERM/IDLE command is processed in all submodes, the INERTIAL command is processed only in GC\_ALIGN1, and all other submode commands are processed only in TERM/IDLE.

The following is a summary of the On-Orbit IMU Control Specialist Function moding:

The INERTIAL submode is scheduled on any transition from STANDBY to OPERATE. All other submodes are scheduled in response to a keyboard request. These submodes, On-Orbit Alignment and On-Orbit Calibration, do not cause the termination of the INERTIAL submode function but perform their specified functions with INERTIAL processing continuing as background. Both these submodes default to INERTIAL.

In general, termination of any submode prior to normal completion is allowed by a crew commanded TERM/IDLE, downmoding to STANDBY by any means, power off, or default (insufficient selected IMU's in OPERATE). However, the INERTIAL submode shall only be terminated by a crew commanded transition to the STANDBY mode or the TERM/IDLE submode or power off. Note that a crew commanded STANDBY submode does not include the apparent STANDBY mode (in-operate discrete false) that may exist due to a power transient or inadvertent power off.

##### **4.5.4.1 IMU Terminate/Idle Processing (TERM/IDLE).**

The purpose of the TERM/IDLE submode is to provide the processing required to support the IMU OPERATE mode quiescent or default state. The IMU TERM/IDLE submode is defined as the state which exists when the IMU is in the OPERATE mode but is not being controlled by one of the other submodes, such as calibration, alignment, INERTIAL, etc. TERM/IDLE is first entered when the IMU advances from the STANDBY mode to the OPERATE mode. TERM/IDLE is reentered whenever the other submodes run to normal completion or are manually terminated by requesting the TERM/IDLE submode. A default condition occurring during IMU SOP processing shall return processing to the TERM/IDLE submode. Any IMU which is commanded to the OPERATE mode, while other operating IMU's are being controlled by a submode other than TERM/IDLE, shall be held in the TERM/IDLE submode until all operating IMU's have been returned to TERM/IDLE and advanced to another submode. TERM/IDLE processing requirements do not apply to IMU's that are in the STANDBY mode or are powered down. Note that TERM/IDLE is only defined in GN&C OPS-9 – Precount.

A. Functional Requirements. The TERM/IDLE submode provides the following functions for each applicable IMU in the OPERATE mode:

1. Perform the initialization required when the IMU's enter the OPERATE mode.
2. Report IMU mode status to the User Interface.
3. Perform IMU\_BITE processing functions to support DISPLAYS.
4. Perform attitude and accelerometer processing to support the User Interface DISPLAYS.

B. Interface Requirements. The interfaces required for the TERM/IDLE submode are in most cases defined by the individual modules referenced in Detailed Requirements (Part C). Additional interfaces are also identified in Part C.

C. Detailed Requirements. Upon entry to the TERM/IDLE submode, the following operations shall be performed:

1. If all powered up IMU's are in this submode, set the TERM/IDLE IN PROGRESS flag equal to one. Reset all other IMU SUBMODE IN PROGRESS flags equal to zero and initializes the following parameters to the indicated values:

```

INERTIAL      = 0
ALIGNCMP      = 0
FAIL_GC       = 0
ALIGN_FAIL    = 0
REFS_RDY      = 0
LSF           = 0
QREFS_RDY     = 0

```

2. For each applicable IMU, initialize the following parameters to the indicated values (the parameters are defined in detail in other IMU SOP modules):

```

ACCEL_SF      = 1
VELSUMM50X    = 0
VELSUMM50Y    = 0
VELSUMM50Z    = 0
FAIL_AC       = 0
LATCOMP       = 0
SLEW_X_POS    = 0
SLEW_Y_POS    = 0
SLEW_Z_POS    = 0
SLEW_X_NEG    = 0
SLEW_Y_NEG    = 0
SLEW_Z_NEG    = 0
TRX           = 0 deg/hr
TRY           = 0 deg/hr
GTX           = 0
GTY           = 0
GTZ           = 0
RESX          = 0
RESY          = 0
RESZ          = 0
GC_FAILED PAIR 1, 2 = 0
GC_FAILED PAIR 1, 3 = 0
GC_FAILED PAIR 2, 3 = 0

```

TRZ	=	0 deg/hr
LATX	=	0 deg/hr
LATY	=	0 deg/hr
LATZ	=	0 deg/hr
RDCLX	=	0 deg/hr
RDCLY	=	0 deg/hr
RDCLZ	=	0 deg/hr

Note that the accelerometer loops are set to high gain.

3. If the IMU control/monitor display is active, schedule the ACP\_COMP major cycle module for each applicable IMU and execute the minor cycle modules in accordance with the requirement of Section 4.5.1. GYO\_TORQ need not be executed during this submode. If GYO\_TORQ is executed, each gyro torquing output shall be zero.

If the display is not active, no further IMU SOP processing is required until the termination of this submode.

4. The rate of the IMU\_BITE and BITE\_SUM modules may be reduced to not less than the CRT display rate.
5. Upon exit from the TERM/IDLE submode, the TERM/IDLE IN PROGRESS flag (V95X0016X) shall be set equal to zero.

#### **4.5.4.1.1 Parameter Tables for IMU TERM/IDLE Processing.**

The IDD inputs and outputs are listed in Tables 4.5.4.1.1-1 and 4.5.4.1.1-2. In the table it should be noted that the CAPRI TEMP discretes are set true (=1) when power is applied to the HAINS IMU and some dual discretes have been designated with dual names dependent upon IMU hardware. The first part of the dual name is for the KT-70 IMU while the second part is for the HAINS IMU. Values for the I-loads are contained in the I-load requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.5.4.1.1-3. K-loads are listed in Table 4.5.4.1.1-4. Constants are listed in Table 4.5.4.1.1-5.



TABLE 4.5.4.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AD_FAIL(1)	V71X2023B	IMU-1 A/D FAIL	WD1B2	IMU 1	BD		93017G	*
AD_FAIL(2)	V71X3023B	IMU-2 A/D FAIL	WD1B2	IMU 2	BD		93017G	*
AD_FAIL(3)	V71X4023B	IMU-3 A/D FAIL	WD1B2	IMU 3	BD		93017G	*
AZO(1)	V99H2610CA	AZIMUTH RESOLVER OFFSET(1)		IMU GND CAL	DEG		93017G	*
AZO(1)	V99H2610CB	AZIMUTH RESOLVER OFFSET(1)		MASS MEM	DEG			
AZO(2)	V99H2611CA	AZIMUTH RESOLVER OFFSET(2)		IMU GND CAL	DEG		93017G	*
AZO(2)	V99H2611CB	AZIMUTH RESOLVER OFFSET(2)		MASS MEM	DEG			
AZO(3)	V99H2612CA	AZIMUTH RESOLVER OFFSET(3)		IMU GND CAL	DEG		93017G	*
AZO(3)	V99H2612CB	AZIMUTH RESOLVER OFFSET(3)		MASS MEM	DEG			
BTU_TEST	V93X6004X	BTU TEST IN PROGRESS		GROUND IMU DISP	EVENT		92009	
CAP_TEMP_RDY(1)	V71X2406X	IMU 1 CAPRI TEMP READY		IMU 1	BD		93017G	*
CAP_TEMP_RDY(2)	V71X3406X	IMU 2 CAPRI TEMP READY		IMU 2	BD		93017G	*
CAP_TEMP_RDY(3)	V71X4406X	IMU 3 CAPRI TEMP READY		IMU 3	BD		93017G	*
CAP_TEMP_SAFE(1)	V71X2407X	IMU 1 CAPRI TEMP SAFE		IMU 1	BD		93017G	*
CAP_TEMP_SAFE(2)	V71X3407X	IMU 2 CAPRI TEMP SAFE		IMU 2	BD		93017G	*
CAP_TEMP_SAFE(3)	V71X4407X	IMU 3 CAPRI TEMP SAFE		IMU 3	BD		93017G	*
CVX(1)	V71L2200B	IMU-1 ACCUMD VX	WD10	IMU 1	HXU		93017G	*
CVX(2)	V71L3200B	IMU-2 ACCUMD VX	WD10	IMU 2	HXU		93017G	*
CVX(3)	V71L4200B	IMU-3 ACCUMD VX	WD10	IMU 3	HXU		93017G	*
CVY(1)	V71L2220B	IMU-1 ACCUMD VY	WD11	IMU 1	HXU		93017G	*
CVY(2)	V71L3220B	IMU-2 ACCUMD VY	WD11	IMU 2	HXU		93017G	*
CVY(3)	V71L4220B	IMU-3 ACCUMD VY	WD11	IMU 3	PULSES		93017G	*
CVZ(1)	V71L2240B	IMU-1 ACCUMD VZ	WD12	IMU 1	HXU		93017G	*
CVZ(2)	V71L3240B	IMU-2 ACCUMD VZ	WD12	IMU 2	HXU		93017G	*
CVZ(3)	V71L4240B	IMU-3 ACCUMD VZ	WD12	IMU 3	PULSES		93017G	*
D1/D8_SEQR(1)	V71X2032B	IMU-1 D1/D8 SEQUENCER	WD1B11	IMU 1	BD		93017G	*
D1/D8_SEQR(2)	V71X3032B	IMU-2 D1/D8 SEQUENCER	WD1B11	IMU 2	BD		93017G	*
D1/D8_SEQR(3)	V71X4032B	IMU-3 D1/D8 SEQUENCER	WD1B11	IMU 3	BD		93017G	*
D2_SEQR(1)	V71X2033B	IMU-1 D2 SEQUENCER	WD1B12	IMU 1	BD		93017G	*
D2_SEQR(2)	V71X3033B	IMU-2 D2 SEQUENCER	WD1B12	IMU 2	BD		93017G	*
D2_SEQR(3)	V71X4033B	IMU-3 D2 SEQUENCER	WD1B12	IMU 3	BD		93017G	*
D3_SEQR(1)	V71X2034B	IMU-1 D3 SEQUENCER	WD1B13	IMU 1	BD		93017G	*
D3_SEQR(2)	V71X3034B	IMU-2 D3 SEQUENCER	WD1B13	IMU 2	BD		93017G	*
D3_SEQR(3)	V71X4034B	IMU-3 D3 SEQUENCER	WD1B13	IMU 3	BD		93017G	*
D4_SEQR(1)	V71X2035B	IMU-1 D4 SEQUENCER	WD1B14	IMU 1	BD		93017G	*
D4_SEQR(2)	V71X3035B	IMU-2 D4 SEQUENCER	WD1B14	IMU 2	BD		93017G	*
D4_SEQR(3)	V71X4035B	IMU-3 D4 SEQUENCER	WD1B14	IMU 3	BD		93017G	*
D5_SEQR(1)	V71X2036B	IMU-1 D5 SEQUENCER	WD1B15	IMU 1	BD		93017G	*
D5_SEQR(2)	V71X3036B	IMU-2 D5 SEQUENCER	WD1B15	IMU 2	BD		93017G	*
D5_SEQR(3)	V71X4036B	IMU-3 D5 SEQUENCER	WD1B15	IMU 3	BD		93017G	*
DCDC_1_FAIL(1)	V71X2026B	IMU-1 DC/DC NO 1 FAIL	WD1B5	IMU 1	BD		93017G	*
DCDC_1_FAIL(2)	V71X3026B	IMU-2 DC/DC NO 1 FAIL	WD1B5	IMU 2	BD		93017G	*
DCDC_1_FAIL(3)	V71X4026B	IMU-3 DC/DC NO 1 FAIL	WD1B5	IMU 3	BD		93017G	*
DELTXZ(1)	V99H2552CA	X-ACCEL MISALIGNMENT TO Z-REF(1)		IMU GND CAL	RAD		93017G	*
DELTXZ(1)	V99H2552CB	X-ACCEL MISALIGNMENT TO Z-REF(1)		MASS MEM	RAD			
DELTXZ(2)	V99H2553CA	X-ACCEL MISALIGNMENT TO Z-REF(2)		IMU GND CAL	RAD		93017G	*

TABLE 4.5.4.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTXZ (2)	V99H2553CB	X-ACCEL MISALIGNMENT TO Z-REF (2)	MASS MEM	RAD				
DELTXZ (3)	V99H2554CA	X-ACCEL MISALIGNMENT TO Z-REF (3)	IMU GND CAL	RAD			93017G	*
DELTXZ (3)	V99H2554CB	X-ACCEL MISALIGNMENT TO Z-REF (3)	MASS MEM	RAD				
DELTYX (1)	V99H2540CA	Y-ACCEL MISALIGNMENT TO X-REF (1)	IMU GND CAL	RAD			93017G	*
DELTYX (1)	V99H2540CB	Y-ACCEL MISALIGNMENT TO X-REF (1)	MASS MEM	RAD			90525D	
DELTYX (2)	V99H2541CA	Y-ACCEL MISALIGNMENT TO X-REF (2)	IMU GND CAL	RAD			93017G	*
DELTYX (2)	V99H2541CB	Y-ACCEL MISALIGNMENT TO X-REF (2)	MASS MEM	RAD			90525D	
DELTYX (3)	V99H2542CA	Y-ACCEL MISALIGNMENT TO X-REF (3)	IMU GND CAL	RAD			93017G	*
DELTYX (3)	V99H2542CB	Y-ACCEL MISALIGNMENT TO X-REF (3)	MASS MEM	RAD			90525D	
DELTYZ (1)	V99H2549CA	Y-ACCEL MISALIGNMENT TO Z-REF (1)	IMU GND CAL	RAD			93017G	*
DELTYZ (1)	V99H2549CB	Y-ACCEL MISALIGNMENT TO Z-REF (1)	MASS MEM	RAD				
DELTYZ (2)	V99H2550CA	Y-ACCEL MISALIGNMENT TO Z-REF (2)	IMU GND CAL	RAD			93017G	*
DELTYZ (2)	V99H2550CB	Y-ACCEL MISALIGNMENT TO Z-REF (2)	MASS MEM	RAD				
DELTYZ (3)	V99H2551CA	Y-ACCEL MISALIGNMENT TO Z-REF (3)	IMU GND CAL	RAD			93017G	*
DELTYZ (3)	V99H2551CB	Y-ACCEL MISALIGNMENT TO Z-REF (3)	MASS MEM	RAD				
DELTZX (1)	V99H2543CA	Z-ACCEL MISALIGNMENT TO X-REF (1)	IMU GND CAL	RAD			93017G	*
DELTZX (1)	V99H2543CB	Z-ACCEL MISALIGNMENT TO X-REF (1)	MASS MEM	RAD			90525D	
DELTZX (2)	V99H2544CA	Z-ACCEL MISALIGNMENT TO X-REF (2)	IMU GND CAL	RAD			93017G	*
DELTZX (2)	V99H2544CB	Z-ACCEL MISALIGNMENT TO X-REF (2)	MASS MEM	RAD			90525D	
DELTZX (3)	V99H2545CA	Z-ACCEL MISALIGNMENT TO X-REF (3)	IMU GND CAL	RAD			93017G	*
DELTZX (3)	V99H2545CB	Z-ACCEL MISALIGNMENT TO X-REF (3)	MASS MEM	RAD			90525D	
DELTZY (1)	V99H2546CA	Z-ACCEL MISALIGNMENT TO Y-REF (1)	IMU GND CAL	RAD			93017G	*
DELTZY (1)	V99H2546CB	Z-ACCEL MISALIGNMENT TO Y-REF (1)	MASS MEM	RAD			90525D	
DELTZY (2)	V99H2547CA	Z-ACCEL MISALIGNMENT TO Y-REF (2)	IMU GND CAL	RAD			93017G	*
DELTZY (2)	V99H2547CB	Z-ACCEL MISALIGNMENT TO Y-REF (2)	MASS MEM	RAD			90525D	
DELTZY (3)	V99H2548CA	Z-ACCEL MISALIGNMENT TO Y-REF (3)	IMU GND CAL	RAD			93017G	*
DELTZY (3)	V99H2548CB	Z-ACCEL MISALIGNMENT TO Y-REF (3)	MASS MEM	RAD			90525D	
ECHO_13 (1)	V71M2260P	IMU-1 ECHO 1	WD13 IMU 1		HMD		93017G	*
ECHO_13 (2)	V71M3260P	IMU-2 ECHO 1	WD13 IMU 2		HMD		93017G	*
ECHO_13 (3)	V71M4260P	IMU-3 ECHO 1	WD13 IMU 3		HMD		93017G	*
ECHO_14 (1)	V71M2280P	IMU-1 ECHO 2	WD14 IMU 1		HMD		93017G	*
ECHO_14 (2)	V71M3280P	IMU-2 ECHO 2	WD14 IMU 2		HMD		93017G	*
ECHO_14 (3)	V71M4280P	IMU-3 ECHO 2	WD14 IMU 3		HMD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL (1)	V71X2027B	IMU 1 FLTR DC2/DSCRET PWR SUP FAIL	IMU 1		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL (2)	V71X3027B	IMU 2 FLTR DC2/DSCRET PWR SUP FAIL	IMU 2		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL (3)	V71X4027B	IMU 3 FLTR DC2/DSCRET PWR SUP FAIL	IMU 3		BD		93017G	*
IMU_CF (1)	V91X3101X	IMU 1 COMMFAULT	FCOS				92354	
IMU_CF (2)	V91X3131X	IMU 2 COMMFAULT	FCOS				92354	
IMU_CF (3)	V91X3161X	IMU 3 COMMFAULT	FCOS				92354	
IO/MUX_FAIL (1)	V71X2022B	IMU 1 IO/MUX FAIL	WD1B1 IMU 1		BD		93017G	*
IO/MUX_FAIL (2)	V71X3022B	IMU 2 IO/MUX FAIL	WD1B1 IMU 2		BD		93017G	*
IO/MUX_FAIL (3)	V71X4022B	IMU 3 IO/MUX FAIL	WD1B1 IMU 3		BD		93017G	*
IRO (1)	V99H2615CA	INNER ROLL RESOLVER OFFSET (1)	IMU GND CAL	DEG			93017G	*
IRO (1)	V99H2615CB	INNER ROLL RESOLVER OFFSET (1)	MASS MEM	DEG				
IRO (2)	V99H2616CA	INNER ROLL RESOLVER OFFSET (2)	IMU GND CAL	DEG			93017G	*
IRO (2)	V99H2616CB	INNER ROLL RESOLVER OFFSET (2)	MASS MEM	DEG				

TABLE 4.5.4.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
IRO(3)	V99H2617CA	INNER ROLL RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
IRO(3)	V99H2617CB	INNER ROLL RESOLVER OFFSET(3)	MASS MEM	DEG				
KIXH(1)	V99A2681CA	IMU-1 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(1)	V99A2681CB	HIGH-GAIN X-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIXH(2)	V99A2682CA	IMU-2 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(2)	V99A2682CB	HIGH-GAIN X-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIXH(3)	V99A2683CA	IMU-3 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(3)	V99A2683CB	HIGH-GAIN X-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIYH(1)	V99A2684CA	IMU-1 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(1)	V99A2684CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIYH(2)	V99A2685CA	IMU-2 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(2)	V99A2685CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIYH(3)	V99A2686CA	IMU-3 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(3)	V99A2686CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIZH(1)	V99A2687CA	IMU-1 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(1)	V99A2687CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIZH(2)	V99A2688CA	IMU-2 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(2)	V99A2688CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIZH(3)	V99A2689CA	IMU-3 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(3)	V99A2689CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KOXH(1)	V99G2670CA	IMU-1 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(1)	V99G2670CB	HIGH-GAIN X-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOXH(2)	V99G2671CA	IMU-2 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(2)	V99G2671CB	HIGH-GAIN X-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOXH(3)	V99G2672CA	IMU-3 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(3)	V99G2672CB	HIGH-GAIN X-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOYH(1)	V99G2673CA	IMU-1 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(1)	V99G2673CB	HIGH-GAIN Y-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOYH(2)	V99G2674CA	IMU-2 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(2)	V99G2674CB	HIGH-GAIN Y-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOYH(3)	V99G2675CA	IMU-3 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(3)	V99G2675CB	HIGH-GAIN Y-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOZH(1)	V99G2676CA	IMU-1 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(1)	V99G2676CB	HIGH-GAIN Z-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOZH(2)	V99G2677CA	IMU-2 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(2)	V99G2677CB	HIGH-GAIN Z-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOZH(3)	V99G2678CA	IMU-3 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(3)	V99G2678CB	HIGH-GAIN Z-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KT70/HAINS_GOOD(1)	V71X2021B	IMU 1 KT70/HAINS GOOD	WD1B0	IMU 1	BD		93017G	*
KT70/HAINS_GOOD(2)	V71X3021B	IMU 2 KT70/HAINS GOOD	WD1B0	IMU 2	BD		93017G	*
KT70/HAINS_GOOD(3)	V71X4021B	IMU 3 KT70/HAINS GOOD	WD1B0	IMU 3	BD		93017G	*
MODE_BITE(1)	V71M2020P	IMU 1 MODE STATUS WD1		IMU 1	HMD		93017G	*
MODE_BITE(2)	V71M3020P	IMU 2 MODE STATUS WD1		IMU 2	HMD		93017G	*
MODE_BITE(3)	V71M4020P	IMU 3 MODE STATUS WD1		IMU 3	HMD		93017G	*
OMEGA_R(1)	V71R2040B	IMU-1 OMEGA R	WD2	IMU 1	DEG/HR	HFS	93017G	*
OMEGA_R(2)	V71R3040B	IMU-2 OMEGA R	WD2	IMU 2	DEG/HR	HFS	93017G	*

TABLE 4.5.4.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
OMEGA_R(3)	V71R4040B	IMU-3 OMEGA R	WD2	IMU 3	DEG/HR		93017G	*
OPER/STBY(1)	V93X6020X	IMU 1 OPERATE/STBY REQUEST		GROUND IMU DISP	EVENT			
OPER/STBY(2)	V93X6021X	IMU 2 OPERATE/STBY REQUEST		GROUND IMU DISP	EVENT			
OPER/STBY(3)	V93X6022X	IMU 3 OPERATE/STBY REQUEST		GROUND IMU DISP	EVENT			
PC/CRCT_CRD_OVRTMP(1)	V71X2029B	IMU 1 PWR CNDTNR/CRCT CARD OVRTEMP		IMU 1			93017G	*
PC/CRCT_CRD_OVRTMP(2)	V71X3029B	IMU 2 PWR CNDTNR/CRCT CARD OVRTEMP		IMU 2			93017G	*
PC/CRCT_CRD_OVRTMP(3)	V71X4029B	IMU 3 PWR CNDTNR/CRCT CARD OVRTEMP		IMU 3			93017G	*
PLAT_FAIL(1)	V71X2024B	IMU-1 PLATFORM FAIL	WD1B3	IMU 1			93017G	*
PLAT_FAIL(2)	V71X3024B	IMU-2 PLATFORM FAIL	WD1B3	IMU 2			93017G	*
PLAT_FAIL(3)	V71X4024B	IMU-3 PLATFORM FAIL	WD1B3	IMU 3			93017G	*
PLAT_TEMP_RDY(1)	V71X2404X	IMU 1 PLATFORM TEMP READY		IMU 1			93017G	*
PLAT_TEMP_RDY(2)	V71X3404X	IMU 2 PLATFORM TEMP READY		IMU 2			93017G	*
PLAT_TEMP_RDY(3)	V71X4404X	IMU 3 PLATFORM TEMP READY		IMU 3			93017G	*
PLAT_TEMP_SAFE(1)	V71X2405X	IMU 1 PLATFORM TEMP SAFE		IMU 1			93017G	*
PLAT_TEMP_SAFE(2)	V71X3405X	IMU 2 PLATFORM TEMP SAFE		IMU 2			93017G	*
PLAT_TEMP_SAFE(3)	V71X4405X	IMU 3 PLATFORM TEMP SAFE		IMU 3			93017G	*
PO(1)	V99H2620CA	PITCH RESOLVER OFFSET(1)		IMU GND CAL	DEG		93017G	*
PO(1)	V99H2620CB	PITCH RESOLVER OFFSET(1)		MASS MEM	DEG			
PO(2)	V99H2621CA	PITCH RESOLVER OFFSET(2)		IMU GND CAL	DEG		93017G	*
PO(2)	V99H2621CB	PITCH RESOLVER OFFSET(2)		MASS MEM	DEG			
PO(3)	V99H2622CA	PITCH RESOLVER OFFSET(3)		IMU GND CAL	DEG		93017G	*
PO(3)	V99H2622CB	PITCH RESOLVER OFFSET(3)		MASS MEM	DEG			
PRESS/COMM_GOOD(1)	V71X2401X	IMU 1 PRESSURE/COMMUNICATION GOOD		IMU 1		BD	93017G	*
PRESS/COMM_GOOD(2)	V71X3401X	IMU 2 PRESSURE/COMMUNICATION GOOD		IMU 2		BD	93017G	*
PRESS/COMM_GOOD(3)	V71X4401X	IMU 3 PRESSURE/COMMUNICATION GOOD		IMU 3		BD	93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(1)	V71X2025B	IMU 1 PWR CNTRLR/DGITAL SBSY FAIL		IMU 1		BD	93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(2)	V71X3025B	IMU 2 PWR CNTRLR/DGITAL SBSY FAIL		IMU 2		BD	93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(3)	V71X4025B	IMU 3 PWR CNTRLR/DGITAL SBSY FAIL		IMU 3		BD	93017G	*
RX_CUR/RX_FAIL(1)	V71X2028B	IMU 1 RESLVR CURRENT/RESLVR FAIL		IMU 1		BD	93017G	*
RX_CUR/RX_FAIL(2)	V71X3028B	IMU 2 RESLVR CURRENT/RESLVR FAIL		IMU 2		BD	93017G	*
RX_CUR/RX_FAIL(3)	V71X4028B	IMU 3 RESLVR CURRENT/RESLVR FAIL		IMU 3		BD	93017G	*
THETARL(1)	V71H2060B	IMU-1 THETA R 8X	WD3	IMU 1	DEG	BSU	93017G	*
THETARL(2)	V71H3060B	IMU-2 THETA R 8X	WD3	IMU 2	DEG	BSU	93017G	*
THETARL(3)	V71H4060B	IMU-3 THETA R 8X	WD3	IMU 3	DEG	BSU	93017G	*
THETAXL(1)	V71H2100B	IMU-1 THETA X 8X	WD5	IMU 1	DEG	BSU	93017G	*
THETAXL(2)	V71H3100B	IMU-2 THETA X 8X	WD5	IMU 2	DEG	BSU	93017G	*
THETAXL(3)	V71H4100B	IMU-3 THETA X 8X	WD5	IMU 3	DEG	BSU	93017G	*
THETAXM(1)	V71H2080B	IMU-1 THETA X 1X	WD4	IMU 1	DEG	BSU	93017G	*
THETAXM(2)	V71H3080B	IMU-2 THETA X 1X	WD4	IMU 2	DEG	BSU	93017G	*
THETAXM(3)	V71H4080B	IMU-3 THETA X 1X	WD4	IMU 3	DEG	BSU	93017G	*
THETAYL(1)	V71H2140B	IMU-1 THETA Y 8X	WD7	IMU 1	DEG	BSU	93017G	*
THETAYL(2)	V71H3140B	IMU-2 THETA Y 8X	WD7	IMU 2	DEG	BSU	93017G	*
THETAYL(3)	V71H4140B	IMU-3 THETA Y 8X	WD7	IMU 3	DEG	BSU	93017G	*
THETAYM(1)	V71H2120B	IMU-1 THETA Y 1X	WD6	IMU 1	DEG	BSU	93017G	*
THETAYM(2)	V71H3120B	IMU-2 THETA Y 1X	WD6	IMU 2	DEG	BSU	93017G	*
THETAYM(3)	V71H4120B	IMU-3 THETA Y 1X	WD6	IMU 3	DEG	BSU	93017G	*

TABLE 4.5.4.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
THETAZL(1)	V71H2180B	IMU-1 THETA Z 8X	WD9 IMU 1	DEG	BSU		93017G	*
THETAZL(2)	V71H3180B	IMU-2 THETA Z 8X	WD9 IMU 2	DEG	BSU		93017G	*
THETAZL(3)	V71H4180B	IMU-3 THETA Z 8X	WD9 IMU 3	DEG	BSU		93017G	*
THETAZM(1)	V71H2160B	IMU-1 THETA Z 1X	WD8 IMU 1	DEG	BSU		93017G	*
THETAZM(2)	V71H3160B	IMU-2 THETA Z 1X	WD8 IMU 2	DEG	BSU		93017G	*
THETAZM(3)	V71H4160B	IMU-3 THETA Z 1X	WD8 IMU 3	DEG	BSU		93017G	*
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL	WD1B9 IMU 1		BD		93017G	*
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL	WD1B9 IMU 2		BD		93017G	*
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL	WD1B9 IMU 3		BD		93017G	*
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL	WD1B10 IMU 1		BD		93017G	*
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL	WD1B10 IMU 2		BD		93017G	*
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL	WD1B10 IMU 3		BD		93017G	*
	V93X6026X	IMU 1 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6027X	IMU 2 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6028X	IMU 3 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6030X	ATT DET COMMAND	GROUND IMU DISP	EVENT	BD		92354	
	V93X6040X	HGR CAL A COMMAND	GROUND IMU DISP	EVENT	BD		92354	
	V93X6041X	HGR CAL B COMMAND	GROUND IMU DISP	EVENT	BD		92354	
	V93X6042X	HGR CAL C COMMAND	GROUND IMU DISP	EVENT	BD		92354	
	V93X6045X	PREFLT CAL COMMAND	GROUND IMU DISP	EVENT	BD		92354	
	V93X6047X	GYROCOMP COMMAND	GROUND IMU DISP	EVENT	BD		92354	
	V93X6052X	PLAT POS SUBMODE CMD	GROUND IMU DISP	EVENT	BD		92354	
	V93X6055X	TERM/IDLE COMMAND	GROUND IMU DISP	EVENT	BD			

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

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
ACCEL_SF(1)	V71K2541BG	IMU 1 CAPRI SC FAC CMD	WD2 B0 IMU 1					
					TLM			
ACCEL_SF(2)	V71K3541BG	IMU 2 CAPRI SC FAC CMD	WD2 B0 IMU 2					
					TLM			
ACCEL_SF(3)	V71K4541BG	IMU 3 CAPRI SC FAC CMD	WD2 B0 IMU 3					
					TLM			
AZANG(1)	V95H0051CF	IMU 1 COMP AZIMUTH RES ANGLE	DL FMT 44/2	DEG			93017G	*
			DL FMT 45/2					
			DL FMT 60/2					
			GROUND IMU DISP					
AZANG(2)	V95H1051CF	IMU 2 COMP AZIMUTH RES ANGLE	DL FMT 44/2	DEG			93017G	*
			DL FMT 45/2					
			DL FMT 60/2					
			GROUND IMU DISP					
AZANG(3)	V95H2051CF	IMU 3 COMP AZIMUTH RES ANGLE	DL FMT 44/2	DEG			93017G	*
			DL FMT 45/2					
			DL FMT 60/2					
			GROUND IMU DISP					
CMD_WD1(1)	V71M2520PG	IMU 1 COMMAND WORD 1	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
			IMU 1					
CMD_WD1(2)	V71M3520PG	IMU 2 COMMAND WORD 1	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
			IMU 2					
CMD_WD1(3)	V71M4520PG	IMU 3 COMMAND WORD 1	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
			IMU 3					
CMD_WD2(1)	V71M2540PG	IMU 1 COMMAND WORD 2	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 53/1					
			DL FMT 60/1					
			IMU 1					
CMD_WD2(2)	V71M3540PG	IMU 2 COMMAND WORD 2	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
			IMU 2					
CMD_WD2(3)	V71M4540PG	IMU 3 COMMAND WORD 2	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
			IMU 3					
DVX(1)	V99U2860CF	IMU-1 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1	FT/S			93017G	*
			DL FMT 45/1					
			DL FMT 60/1					

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DVX(2)	V99U2861CF	IMU-2 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX(3)	V99U2862CF	IMU-3 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX_1SEC(1)	V95L0056CF	IMU 1 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(2)	V95L1056CF	IMU 2 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(3)	V95L2056CF	IMU 3 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY(1)	V99U2863CF	IMU-1 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(2)	V99U2864CF	IMU-2 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(3)	V99U2865CF	IMU-3 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY_1SEC(1)	V95L0057CF	IMU 1 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY_1SEC(2)	V95L1057CF	IMU 2 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY_1SEC(3)	V95L2057CF	IMU 3 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ(1)	V99U2866CF	IMU-1 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(2)	V99U2867CF	IMU-2 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(3)	V99U2868CF	IMU-3 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ_1SEC(1)	V95L0058CF	IMU 1 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ_1SEC(2)	V95L1058CF	IMU 2 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ_1SEC(3)	V95L2058CF	IMU 3 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
FAIL_ACCEL_SF(1)	V95X0081XF	IMU 1 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_ACCEL_SF(2)	V95X1081XF	IMU 2 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ACCEL_SF(3)	V95X2081XF	IMU 3 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(1)	V95X0030XF	IMU 1 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(2)	V95X1030XF	IMU 2 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(3)	V95X2030XF	IMU 3 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(1)	V95X0031XF	IMU 1 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(2)	V95X1031XF	IMU 2 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(3)	V95X2031XF	IMU 3 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(1)	V95X0034XF	IMU 1 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(2)	V95X1034XF	IMU 2 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(3)	V95X2034XF	IMU 3 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(1)	V95X0037XF	IMU 1 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(2)	V95X1037XF	IMU 2 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(3)	V95X2037XF	IMU 3 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(1)	V95X0035XF	IMU 1 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*



TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_VEL_LIM(2)	V95X1035XF	IMU 2 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(3)	V95X2035XF	IMU 3 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(1)	V95Q0076CF	IMU 1 HEX DISCRETE WORD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP				93017G	*
HDW_BITE1(2)	V95Q1076CF	IMU 2 HEX DISCRETE WORD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP				93017G	*
HDW_BITE1(3)	V95Q2076CF	IMU 3 HEX DISCRETE WORD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP				93017G	*
HDW_BITE2(1)	V95Q0077CF	IMU 1 HEX MODE/BITE STATUS WORD	GROUND IMU DISP GROUND IMU DISP TLM					
HDW_BITE2(2)	V95Q1077CF	IMU 2 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
HDW_BITE2(3)	V95Q2077CF	IMU 3 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
IMU_1_SEL_STATUS	V95X0021XF	IMU 1 SELECT STATUS	GROUND IMU DISP TLM					
IMU_2_SEL_STATUS	V95X1021XF	IMU 2 SELECT STATUS	GROUND IMU DISP TLM					
IMU_3_SEL_STATUS	V95X2021XF	IMU 3 SELECT STATUS	GROUND IMU DISP TLM					
IMU_FAIL_IND(1)	V95X0023XF	IMU 1 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IMU_FAIL_IND(2)	V95X1023XF	IMU 2 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IMU_FAIL_IND(3)	V95X2023XF	IMU 3 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IRANG(1)	V95H0053CF	IMU 1 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
IRANG(2)	V95H1053CF	IMU 2 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
IRANG(3)	V95H2053CF	IMU 3 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
OPER_CMD(1)	V71K2576XG	IMU-1 OPERATE MODE CMD	GROUND IMU DISP IMU 1 TLM				93017G	*
OPER_CMD(1)	V95X0655XE	IMU 1 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
OPER_CMD(2)	V71K3576XG	IMU-2 OPERATE MODE CMD	GROUND IMU DISP IMU 2 TLM				93017G	*
OPER_CMD(2)	V95X0656XE	IMU 2 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
OPER_CMD(3)	V95X0657XE	IMU 3 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
ORANG(1)	V95H0054CF	IMU 1 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
ORANG(2)	V95H1054CF	IMU 2 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
ORANG(3)	V95H2054CF	IMU 3 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(1)	V95H0050CF	IMU 1 COMP PITCH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(2)	V95H1050CF	IMU 2 COMP PITCH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE		DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PANG(3)	V95H2050CF	IMU 3 COMP PITCH RES ANGLE		DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
PWR_ON(1)	V95X0020XF	IMU 1 POWER ON		GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PWR_ON(2)	V95X1020XF	IMU 2 POWER ON		GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PWR_ON(3)	V95X2020XF	IMU 3 POWER ON		GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PX(1)	V71K2521BG	IMU-1 TORQUE X CMD	WD1B0-4	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PX(2)	V71K3521BG	IMU-2 TORQUE X CMD	WD1B0-4	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PX(3)	V71K4521BG	IMU-3 TORQUE X CMD	WD1B0-4	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PY(1)	V71K2526BG	IMU-1 TORQUE Y CMD	WD1B5-9	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PY(2)	V71K3526BG	IMU-2 TORQUE Y CMD	WD1B5-9	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PY(3)	V71K4526BG	IMU-3 TORQUE Y CMD	WD1B5-9	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PZ(1)	V71K2531BG	IMU-1 TORQUE Z CMD	WD1B10-14	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
				IMU 1					

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PZ(2)	V71K3531BG	IMU-2 TORQUE Z CMD	WD1B10-14	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS		93017G	*
PZ(3)	V71K4531BG	IMU-3 TORQUE Z CMD	WD1B10-14	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS		93017G	*
S/W_BITE(1)	V95X0046XF	IMU 1 SW BITE STATUS		GROUND IMU DISP			92297B	
S/W_BITE(2)	V95X1046XF	IMU 2 SW BITE STATUS		GROUND IMU DISP			92297B	
S/W_BITE(3)	V95X2046XF	IMU 3 SW BITE STATUS		GROUND IMU DISP			92297B	
SLEW_X_NEG(1)	V71K2543BG	IMU-1 SLEW X NEG	WD2B2	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_X_NEG(2)	V71K3543BG	IMU-2 SLEW X NEG	WD2B2	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_X_NEG(3)	V71K4543BG	IMU-3 SLEW X NEG	WD2B2	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_X_POS(1)	V71K2542BG	IMU-1 SLEW X POS	WD2B1	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_X_POS(2)	V71K3542BG	IMU-2 SLEW X POS	WD2B1	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_X_POS(3)	V71K4542BG	IMU-3 SLEW X POS	WD2B1	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_NEG(1)	V71K2545BG	IMU-1 SLEW Y NEG	WD2B4	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_NEG(2)	V71K3545BG	IMU-2 SLEW Y NEG	WD2B4	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
				IMU 2				

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Y_NEG(3)	V71K4545BG	IMU-3 SLEW Y NEG	WD2B4	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_POS(1)	V71K2544BG	IMU-1 SLEW Y POS	WD2B3	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_POS(2)	V71K3544BG	IMU-2 SLEW Y POS	WD2B3	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_POS(3)	V71K4544BG	IMU-3 SLEW Y POS	WD2B3	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_NEG(1)	V71K2547BG	IMU-1 SLEW Z NEG	WD2B6	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_NEG(2)	V71K3547BG	IMU-2 SLEW Z NEG	WD2B6	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_NEG(3)	V71K4547BG	IMU-3 SLEW Z NEG	WD2B6	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_POS(1)	V71K2546BG	IMU-1 SLEW Z POS	WD2B5	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_POS(2)	V71K3546BG	IMU-2 SLEW Z POS	WD2B5	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_POS(3)	V71K4546BG	IMU-3 SLEW Z POS	WD2B5	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
				IMU 3				

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
TERM_IDLE	V95X0016X	TERM/IDLE IN PROGRESS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP		BD		93017G	*
VELSUMM50X(1)/V_1(1)	V95L0065CA	IMU 1 ACCUM SENSED CHANGE X VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VELSUMM50X(2)/V_2(1)	V95L1065CA	IMU 2 ACCUM SENSED CHANGE X VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VELSUMM50X(3)/V_3(1)	V95L2065CA	IMU 3 ACCUM SENSED CHANGE X VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VELSUMM50Y(1)/V_1(2)	V95L0066CA	IMU 1 ACCUM SENSED CHANGE Y VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VELSUMM50Y(2)/V_2(2)	V95L1066CA	IMU 2 ACCUM SENSED CHANGE Y VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VELSUMM50Y(3)/V_3(2)	V95L2066CA	IMU 3 ACCUM SENSED CHANGE Y VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VELSUMM50Z(1)/V_1(3)	V95L0067CA	IMU 1 ACCUM SENSED CHANGE Z VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VELSUMM50Z(2)/V_2(3)	V95L1067CA	IMU 2 ACCUM SENSED CHANGE Z VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VELSUMM50Z(3)/V_3(3)	V95L2067CA	IMU 3 ACCUM SENSED CHANGE Z VEL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU INT PROC	FT/S	DPL		93017G	*
VRSS(1)	V95L0060CF	IMU 1 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	FT/S2			93017G	*

TABLE 4.5.4.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU TERMINATE/IDLE PROCESSING (V4.11C)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
VRSS(2)	V95L1060CF	IMU 2 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S2			93017G	*
VRSS(3)	V95L2060CF	IMU 3 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	FT/S2			93017G	*
	V71K4576XG	IMU-3 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP IMU 3 TLM				93017G	*
	V72M6683PG	MDM FF02 DSCR OUT SET CD 13 CH 0	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2842PF	CGMB_IMU_FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
	V95M2843PF	CGMB_PWR_ON_DFG	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2848P	CGMB_TERM_IDLE_IPE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2850PF	CGMB_SW_BITE\$(1:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2851PF	CGMB_SW_BITE\$(2:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2852PF	CGMB_SW_BITE\$(3:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

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

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

This page intentionally left blank.



TABLE 4.5.4.1.1-3. IMU TERMINATE/IDLE PROCESSING (V4.11C) 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 4.5.4.1.1-4. IMU TERMINATE/IDLE PROCESSING (V4.11C) 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 4.5.4.1.1-5. IMU TERMINATE/IDLE PROCESSING (V4.11C) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
DEG_PER_RAD RADIAN TO DEGREE CONVERSION FACTOR	V97U0112C	00	+5.72957795131E+01	DEG/RAD	F		S	C A6.9 G4.10 G4.126 G4.127 G4.128 G4.175 G4.20 G4.201 G4.204 G4.208 G4.21 G4.213 G4.220 G4.226 G4.227 G4.23 G4.234 G4.237 G4.24 G4.25 G4.35 G4.36 G4.5 G4.6 G4.66 G4.8 G4.9 G4.97 G5.26 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
GIM_FLIP_B1 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-I	V90H7625C	00	+8.0	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B2 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-II	V90H7626C	00	+1.0	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	

TABLE 4.5.4.1.1-5. IMU TERMINATE/IDLE PROCESSING (V4.11C) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
GIM_FLIP_B3 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-III	V90H7627C	00	+2.60	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B4 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-IV	V90H7628C	00	+2.80	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GO EARTH GRAV ACCEL CONSTANT	V90A7622C	00	+3.2174049	E+01 FT/SEC**2	F		S	P A6.9 G4.10 G4.105 G4.126 G4.204 G4.208 G4.22 G4.220 G4.227 G4.234 G4.237 G4.36 G4.8 G4.9 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
IRL1 INNER ROLL NULL LIMIT 1	V90H7633C	00	+2.40	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
IRL2 INNER ROLL NULL LIMIT 2	V90H7634C	00	+3.360	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
RESLAGT APPROXIMATE MAXIMUM DATA SKEW TIME	V90W7642C	00	+7.0	E-03 SEC	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	

TABLE 4.5.4.1.1-5. IMU TERMINATE/IDLE PROCESSING (V4.11C) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
RESLIMO RESOLVER LIMIT	V90H7640C	00	+1.0	E+00	DEG	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
SFH NOMINAL ACCELEROMETER SCALE FACTOR HIGH-GAIN	V96U7004C	00	+3.444880	E-03	FT/SEC/PULSE	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
SFL NOMINAL ACCELEROMETER SCALE FACTOR LOW-GAIN	V90A7644C	00	+3.444880	E-02	FT/SEC/PULSE	F	S	P G4.208 V4.10 V4.11B V4.11C	90374C	
T_OP_LIMIT TIME IN OPERATE TEST LIMIT	V90W7623C	00	+3.00	E+02	SEC	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
VCMAX VELOCITY COUNTER OVER-FLOW FACTOR EQUALS MSB OF COUNTER	V90Q7637C	00	+2.0	E+15	PULSES	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	

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

#### 4.5.4.2 Initial Attitude Determination.

The attitude of the Shuttle navigation base with respect to the NWU reference coordinate system must be determined each time that the navigation base is moved (vehicle position changed). The IMU SOP performs this function by computing the transformation matrix from navigation base to NWU (TNB\_NWU). The correct value of this transformation for the current navigation base attitude must be available prior to performing IMU calibration and alignment.

##### 4.5.4.2.1 IMU Attitude Determination (IMU\_ATT).

The purpose of the IMU\_ATT module is to determine the attitude of the navigation base relative to the NWU reference.

A. Functional Requirement. The IMU\_ATT module performs the following function:

Utilize velocity and resolver data to determine a transformation matrix from the navigation base to NWU for each applicable IMU.

B. Interface Requirements. The input/output interfaces associated with the IMU\_ATT module are listed in Tables 4.5.4.2.1-1 and 4.5.4.2.1-2.

C. Detailed Requirements. The following sequence of operations is required for each applicable IMU.

1. Set the IMU accelerometer loops to high gain.
2. Set non-instrument associated torquing commands to zero:

$$RDCL_i = 0 \text{ for } i = X, Y, X$$

$$\text{Set TCB} = \text{TCA}/3$$

$$\text{Set } [T_R^{PC}] \text{ equal to}$$

an identity matrix  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$  for use in the ground sequence modules.

3. Perform ground sequence 7 (refer to Section 4.1.4) for TCB seconds.
4. Upon expiration of the TCB time in ground sequence 7, determine the navigation base to-present cluster transformation by calling the TNB\_CL module.

5. Compute

$$\text{THETA}(3) = \text{THETA}(3) + G$$

$$\overline{\text{THETA}} = \begin{bmatrix} T \\ R \end{bmatrix}^{\text{PC}} \overline{\text{THETA}}$$

$$\overline{\text{ETD}} = \begin{bmatrix} T \\ R \end{bmatrix}^{\text{PC}} \overline{\text{ETD}}$$

6. Compute the unit up vector in cluster coordinates:

$$\overline{U}_c = \frac{\text{THETA}(1) \overline{X} + \text{THETA}(2) \overline{Y} + \text{THETA}(3) \overline{Z}}{\left[ \text{THETA}(1)^2 + \text{THETA}(2)^2 + \text{THETA}(3)^2 \right]^{\frac{1}{2}}}$$

where THETA(i), i = 1, 2, 3, (N, W, U) are the components of  $\overline{\text{THETA}}$  from the LSF\_FILR module (THETA(1) is a measure of the tilt of the north axis about west, etc.) and  $\overline{X} = (1, 0, 0)$ ;  $\overline{Y} = (0, 1, 0)$ ;  $\overline{Z} = (0, 0, 1)$ .

7. Compute the estimated north component of earth's rate vector in cluster coordinates:

$$\overline{WN}_{\text{est}} = \frac{-[\text{ETD}(2) \overline{X} - \text{ETD}(1) \overline{Y} + \text{ETD}(3) \overline{Z}]}{\left[ \sum_{i=1}^{i=3} \text{ETD}^2(i) \right]^{\frac{1}{2}}}$$

where ETD(i), i = 1, 2, 3 are the components of  $\overline{\text{ETD}}$ . (ETD(1) is the drift of the north axis about west, etc.)

8. Compute the west and north vectors in cluster coordinates:

$$\overline{W}_c = -\overline{WN}_{\text{est}} \times \frac{\overline{U}_c}{|\overline{WN}_{\text{est}} \times \overline{U}_c|}$$

$$\overline{N}_c = -\overline{U}_c \times \frac{\overline{W}_c}{|\overline{U}_c \times \overline{W}_c|}$$

where x denotes cross product and  $\overline{N}_c = N_x \overline{X} + N_y \overline{Y} + N_z \overline{Z}$ , etc.

9. Compute an estimate of cluster-to-NWU reference:

$$\begin{bmatrix} T \\ \text{CL} \end{bmatrix}^{\text{NWU1}} = \begin{bmatrix} N_x & N_y & N_z \\ W_x & W_y & W_z \\ U_x & U_y & U_z \end{bmatrix}$$

10. Transform the  $U_c$  and  $ETD$  vectors to local vertical frame:

$$\bar{U}_c = [T_{CL}^{NWU1}] \bar{U}_c$$

$$E\bar{T}D = [T_{CL}^{NWU1}] E\bar{T}D$$

11. Update the north and west vectors by repeating steps 7 and 8, using the vectors from step 10 as arguments.
12. Compute an updated cluster-to-NWU transformation:

$$[T_{CL}^{NWU2}] = \begin{bmatrix} N_x & N_y & N_z \\ W_x & W_y & W_z \\ U_x & U_y & U_z \end{bmatrix}$$

13. Compute an earth rate correction transformation:

$$WNT = (TCB) (WN)/(RAD)$$

$$WUT = (TCB) \left[ \frac{WU}{2} \right] / (RAD)$$

$$[TCOR] = \begin{bmatrix} CWUT & (SWUT) \cdot (CWNT) & (SWUT) \cdot (SWNT) \\ -SWUT & (CWUT) \cdot (CWNT) & (CWUT) \cdot (SWNT) \\ 0 & -SWNT & CWNT \end{bmatrix}$$

where  $CWUT = \cos WUT$ ,  $SWUT = \sin WUT$ , etc.

14. Compute the present cluster-to-NWU transformation:

$$[T_{PC}^{NWU}] = [TCOR] [T_{CL}^{NWU2}] [T_{CL}^{NWU1}]$$

15. Reinitialize reference matrix and time:

$$[T_R^{PC}] = [T_{PC}^{NWU}]^T$$

$$TCB = TCA$$

and repeat steps 3 through 14, then proceed to step 16.



16. Compute the navigation base-to-NWU transformation:

$$\left[ T_{NB}^{NWU} \right] = \left[ T_{PC}^{NWU} \right] \left[ T_{NB}^{PC} \right]$$

Make each  $\left[ T_{NB}^{NWU} \right]$  available for use by other software modules and proceed to the TERM/IDLE submode.

In addition to the foregoing requirements, whenever the IMU attitude determination submode is in progress, an ATTITUDE DETERMINATION IN PROGRESS flag shall be set equal to one and made available to DISPLAYS.

The IMU\_ATT module will be executed when requested by the user. The ground sequence called by IMU\_ATT shall be executed at a 320-msec rate. A suggested design flow which satisfies the IMU\_ATT requirements is shown in Figure 4.5.4.2.1-1.

- D. Special Considerations. This section identifies user interface requirements associated with IMU attitude determination and discusses the recommended utilization of the IMU attitude determination submode.

1. IMU Attitude Determination User Interface. The following CRT format is required to control and monitor the IMU attitude determination mechanization described in previous paragraphs:

ATT\_DET 19X      TERM/IDLE 27X

Item 19X is used to request the attitude determination submode for all selected IMU's that are currently in the OPERATE mode. The X-position displays an asterisk whenever attitude determination is active. This submode is nominally completed in 240 seconds.

Item 27X may be used to terminate attitude determination prior to normal completion. The X-position displays an asterisk when the program is in the TERM/IDLE submode.

Note that the specific correct item numbers are defined in the D&C FSSR.

2. IMU Attitude Determination Operations. The following guidelines are recommended for effective use of the IMU attitude determination submode.
- It is required that currently valid IMU calibration parameters be stored in memory before IMU attitude determination is performed.
  - Prior to performing alignment or calibration, it is required that the IMU attitude determination submode be completed for each IMU after any physical movement of the vehicle/navigation base or any change in computer memory which may invalidate the navigation base-to-NWU transformations.
  - The IMU attitude determination submode may be used as a first check for any gross failures in the IMU accelerometer and resolver channels and in the gyro stabilization loops. Any such failure would result in widely different navigation base-to-NWU transformation matrices for the three IMU's. For successful calibration and gyrocompassing, it is desirable to prescreen such an anomalous case.

Table 4.5.4.2.1-1. IMU\_ATT Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
T <sub>PC</sub> NB	V99U3405C THRU V99U3431C	TRANSFORMATION: NAVIGATION BASE TO PRESENT CLUSTER; 1 PER IMU	TNB_CL	MATRIX	+/-1	NA	ONCE
RAD	V97U6133C	CONVERSION FACTOR TO CONVERT RADIANS TO ARC-SECONDS	CONSTANT	SCALAR	206264.8	ARC- SEC /RAD	ONCE
TCA	V96W7179C	TIME FOR COARSE ALIGN	K-LOAD	SCALAR	179.84	SEC	ONCE
THETA	V99U3220C THRU V99U3228C	ESTIMATED ACCELERATION VECTOR (NWU ORDER); 1 PER IMU	LSF_FILR	VECTOR	+/-70	FT/SEC **2	ONCE
ETD	V99U2845C THRU V99U2853C	LSF ESTIMATED DRIFT VECTOR (NWU ORDER); 1 PER IMU	LSF_FILR	VECTOR	+/-100	DEG/ HR	ONCE
G_SITE_N (N = 1-9)	V96A7002C	LOCAL GRAVITY VALUE	I-LOAD	SCALAR	32.08- 32.21	FT/SEC **2	ONCE
WN	V96R7026C	NORTH COMP OF EARTH'S RATE	I-LOAD	SCALAR	0-15.2	DEG/ HR	ONCE
WU	V96R7027C	UP COMP OF EARTH'S RATE	I-LOAD	SCALAR	0-15.2	DEG/ HR	ONCE
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0, 1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0, 1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0, 1	NA	OD

Table 4.5.4.2.1-2. IMU\_ATT Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
T <sub>NWU</sub> NB	V99U2790C THRU V99U2816C	TRANSFORMATION: NAVIGATION BASE TO NWU; 1 PER IMU	HANG_CALA HANG_CALB PFLT_CALA HANG_CALC GC_ALIGN, TLM	MATRIX	+/-1	NA	ONCE
T <sub>PC</sub> R		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER; 1 PER IMU	ACP_TRSF	MATRIX	+/-1	NA	ONCE
ACCEL_SF(1)	V71K2541B	IMU-1 CAPRI SF WD2 BO CMD	IMU-1, TLM	LOGICAL	0, 1	NA	OD
ACCEL_SF(2)	V71K3541B	IMU-2 CAPRI SF WD2 BO CMD	IMU-2, TLM	LOGICAL	0, 1	NA	OD
ACCEL_SF(3)	V71K4541B	IMU-3 CAPRI SF WD2 BO CMD	IMU-3, TLM	LOGICAL	0, 1	NA	OD
ATT_DET	V99X2718X	ATT DETERM IN PROGRESS	DISPLAY, TLM (V5.1.8)	LOGICAL	0, 1	NA	OD
RDCLX		DESIRED X-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	ONCE
RDCLY		DESIRED Y-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	ONCE
RDCLZ		DESIRED Z-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	ONCE

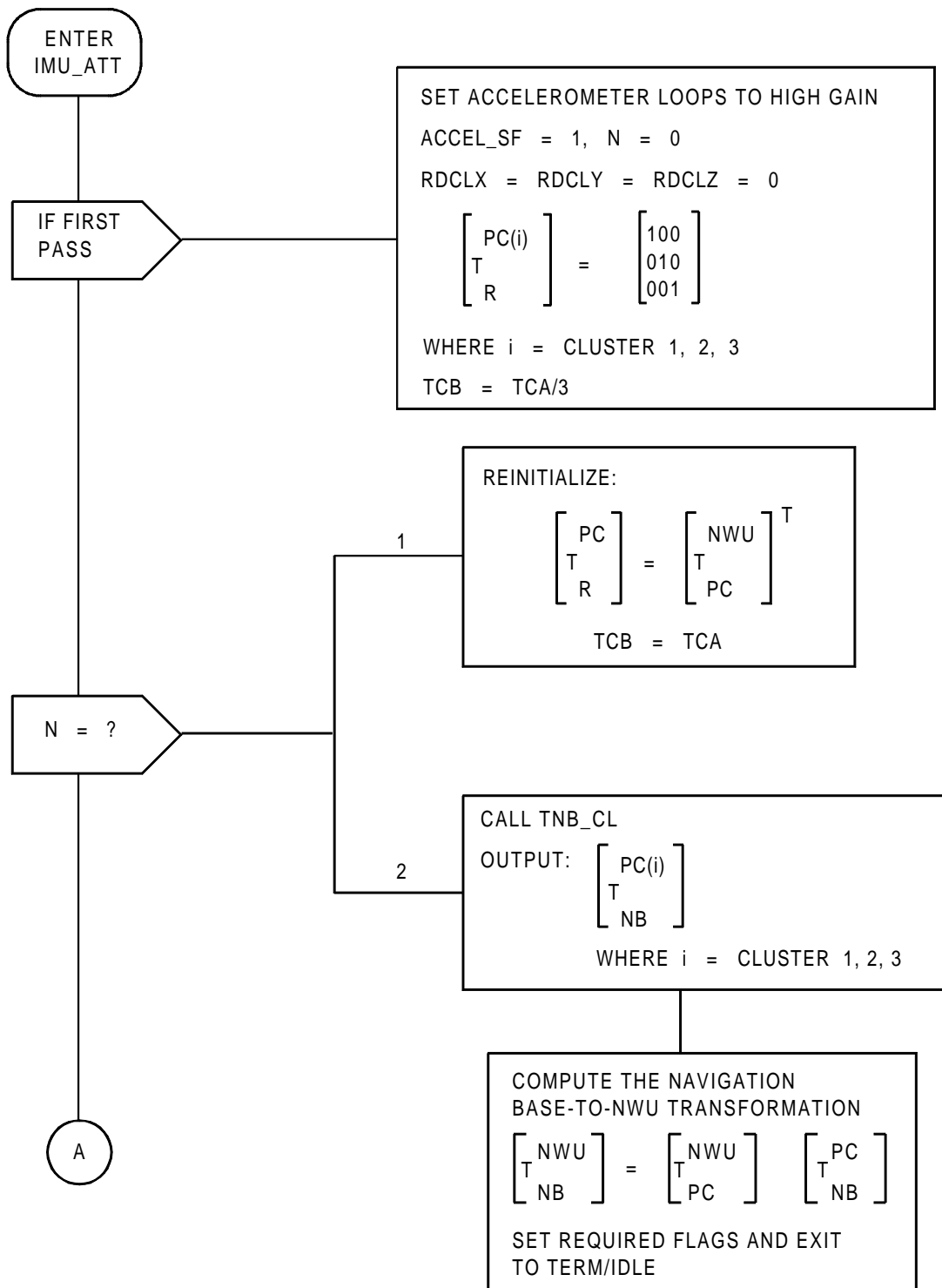


FIGURE 4.5.4.2.1-1.(1) IMU\_ATT Flow Diagram (Sheet 1 of 4)

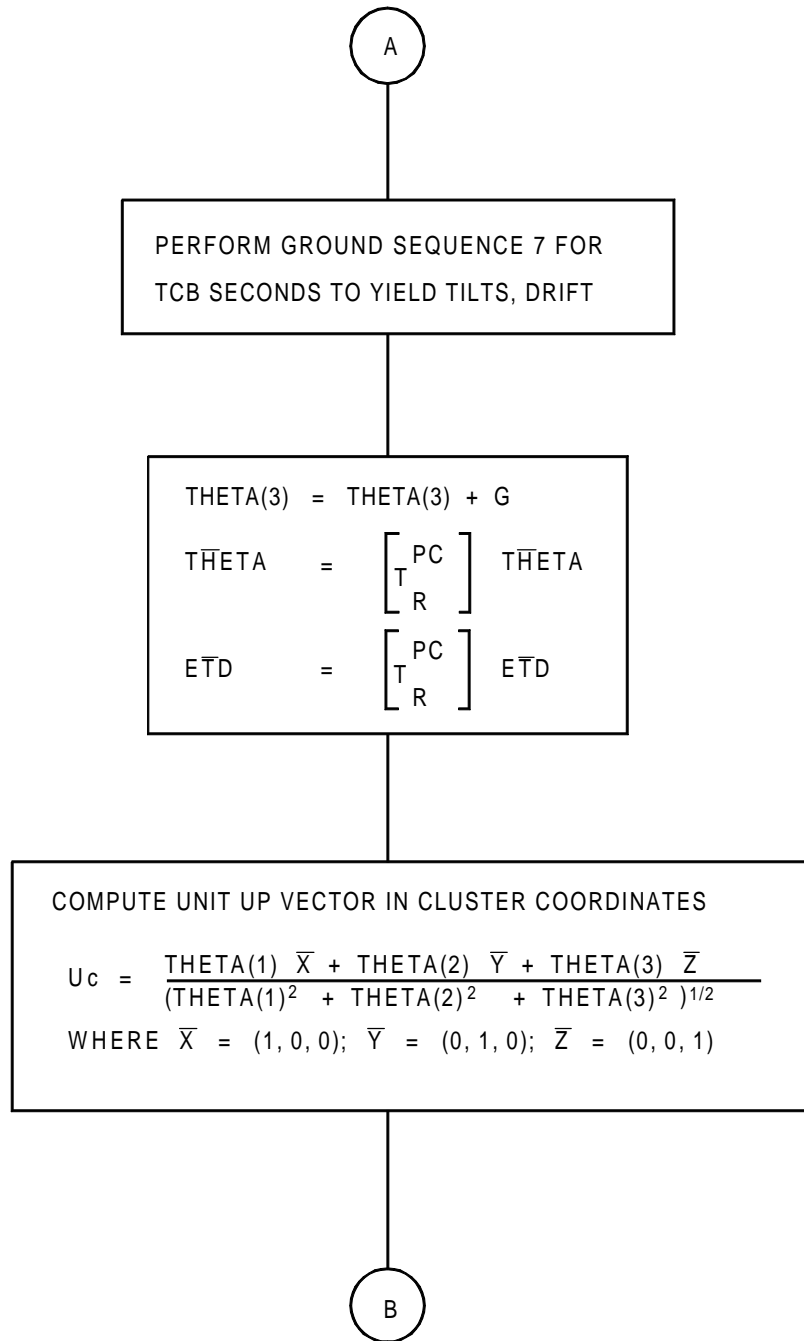


FIGURE 4.5.4.2.1-1.(2) IMU\_ATT Flow Diagram (Sheet 2 of 4)

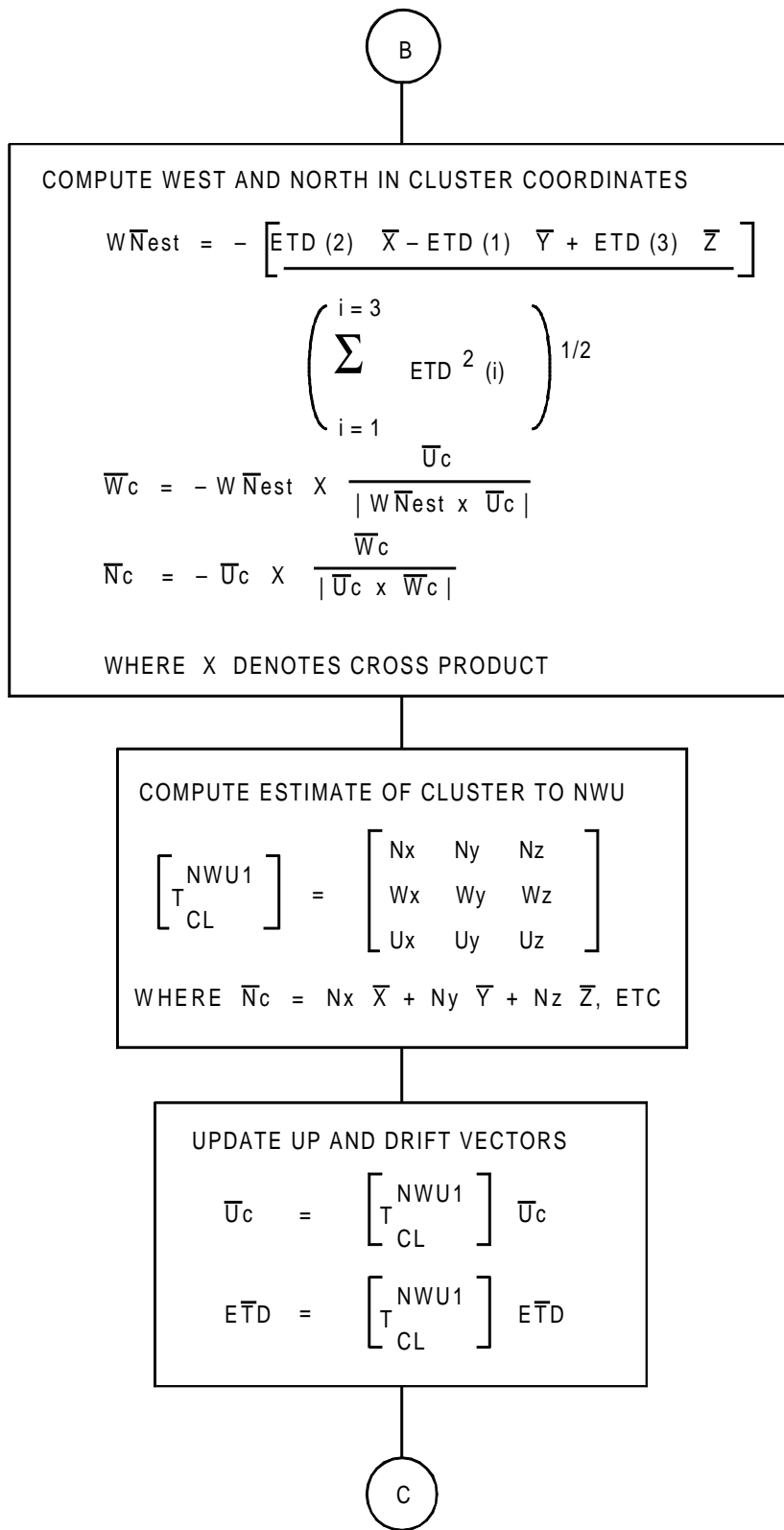


FIGURE 4.5.4.2.1-1.(3) IMU\_ATT Flow Diagram (Sheet 3 of 4)

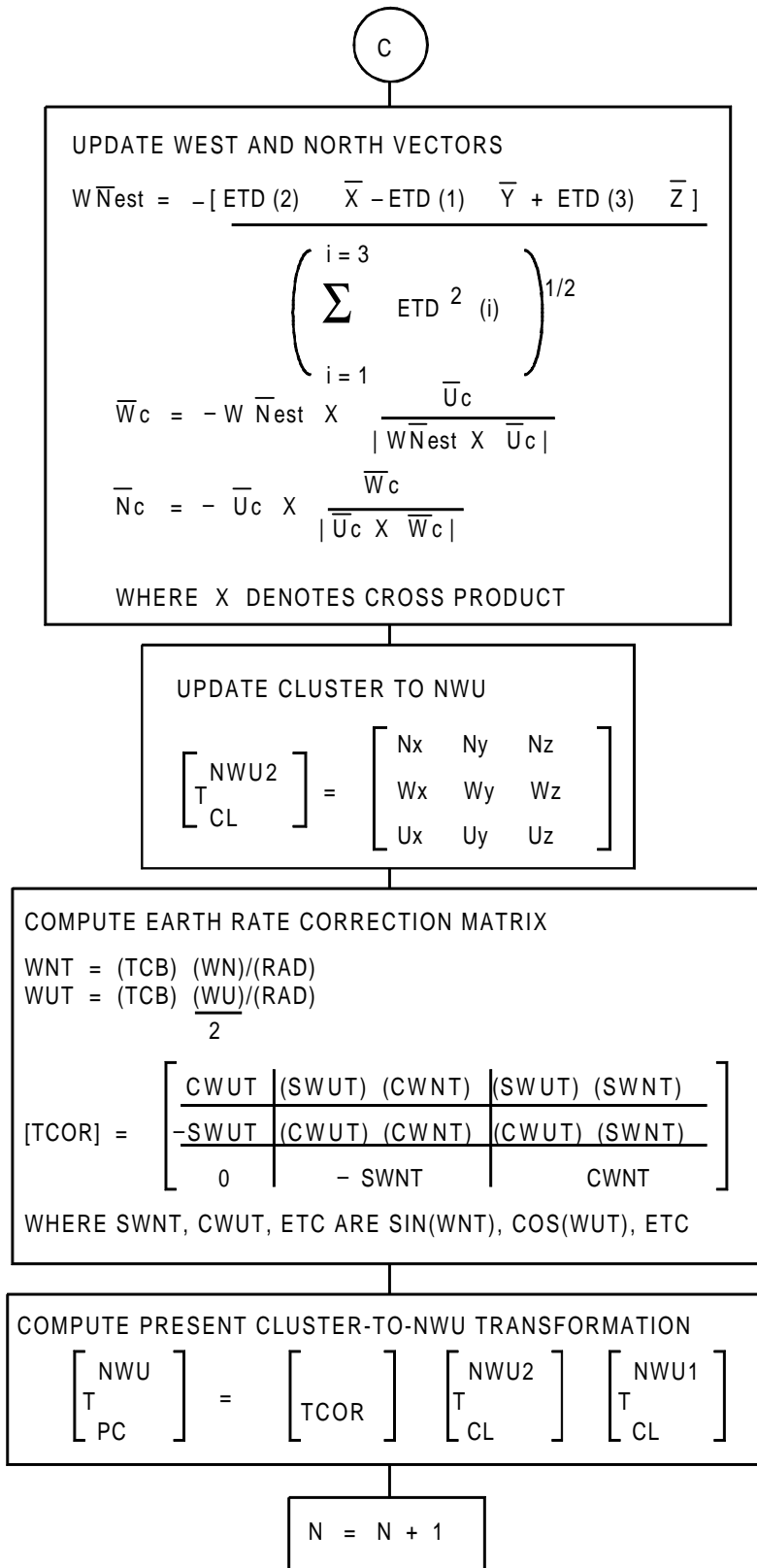


FIGURE 4.5.4.2.1-1.(4) IMU\_ATT Flow Diagram (Sheet 4 of 4)

#### **4.5.4.2.2 Parameter Tables for IMU Attitude Determination.**

The IDD inputs and outputs are listed in Tables 4.5.4.2.2-1 and 4.5.4.2.2-2. In the table it should be noted that the CAPRI TEMP discretes are set true (=1) when power is applied to the HAINS IMU and some dual discretes have been designated with dual names dependent upon IMU hardware. The first part of the dual name is for the KT-70 IMU while the second part is for the HAINS IMU. Values for the I-loads are contained in the I-load requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.5.4.2.2-3. K-loads are listed in Table 4.5.4.2.2-4. Constants are listed in Table 4.5.4.2.2-5.

TABLE 4.5.4.2.2-1. INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AD_FAIL(1)	V71X2023B	IMU-1 A/D FAIL	WD1B2	IMU 1	BD		93017G	*
AD_FAIL(2)	V71X3023B	IMU-2 A/D FAIL	WD1B2	IMU 2	BD		93017G	*
AD_FAIL(3)	V71X4023B	IMU-3 A/D FAIL	WD1B2	IMU 3	BD		93017G	*
AZO(1)	V99H2610CA	AZIMUTH RESOLVER OFFSET(1)		IMU GND CAL	DEG		93017G	*
AZO(1)	V99H2610CB	AZIMUTH RESOLVER OFFSET(1)		MASS MEM	DEG			
AZO(2)	V99H2611CA	AZIMUTH RESOLVER OFFSET(2)		IMU GND CAL	DEG		93017G	*
AZO(2)	V99H2611CB	AZIMUTH RESOLVER OFFSET(2)		MASS MEM	DEG			
AZO(3)	V99H2612CA	AZIMUTH RESOLVER OFFSET(3)		IMU GND CAL	DEG		93017G	*
AZO(3)	V99H2612CB	AZIMUTH RESOLVER OFFSET(3)		MASS MEM	DEG			
BXY(1)	V99H2590CA	X-GYRO MISALIGNMENT TO Y-REF(1)		IMU GND CAL	RAD		93017G	*
BXY(1)	V99H2590CB	X-GYRO MISALIGNMENT TO Y-REF(1)		MASS MEM	RAD		90525D	
BXY(2)	V99H2591CA	X-GYRO MISALIGNMENT TO Y-REF(2)		IMU GND CAL	RAD		93017G	*
BXY(2)	V99H2591CB	X-GYRO MISALIGNMENT TO Y-REF(2)		MASS MEM	RAD		90525D	
BXY(3)	V99H2592CA	X-GYRO MISALIGNMENT TO Y-REF(3)		IMU GND CAL	RAD		93017G	*
BXY(3)	V99H2592CB	X-GYRO MISALIGNMENT TO Y-REF(3)		MASS MEM	RAD		90525D	
BXZ(1)	V99H2593CA	X-GYRO MISALIGNMENT TO Z-REF(1)		IMU GND CAL	RAD		93017G	*
BXZ(1)	V99H2593CB	X-GYRO MISALIGNMENT TO Z-REF(1)		MASS MEM	RAD		90525D	
BXZ(2)	V99H2594CA	X-GYRO MISALIGNMENT TO Z-REF(2)		IMU GND CAL	RAD		93017G	*
BXZ(2)	V99H2594CB	X-GYRO MISALIGNMENT TO Z-REF(2)		MASS MEM	RAD		90525D	
BXZ(3)	V99H2595CA	X-GYRO MISALIGNMENT TO Z-REF(3)		IMU GND CAL	RAD		93017G	*
BXZ(3)	V99H2595CB	X-GYRO MISALIGNMENT TO Z-REF(3)		MASS MEM	RAD		90525D	
BYX(1)	V99H2596CA	Y-GYRO MISALIGNMENT TO X-REF(1)		IMU GND CAL	RAD		93017G	*
BYX(1)	V99H2596CB	Y-GYRO MISALIGNMENT TO X-REF(1)		MASS MEM	RAD		90525D	
BYX(2)	V99H2597CA	Y-GYRO MISALIGNMENT TO X-REF(2)		IMU GND CAL	RAD		93017G	*
BYX(2)	V99H2597CB	Y-GYRO MISALIGNMENT TO X-REF(2)		MASS MEM	RAD		90525D	
BYX(3)	V99H2598CA	Y-GYRO MISALIGNMENT TO X-REF(3)		IMU GND CAL	RAD		93017G	*
BYX(3)	V99H2598CB	Y-GYRO MISALIGNMENT TO X-REF(3)		MASS MEM	RAD		90525D	
BYZ(1)	V99H2599CA	Y-GYRO MISALIGNMENT TO Z-REF(1)		IMU GND CAL	RAD		93017G	*
BYZ(1)	V99H2599CB	Y-GYRO MISALIGNMENT TO Z-REF(1)		MASS MEM	RAD		90525D	
BYZ(2)	V99H2600CA	Y-GYRO MISALIGNMENT TO Z-REF(2)		IMU GND CAL	RAD		93017G	*
BYZ(2)	V99H2600CB	Y-GYRO MISALIGNMENT TO Z-REF(2)		MASS MEM	RAD		90525D	
BYZ(3)	V99H2601CA	Y-GYRO MISALIGNMENT TO Z-REF(3)		IMU GND CAL	RAD		93017G	*
BYZ(3)	V99H2601CB	Y-GYRO MISALIGNMENT TO Z-REF(3)		MASS MEM	RAD		90525D	
BZX(1)	V99H2602CA	Z-GYRO MISALIGNMENT TO X-REF(1)		IMU GND CAL	RAD		93017G	*
BZX(1)	V99H2602CB	Z-GYRO MISALIGNMENT TO X-REF(1)		MASS MEM	RAD		90525D	
BZX(2)	V99H2603CA	Z-GYRO MISALIGNMENT TO X-REF(2)		IMU GND CAL	RAD		93017G	*
BZX(2)	V99H2603CB	Z-GYRO MISALIGNMENT TO X-REF(2)		MASS MEM	RAD		90525D	
BZX(3)	V99H2604CA	Z-GYRO MISALIGNMENT TO X-REF(3)		IMU GND CAL	RAD		93017G	*
BZX(3)	V99H2604CB	Z-GYRO MISALIGNMENT TO X-REF(3)		MASS MEM	RAD		90525D	
BZY(1)	V99H2605CA	Z-GYRO MISALIGNMENT TO Y-REF(1)		IMU GND CAL	RAD		93017G	*
BZY(1)	V99H2605CB	Z-GYRO MISALIGNMENT TO Y-REF(1)		MASS MEM	RAD		90525D	
BZY(2)	V99H2606CA	Z-GYRO MISALIGNMENT TO Y-REF(2)		IMU GND CAL	RAD		93017G	*
BZY(2)	V99H2606CB	Z-GYRO MISALIGNMENT TO Y-REF(2)		MASS MEM	RAD		90525D	
BZY(3)	V99H2607CA	Z-GYRO MISALIGNMENT TO Y-REF(3)		IMU GND CAL	RAD		93017G	*
BZY(3)	V99H2607CB	Z-GYRO MISALIGNMENT TO Y-REF(3)		MASS MEM	RAD		90525D	
CAP_TEMP_RDY(1)	V71X2406X	IMU 1 CAPRI TEMP READY		IMU 1	BD		93017G	*



TABLE 4.5.4.2.2-1. INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
CAP_TEMP_RDY(2)	V71X3406X	IMU 2 CAPRI TEMP READY	IMU 2		BD		93017G	*
CAP_TEMP_RDY(3)	V71X4406X	IMU 3 CAPRI TEMP READY	IMU 3		BD		93017G	*
CAP_TEMP_SAFE(1)	V71X2407X	IMU 1 CAPRI TEMP SAFE	IMU 1		BD		93017G	*
CAP_TEMP_SAFE(2)	V71X3407X	IMU 2 CAPRI TEMP SAFE	IMU 2		BD		93017G	*
CAP_TEMP_SAFE(3)	V71X4407X	IMU 3 CAPRI TEMP SAFE	IMU 3		BD		93017G	*
CVX(1)	V71L2200B	IMU-1 ACCUMD VX	WD10 IMU 1		HXU		93017G	*
CVX(2)	V71L3200B	IMU-2 ACCUMD VX	WD10 IMU 2		HXU		93017G	*
CVX(3)	V71L4200B	IMU-3 ACCUMD VX	WD10 IMU 3		HXU		93017G	*
CVY(1)	V71L2220B	IMU-1 ACCUMD VY	WD11 IMU 1		HXU		93017G	*
CVY(2)	V71L3220B	IMU-2 ACCUMD VY	WD11 IMU 2		HXU		93017G	*
CVY(3)	V71L4220B	IMU-3 ACCUMD VY	WD11 IMU 3	PULSES	HXU		93017G	*
CVZ(1)	V71L2240B	IMU-1 ACCUMD VZ	WD12 IMU 1		HXU		93017G	*
CVZ(2)	V71L3240B	IMU-2 ACCUMD VZ	WD12 IMU 2		HXU		93017G	*
CVZ(3)	V71L4240B	IMU-3 ACCUMD VZ	WD12 IMU 3	PULSES	HXU		93017G	*
D1/D8_SEQR(1)	V71X2032B	IMU-1 D1/D8 SEQUENCER	WD1B11 IMU 1		BD		93017G	*
D1/D8_SEQR(2)	V71X3032B	IMU-2 D1/D8 SEQUENCER	WD1B11 IMU 2		BD		93017G	*
D1/D8_SEQR(3)	V71X4032B	IMU-3 D1/D8 SEQUENCER	WD1B11 IMU 3		BD		93017G	*
D2_SEQR(1)	V71X2033B	IMU-1 D2 SEQUENCER	WD1B12 IMU 1		BD		93017G	*
D2_SEQR(2)	V71X3033B	IMU-2 D2 SEQUENCER	WD1B12 IMU 2		BD		93017G	*
D2_SEQR(3)	V71X4033B	IMU-3 D2 SEQUENCER	WD1B12 IMU 3		BD		93017G	*
D3_SEQR(1)	V71X2034B	IMU-1 D3 SEQUENCER	WD1B13 IMU 1		BD		93017G	*
D3_SEQR(2)	V71X3034B	IMU-2 D3 SEQUENCER	WD1B13 IMU 2		BD		93017G	*
D3_SEQR(3)	V71X4034B	IMU-3 D3 SEQUENCER	WD1B13 IMU 3		BD		93017G	*
D4_SEQR(1)	V71X2035B	IMU-1 D4 SEQUENCER	WD1B14 IMU 1		BD		93017G	*
D4_SEQR(2)	V71X3035B	IMU-2 D4 SEQUENCER	WD1B14 IMU 2		BD		93017G	*
D4_SEQR(3)	V71X4035B	IMU-3 D4 SEQUENCER	WD1B14 IMU 3		BD		93017G	*
D5_SEQR(1)	V71X2036B	IMU-1 D5 SEQUENCER	WD1B15 IMU 1		BD		93017G	*
D5_SEQR(2)	V71X3036B	IMU-2 D5 SEQUENCER	WD1B15 IMU 2		BD		93017G	*
D5_SEQR(3)	V71X4036B	IMU-3 D5 SEQUENCER	WD1B15 IMU 3		BD		93017G	*
DCDC_1_FAIL(1)	V71X2026B	IMU-1 DC/DC NO 1 FAIL	WD1B5 IMU 1		BD		93017G	*
DCDC_1_FAIL(2)	V71X3026B	IMU-2 DC/DC NO 1 FAIL	WD1B5 IMU 2		BD		93017G	*
DCDC_1_FAIL(3)	V71X4026B	IMU-3 DC/DC NO 1 FAIL	WD1B5 IMU 3		BD		93017G	*
DELTXZ(1)	V99H2552CA	X-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL	RAD			93017G	*
DELTXZ(1)	V99H2552CB	X-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD				
DELTXZ(2)	V99H2553CA	X-ACCEL MISALIGNMENT TO Z-REF(2)	IMU GND CAL	RAD			93017G	*
DELTXZ(2)	V99H2553CB	X-ACCEL MISALIGNMENT TO Z-REF(2)	MASS MEM	RAD				
DELTXZ(3)	V99H2554CA	X-ACCEL MISALIGNMENT TO Z-REF(3)	IMU GND CAL	RAD			93017G	*
DELTXZ(3)	V99H2554CB	X-ACCEL MISALIGNMENT TO Z-REF(3)	MASS MEM	RAD				
DELTYX(1)	V99H2540CA	Y-ACCEL MISALIGNMENT TO X-REF(1)	IMU GND CAL	RAD			93017G	*
DELTYX(1)	V99H2540CB	Y-ACCEL MISALIGNMENT TO X-REF(1)	MASS MEM	RAD			90525D	
DELTYX(2)	V99H2541CA	Y-ACCEL MISALIGNMENT TO X-REF(2)	IMU GND CAL	RAD			93017G	*
DELTYX(2)	V99H2541CB	Y-ACCEL MISALIGNMENT TO X-REF(2)	MASS MEM	RAD			90525D	
DELTYX(3)	V99H2542CA	Y-ACCEL MISALIGNMENT TO X-REF(3)	IMU GND CAL	RAD			93017G	*
DELTYX(3)	V99H2542CB	Y-ACCEL MISALIGNMENT TO X-REF(3)	MASS MEM	RAD			90525D	
DELTYZ(1)	V99H2549CA	Y-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL	RAD			93017G	*
DELTYZ(1)	V99H2549CB	Y-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD				

TABLE 4.5.4.2.2-1. INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTYZ (2)	V99H2550CA	Y-ACCEL MISALIGNMENT TO Z-REF (2)	IMU GND CAL	RAD			93017G	*
DELTYZ (2)	V99H2550CB	Y-ACCEL MISALIGNMENT TO Z-REF (2)	MASS MEM	RAD				
DELTYZ (3)	V99H2551CA	Y-ACCEL MISALIGNMENT TO Z-REF (3)	IMU GND CAL	RAD			93017G	*
DELTYZ (3)	V99H2551CB	Y-ACCEL MISALIGNMENT TO Z-REF (3)	MASS MEM	RAD				
DELTZX (1)	V99H2543CA	Z-ACCEL MISALIGNMENT TO X-REF (1)	IMU GND CAL	RAD			93017G	*
DELTZX (1)	V99H2543CB	Z-ACCEL MISALIGNMENT TO X-REF (1)	MASS MEM	RAD			90525D	
DELTZX (2)	V99H2544CA	Z-ACCEL MISALIGNMENT TO X-REF (2)	IMU GND CAL	RAD			93017G	*
DELTZX (2)	V99H2544CB	Z-ACCEL MISALIGNMENT TO X-REF (2)	MASS MEM	RAD			90525D	
DELTZX (3)	V99H2545CA	Z-ACCEL MISALIGNMENT TO X-REF (3)	IMU GND CAL	RAD			93017G	*
DELTZX (3)	V99H2545CB	Z-ACCEL MISALIGNMENT TO X-REF (3)	MASS MEM	RAD			90525D	
DELTZY (1)	V99H2546CA	Z-ACCEL MISALIGNMENT TO Y-REF (1)	IMU GND CAL	RAD			93017G	*
DELTZY (1)	V99H2546CB	Z-ACCEL MISALIGNMENT TO Y-REF (1)	MASS MEM	RAD			90525D	
DELTZY (2)	V99H2547CA	Z-ACCEL MISALIGNMENT TO Y-REF (2)	IMU GND CAL	RAD			93017G	*
DELTZY (2)	V99H2547CB	Z-ACCEL MISALIGNMENT TO Y-REF (2)	MASS MEM	RAD			90525D	
DELTZY (3)	V99H2548CA	Z-ACCEL MISALIGNMENT TO Y-REF (3)	IMU GND CAL	RAD			93017G	*
DELTZY (3)	V99H2548CB	Z-ACCEL MISALIGNMENT TO Y-REF (3)	MASS MEM	RAD			90525D	
DFR (1)	V99U5952CA	IMU 1 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR (1)	V99U5952CB	IMU 1 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFR (2)	V99U5953CA	IMU 2 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR (2)	V99U5953CB	IMU 2 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFR (3)	V99U5954CA	IMU 3 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR (3)	V99U5954CB	IMU 3 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFX (1)	V99R2560CB	X-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFX (1)	V99R2560CC	X-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFX (2)	V99R2561CB	X-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFX (2)	V99R2561CC	X-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFX (3)	V99R2562CB	X-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFX (3)	V99R2562CC	X-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DFY (1)	V99R2563CB	Y-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFY (1)	V99R2563CC	Y-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFY (2)	V99R2564CB	Y-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFY (2)	V99R2564CC	Y-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFY (3)	V99R2565CB	Y-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFY (3)	V99R2565CC	Y-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DFZ (1)	V99R2566CB	Z-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFZ (1)	V99R2566CC	Z-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFZ (2)	V99R2567CB	Z-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFZ (2)	V99R2567CC	Z-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFZ (3)	V99R2568CB	Z-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFZ (3)	V99R2568CC	Z-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DIR (1)	V99U5955CA	IMU 1 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (1)	V99U5955CB	IMU 1 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR (2)	V99U5956CA	IMU 2 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (2)	V99U5956CB	IMU 2 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR (3)	V99U5957CA	IMU 3 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (3)	V99U5957CB	IMU 3 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	

TABLE 4.5.4.2.2-1. INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DIX(1)	V99U2570CA	X-GYRO IN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DIX(1)	V99U2570CB	X-GYRO IN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DIX(2)	V99U2571CA	X-GYRO IN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DIX(2)	V99U2571CB	X-GYRO IN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DIX(3)	V99U2572CA	X-GYRO IN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DIX(3)	V99U2572CB	X-GYRO IN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DIZ(1)	V99U2573CA	Z-GYRO IN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(1)	V99U2573CB	Z-GYRO IN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DIZ(2)	V99U2574CA	Z-GYRO IN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(2)	V99U2574CB	Z-GYRO IN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DIZ(3)	V99U2575CA	Z-GYRO IN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(3)	V99U2575CB	Z-GYRO IN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DOR(1)	V99U5958CA	IMU 1 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(1)	V99U5958CB	IMU 1 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR(2)	V99U5959CA	IMU 2 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(2)	V99U5959CB	IMU 2 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR(3)	V99U5960CA	IMU 3 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(3)	V99U5960CB	IMU 3 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOZ(1)	V99U2582CA	Z-GYRO OUT AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(1)	V99U2582CB	Z-GYRO OUT AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DOZ(2)	V99U2583CA	Z-GYRO OUT AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(2)	V99U2583CB	Z-GYRO OUT AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DOZ(3)	V99U2584CA	Z-GYRO OUT AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(3)	V99U2584CB	Z-GYRO OUT AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DP(1)	V99H2660CA	IMU-1 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(1)	V99H2660CB	IMU 1 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(2)	V99H2661CA	IMU-2 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(2)	V99H2661CB	IMU 2 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(3)	V99H2662CA	IMU-3 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(3)	V99H2662CB	IMU 3 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DSR(1)	V99U5961CA	IMU 1 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(1)	V99U5961CB	IMU 1 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(2)	V99U5962CA	IMU 2 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(2)	V99U5962CB	IMU 2 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(3)	V99U5963CA	IMU 3 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(3)	V99U5963CB	IMU 3 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSX(1)	V99U2576CA	X-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(1)	V99U2576CB	X-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSX(2)	V99U2577CA	X-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(2)	V99U2577CB	X-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSX(3)	V99U2578CA	X-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(3)	V99U2578CB	X-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DSZ(1)	V99U2579CA	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(1)	V99U2579CB	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSZ(2)	V99U2580CA	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(2)	V99U2580CB	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	

TABLE 4.5.4.2.2-1. INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DSZ(3)	V99U2581CA	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(3)	V99U2581CB	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
ECHO_13(1)	V71M2260P	IMU-1 ECHO 1	WD13 IMU 1		HMD		93017G	*
ECHO_13(2)	V71M3260P	IMU-2 ECHO 1	WD13 IMU 2		HMD		93017G	*
ECHO_13(3)	V71M4260P	IMU-3 ECHO 1	WD13 IMU 3		HMD		93017G	*
ECHO_14(1)	V71M2280P	IMU-1 ECHO 2	WD14 IMU 1		HMD		93017G	*
ECHO_14(2)	V71M3280P	IMU-2 ECHO 2	WD14 IMU 2		HMD		93017G	*
ECHO_14(3)	V71M4280P	IMU-3 ECHO 2	WD14 IMU 3		HMD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(1)	V71X2027B	IMU 1 FLTR DC2/DSCRET PWR SUP FAIL	IMU 1		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(2)	V71X3027B	IMU 2 FLTR DC2/DSCRET PWR SUP FAIL	IMU 2		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(3)	V71X4027B	IMU 3 FLTR DC2/DSCRET PWR SUP FAIL	IMU 3		BD		93017G	*
IMU_CF(1)	V91X3101X	IMU 1 COMMFAULT	FCOS				92354	
IMU_CF(2)	V91X3131X	IMU 2 COMMFAULT	FCOS				92354	
IMU_CF(3)	V91X3161X	IMU 3 COMMFAULT	FCOS				92354	
IN_OPERATE(1)	V71X2403XB	IMU-1 IN OPERATE MODE	IMU 1				93017G	*
IN_OPERATE(2)	V71X3403XB	IMU-2 IN OPERATE MODE	IMU 2				93017G	*
IN_OPERATE(3)	V71X4403XB	IMU-3 IN OPERATE MODE	IMU 3				93017G	*
IO/MUX_FAIL(1)	V71X2022B	IMU 1 IO/MUX FAIL	WD1B1 IMU 1		BD		93017G	*
IO/MUX_FAIL(2)	V71X3022B	IMU 2 IO/MUX FAIL	WD1B1 IMU 2		BD		93017G	*
IO/MUX_FAIL(3)	V71X4022B	IMU 3 IO/MUX FAIL	WD1B1 IMU 3		BD		93017G	*
IRO(1)	V99H2615CA	INNER ROLL RESOLVER OFFSET(1)	IMU GND CAL	DEG			93017G	*
IRO(1)	V99H2615CB	INNER ROLL RESOLVER OFFSET(1)	MASS MEM	DEG				
IRO(2)	V99H2616CA	INNER ROLL RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
IRO(2)	V99H2616CB	INNER ROLL RESOLVER OFFSET(2)	MASS MEM	DEG				
IRO(3)	V99H2617CA	INNER ROLL RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
IRO(3)	V99H2617CB	INNER ROLL RESOLVER OFFSET(3)	MASS MEM	DEG				
KIXH(1)	V99A2681CA	IMU-1 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(1)	V99A2681CB	HIGH-GAIN X-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIXH(2)	V99A2682CA	IMU-2 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(2)	V99A2682CB	HIGH-GAIN X-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIXH(3)	V99A2683CA	IMU-3 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(3)	V99A2683CB	HIGH-GAIN X-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIYH(1)	V99A2684CA	IMU-1 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(1)	V99A2684CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIYH(2)	V99A2685CA	IMU-2 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(2)	V99A2685CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIYH(3)	V99A2686CA	IMU-3 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(3)	V99A2686CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIZH(1)	V99A2687CA	IMU-1 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(1)	V99A2687CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIZH(2)	V99A2688CA	IMU-2 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(2)	V99A2688CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIZH(3)	V99A2689CA	IMU-3 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(3)	V99A2689CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KOXH(1)	V99G2670CA	IMU-1 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(1)	V99G2670CB	HIGH-GAIN X-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	

TABLE 4.5.4.2.2-1. INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOXH(2)	V99G2671CA	IMU-2 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(2)	V99G2671CB	HIGH-GAIN X-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOXH(3)	V99G2672CA	IMU-3 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(3)	V99G2672CB	HIGH-GAIN X-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOYH(1)	V99G2673CA	IMU-1 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(1)	V99G2673CB	HIGH-GAIN Y-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOYH(2)	V99G2674CA	IMU-2 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(2)	V99G2674CB	HIGH-GAIN Y-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOYH(3)	V99G2675CA	IMU-3 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(3)	V99G2675CB	HIGH-GAIN Y-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOZH(1)	V99G2676CA	IMU-1 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(1)	V99G2676CB	HIGH-GAIN Z-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOZH(2)	V99G2677CA	IMU-2 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(2)	V99G2677CB	HIGH-GAIN Z-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOZH(3)	V99G2678CA	IMU-3 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(3)	V99G2678CB	HIGH-GAIN Z-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KT70/HAINS_GOOD(1)	V71X2021B	IMU 1 KT70/HAINS GOOD	WD1B0 IMU 1		BD		93017G	*
KT70/HAINS_GOOD(2)	V71X3021B	IMU 2 KT70/HAINS GOOD	WD1B0 IMU 2		BD		93017G	*
KT70/HAINS_GOOD(3)	V71X4021B	IMU 3 KT70/HAINS GOOD	WD1B0 IMU 3		BD		93017G	*
KTX(1)	V99G2500CA	X-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(1)	V99G2500CB	X-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(2)	V99G2501CA	X-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(2)	V99G2501CB	X-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(3)	V99G2502CA	X-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(3)	V99G2502CB	X-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(1)	V99G2503CA	Y-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(1)	V99G2503CB	Y-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(2)	V99G2504CA	Y-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(2)	V99G2504CB	Y-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(3)	V99G2505CA	Y-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(3)	V99G2505CB	Y-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(1)	V99G2506CA	Z-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(1)	V99G2506CB	Z-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(2)	V99G2507CA	Z-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(2)	V99G2507CB	Z-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(3)	V99G2508CA	Z-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(3)	V99G2508CB	Z-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90185A	
KXR(1)	V99U5964CA	IMU 1 RED GYRO X SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KXR(1)	V99U5964CB	IMU 1 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KXR(2)	V99U5965CA	IMU 2 RED GYRO X SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KXR(2)	V99U5965CB	IMU 2 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KXR(3)	V99U5966CA	IMU 3 RED GYRO X SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KXR(3)	V99U5966CB	IMU 3 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(1)	V99U5967CA	IMU 1 RED GYRO Y SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KYR(1)	V99U5967CB	IMU 1 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(2)	V99U5968CA	IMU 2 RED GYRO Y SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*

TABLE 4.5.4.2.2-1. INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KYR(2)	V99U5968CB	IMU 2 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(3)	V99U5969CA	IMU 3 RED GYRO Y SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KYR(3)	V99U5969CB	IMU 3 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(1)	V99U5970CA	IMU 1 RED GYRO Z SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KZR(1)	V99U5970CB	IMU 1 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(2)	V99U5971CA	IMU 2 RED GYRO Z SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KZR(2)	V99U5971CB	IMU 2 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(3)	V99U5972CA	IMU 3 RED GYRO Z SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KZR(3)	V99U5972CB	IMU 3 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
MODE_BITE(1)	V71M2020P	IMU 1 MODE STATUS WD1	IMU 1		HMD		93017G	*
MODE_BITE(2)	V71M3020P	IMU 2 MODE STATUS WD1	IMU 2		HMD		93017G	*
MODE_BITE(3)	V71M4020P	IMU 3 MODE STATUS WD1	IMU 3		HMD		93017G	*
OMEGA_R(1)	V71R2040B	IMU-1 OMEGA R	WD2 IMU 1	DEG/HR	HFS		93017G	*
OMEGA_R(2)	V71R3040B	IMU-2 OMEGA R	WD2 IMU 2	DEG/HR	HFS		93017G	*
OMEGA_R(3)	V71R4040B	IMU-3 OMEGA R	WD2 IMU 3	DEG/HR	HFS		93017G	*
OPER/STBY(1)	V93X6020X	IMU 1 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(2)	V93X6021X	IMU 2 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(3)	V93X6022X	IMU 3 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
PC/CRCT_CRD_OVRTMP(1)	V71X2029B	IMU 1 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 1		BD		93017G	*
PC/CRCT_CRD_OVRTMP(2)	V71X3029B	IMU 2 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 2		BD		93017G	*
PC/CRCT_CRD_OVRTMP(3)	V71X4029B	IMU 3 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 3		BD		93017G	*
PLAT_FAIL(1)	V71X2024B	IMU-1 PLATFORM FAIL	WD1B3 IMU 1		BD		93017G	*
PLAT_FAIL(2)	V71X3024B	IMU-2 PLATFORM FAIL	WD1B3 IMU 2		BD		93017G	*
PLAT_FAIL(3)	V71X4024B	IMU-3 PLATFORM FAIL	WD1B3 IMU 3		BD		93017G	*
PLAT_TEMP_RDY(1)	V71X2404X	IMU 1 PLATFORM TEMP READY	IMU 1		BD		93017G	*
PLAT_TEMP_RDY(2)	V71X3404X	IMU 2 PLATFORM TEMP READY	IMU 2		BD		93017G	*
PLAT_TEMP_RDY(3)	V71X4404X	IMU 3 PLATFORM TEMP READY	IMU 3		BD		93017G	*
PLAT_TEMP_SAFE(1)	V71X2405X	IMU 1 PLATFORM TEMP SAFE	IMU 1		BD		93017G	*
PLAT_TEMP_SAFE(2)	V71X3405X	IMU 2 PLATFORM TEMP SAFE	IMU 2		BD		93017G	*
PLAT_TEMP_SAFE(3)	V71X4405X	IMU 3 PLATFORM TEMP SAFE	IMU 3		BD		93017G	*
PO(1)	V99H2620CA	PITCH RESOLVER OFFSET(1)	IMU GND CAL	DEG			93017G	*
PO(1)	V99H2620CB	PITCH RESOLVER OFFSET(1)	MASS MEM	DEG				
PO(2)	V99H2621CA	PITCH RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
PO(2)	V99H2621CB	PITCH RESOLVER OFFSET(2)	MASS MEM	DEG				
PO(3)	V99H2622CA	PITCH RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
PO(3)	V99H2622CB	PITCH RESOLVER OFFSET(3)	MASS MEM	DEG				
PRESS/COMM_GOOD(1)	V71X2401X	IMU 1 PRESSURE/COMMUNICATION GOOD	IMU 1		BD		93017G	*
PRESS/COMM_GOOD(2)	V71X3401X	IMU 2 PRESSURE/COMMUNICATION GOOD	IMU 2		BD		93017G	*
PRESS/COMM_GOOD(3)	V71X4401X	IMU 3 PRESSURE/COMMUNICATION GOOD	IMU 3		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(1)	V71X2025B	IMU 1 PWR CNTRLR/DGITAL SBSY FAIL	IMU 1		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(2)	V71X3025B	IMU 2 PWR CNTRLR/DGITAL SBSY FAIL	IMU 2		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(3)	V71X4025B	IMU 3 PWR CNTRLR/DGITAL SBSY FAIL	IMU 3		BD		93017G	*
RX_CUR/RX_FAIL(1)	V71X2028B	IMU 1 RESLVR CURRENT/RESLVR FAIL	IMU 1		BD		93017G	*
RX_CUR/RX_FAIL(2)	V71X3028B	IMU 2 RESLVR CURRENT/RESLVR FAIL	IMU 2		BD		93017G	*
RX_CUR/RX_FAIL(3)	V71X4028B	IMU 3 RESLVR CURRENT/RESLVR FAIL	IMU 3		BD		93017G	*
THETARL(1)	V71H2060B	IMU-1 THETA R 8X	WD3 IMU 1	DEG	BSU		93017G	*

TABLE 4.5.4.2.2-1. INPUT FUNCTIONAL PARAMETERS FOR IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
THETARL(2)	V71H3060B	IMU-2 THETA R 8X	WD3 IMU 2	DEG	BSU		93017G	*
THETARL(3)	V71H4060B	IMU-3 THETA R 8X	WD3 IMU 3	DEG	BSU		93017G	*
THETAXL(1)	V71H2100B	IMU-1 THETA X 8X	WD5 IMU 1	DEG	BSU		93017G	*
THETAXL(2)	V71H3100B	IMU-2 THETA X 8X	WD5 IMU 2	DEG	BSU		93017G	*
THETAXL(3)	V71H4100B	IMU-3 THETA X 8X	WD5 IMU 3	DEG	BSU		93017G	*
THETAXM(1)	V71H2080B	IMU-1 THETA X 1X	WD4 IMU 1	DEG	BSU		93017G	*
THETAXM(2)	V71H3080B	IMU-2 THETA X 1X	WD4 IMU 2	DEG	BSU		93017G	*
THETAXM(3)	V71H4080B	IMU-3 THETA X 1X	WD4 IMU 3	DEG	BSU		93017G	*
THETAYL(1)	V71H2140B	IMU-1 THETA Y 8X	WD7 IMU 1	DEG	BSU		93017G	*
THETAYL(2)	V71H3140B	IMU-2 THETA Y 8X	WD7 IMU 2	DEG	BSU		93017G	*
THETAYL(3)	V71H4140B	IMU-3 THETA Y 8X	WD7 IMU 3	DEG	BSU		93017G	*
THETAYM(1)	V71H2120B	IMU-1 THETA Y 1X	WD6 IMU 1	DEG	BSU		93017G	*
THETAYM(2)	V71H3120B	IMU-2 THETA Y 1X	WD6 IMU 2	DEG	BSU		93017G	*
THETAYM(3)	V71H4120B	IMU-3 THETA Y 1X	WD6 IMU 3	DEG	BSU		93017G	*
THETAZL(1)	V71H2180B	IMU-1 THETA Z 8X	WD9 IMU 1	DEG	BSU		93017G	*
THETAZL(2)	V71H3180B	IMU-2 THETA Z 8X	WD9 IMU 2	DEG	BSU		93017G	*
THETAZL(3)	V71H4180B	IMU-3 THETA Z 8X	WD9 IMU 3	DEG	BSU		93017G	*
THETAZM(1)	V71H2160B	IMU-1 THETA Z 1X	WD8 IMU 1	DEG	BSU		93017G	*
THETAZM(2)	V71H3160B	IMU-2 THETA Z 1X	WD8 IMU 2	DEG	BSU		93017G	*
THETAZM(3)	V71H4160B	IMU-3 THETA Z 1X	WD8 IMU 3	DEG	BSU		93017G	*
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL	WD1B9 IMU 1		BD		93017G	*
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL	WD1B9 IMU 2		BD		93017G	*
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL	WD1B9 IMU 3		BD		93017G	*
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL	WD1B10 IMU 1		BD		93017G	*
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL	WD1B10 IMU 2		BD		93017G	*
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL	WD1B10 IMU 3		BD		93017G	*
V93X6026X		IMU 1 SELECT	GROUND IMU DISP	EVENT	BD			
V93X6027X		IMU 2 SELECT	GROUND IMU DISP	EVENT	BD			
V93X6028X		IMU 3 SELECT	GROUND IMU DISP	EVENT	BD			
V93X6055X		TERM/IDLE COMMAND	GROUND IMU DISP	EVENT	BD			

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

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TNB_NWU_1,1	V99U2790C	NAV BASE TO NWU,IMU-1/ELEMENT 1,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_NWU_1,2	V99U2791C	NAV BASE TO NWU,IMU-1/ELEMENT 1,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_NWU_1,3	V99U2792C	NAV BASE TO NWU,IMU-1/ELEMENT 1,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_NWU_2,1	V99U2793C	NAV BASE TO NWU,IMU-1/ELEMENT 2,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_NWU_2,2	V99U2794C	NAV BASE TO NWU,IMU-1/ELEMENT 2,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_NWU_2,3	V99U2795C	NAV BASE TO NWU,IMU-1/ELEMENT 2,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_NWU_3,1	V99U2796C	NAV BASE TO NWU,IMU-1/ELEMENT 3,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_NWU_3,2	V99U2797C	NAV BASE TO NWU,IMU-1/ELEMENT 3,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_NWU_3,3	V99U2798C	NAV BASE TO NWU,IMU-1/ELEMENT 3,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
1TNB_PC_1,1	V99U3405CC	XFMTN NAV BASE-PRES CL (1) ELEM1,1	DL FMT 53/1				93017G	*



TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TNB_PC_1,2	V99U3408CC	XFMTN NAV BASE-PRES CL (1) ELEM1,2	DL FMT 53/1				93017G	*
1TNB_PC_1,3	V99U3411CC	XFMTN NAV BASE-PRES CL (1) ELEM1,3	DL FMT 53/1				93017G	*
1TNB_PC_2,1	V99U3414CC	XFMTN NAV BASE-PRES CL (1) ELEM2,1	DL FMT 53/1				93017G	*
1TNB_PC_2,2	V99U3417CC	XFMTN NAV BASE-PRES CL (1) ELEM2,2	DL FMT 53/1				93017G	*
1TNB_PC_2,3	V99U3420CC	XFMTN NAV BASE-PRES CL (1) ELEM2,3	DL FMT 53/1				93017G	*
1TNB_PC_3,1	V99U3423CC	XFMTN NAV BASE-PRES CL (1) ELEM3,1	DL FMT 53/1				93017G	*
1TNB_PC_3,2	V99U3426CC	XFMTN NAV BASE-PRES CL (1) ELEM3,2	DL FMT 53/1				93017G	*
1TNB_PC_3,3	V99U3429CC	XFMTN NAV BASE-PRES CL (1) ELEM3,3	DL FMT 53/1				93017G	*
2TNB_NWU_1,1	V99U2799C	NAV BASE TO NWU,IMU-2/ELEMENT 1,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
2TNB_NWU_1,2	V99U2800C	NAV BASE TO NWU,IMU-2/ELEMENT 1,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
2TNB_NWU_1,3	V99U2801C	NAV BASE TO NWU,IMU-2/ELEMENT 1,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
2TNB_NWU_2,1	V99U2802C	NAV BASE TO NWU,IMU-2/ELEMENT 2,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
2TNB_NWU_2,2	V99U2803C	NAV BASE TO NWU,IMU-2/ELEMENT 2,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
2TNB_NWU_2,3	V99U2804C	NAV BASE TO NWU,IMU-2/ELEMENT 2,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
2TNB_NWU_3,1	V99U2805C	NAV BASE TO NWU,IMU-2/ELEMENT 3,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
2TNB_NWU_3,2	V99U2806C	NAV BASE TO NWU,IMU-2/ELEMENT 3,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
2TNB_NWU_3,3	V99U2807C	NAV BASE TO NWU,IMU-2/ELEMENT 3,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
2TNB_PC_1,1	V99U3406CC	XFMTN NAV BASE-PRES CL (2) ELEM1,1	DL FMT 53/1				93017G	*
2TNB_PC_1,2	V99U3409CC	XFMTN NAV BASE-PRES CL (2) ELEM1,2	DL FMT 53/1				93017G	*
2TNB_PC_1,3	V99U3412CC	XFMTN NAV BASE-PRES CL (2) ELEM1,3	DL FMT 53/1				93017G	*
2TNB_PC_2,1	V99U3415CC	XFMTN NAV BASE-PRES CL (2) ELEM2,1	DL FMT 53/1				93017G	*
2TNB_PC_2,2	V99U3418CC	XFMTN NAV BASE-PRES CL (2) ELEM2,2	DL FMT 53/1				93017G	*
2TNB_PC_2,3	V99U3421CC	XFMTN NAV BASE-PRES CL (2) ELEM2,3	DL FMT 53/1				93017G	*
2TNB_PC_3,1	V99U3424CC	XFMTN NAV BASE-PRES CL (2) ELEM3,1	DL FMT 53/1				93017G	*
2TNB_PC_3,2	V99U3427CC	XFMTN NAV BASE-PRES CL (2) ELEM3,2	DL FMT 53/1				93017G	*
2TNB_PC_3,3	V99U3430CC	XFMTN NAV BASE-PRES CL (2) ELEM3,3	DL FMT 53/1				93017G	*
3TNB_NWU_1,1	V99U2808C	NAV BASE TO NWU,IMU-3/ELEMENT 1,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
3TNB_NWU_1,2	V99U2809C	NAV BASE TO NWU,IMU-3/ELEMENT 1,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
3TNB_NWU_1,3	V99U2810C	NAV BASE TO NWU,IMU-3/ELEMENT 1,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
3TNB_NWU_2,1	V99U2811C	NAV BASE TO NWU,IMU-3/ELEMENT 2,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
3TNB_NWU_2,2	V99U2812C	NAV BASE TO NWU,IMU-3/ELEMENT 2,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
3TNB_NWU_2,3	V99U2813C	NAV BASE TO NWU,IMU-3/ELEMENT 2,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
3TNB_NWU_3,1	V99U2814C	NAV BASE TO NWU,IMU-3/ELEMENT 3,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
3TNB_NWU_3,2	V99U2815C	NAV BASE TO NWU,IMU-3/ELEMENT 3,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
3TNB_NWU_3,3	V99U2816C	NAV BASE TO NWU,IMU-3/ELEMENT 3,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU GND CAL		SPL		93017G	*
3TNB_PC_1,1	V99U3407CC	XFMTN NAV BASE-PRES CL (3) ELEM1,1	DL FMT 53/1				93017G	*
3TNB_PC_1,2	V99U3410CC	XFMTN NAV BASE-PRES CL (3) ELEM1,2	DL FMT 53/1				93017G	*
3TNB_PC_1,3	V99U3413CC	XFMTN NAV BASE-PRES CL (3) ELEM1,3	DL FMT 53/1				93017G	*
3TNB_PC_2,1	V99U3416CC	XFMTN NAV BASE-PRES CL (3) ELEM2,1	DL FMT 53/1				93017G	*
3TNB_PC_2,2	V99U3419CC	XFMTN NAV BASE-PRES CL (3) ELEM2,2	DL FMT 53/1				93017G	*
3TNB_PC_2,3	V99U3422CC	XFMTN NAV BASE-PRES CL (3) ELEM2,3	DL FMT 53/1				93017G	*
3TNB_PC_3,1	V99U3425CC	XFMTN NAV BASE-PRES CL (3) ELEM3,1	DL FMT 53/1				93017G	*
3TNB_PC_3,2	V99U3428CC	XFMTN NAV BASE-PRES CL (3) ELEM3,2	DL FMT 53/1				93017G	*
3TNB_PC_3,3	V99U3431CC	XFMTN NAV BASE-PRES CL (3) ELEM3,3	DL FMT 53/1				93017G	*
ACCEL_SF(1)	V71K2541BE	IMU 1 CAPRI SC FAC CMD	WD2 B0 IMU 1 TLM					
ACCEL_SF(2)	V71K3541BE	IMU 2 CAPRI SC FAC CMD	WD2 B0 IMU 2 TLM					
ACCEL_SF(3)	V71K4541BE	IMU 3 CAPRI SC FAC CMD	WD2 B0 IMU 3 TLM					
ATT_DET	V99X2718X	ATT DETERM IN PROGRESS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP		BD		93017G	*
AZANG(1)	V95H0051CD	IMU 1 COMP AZIMUTH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AZANG(2)	V95H1051CD	IMU 2 COMP AZIMUTH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
AZANG(3)	V95H2051CD	IMU 3 COMP AZIMUTH RES ANGLE	GROUND IMU DISP DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
CMD_WD1(1)	V71M2520PE	IMU 1 COMMAND WORD 1	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD1(2)	V71M3520PE	IMU 2 COMMAND WORD 1	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD1(3)	V71M4520PE	IMU 3 COMMAND WORD 1	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD2(1)	V71M2540PE	IMU 1 COMMAND WORD 2	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
CMD_WD2(2)	V71M3540PE	IMU 2 COMMAND WORD 2	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD2(3)	V71M4540PE	IMU 3 COMMAND WORD 2	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
DVX(1)	V99U2860CD	IMU-1 X-AXIS DELTA VEL MAJ CYC	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX(2)	V99U2861CD	IMU-2 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX(3)	V99U2862CD	IMU-3 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX_1SEC(1)	V95L0056CD	IMU 1 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(2)	V95L1056CD	IMU 2 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DVX_1SEC(3)	V95L2056CD	IMU 3 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVY(1)	V99U2863CD	IMU-1 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(2)	V99U2864CD	IMU-2 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(3)	V99U2865CD	IMU-3 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY_1SEC(1)	V95L0057CD	IMU 1 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVY_1SEC(2)	V95L1057CD	IMU 2 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVY_1SEC(3)	V95L2057CD	IMU 3 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVZ(1)	V99U2866CD	IMU-1 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(2)	V99U2867CD	IMU-2 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(3)	V99U2868CD	IMU-3 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ_1SEC(1)	V95L0058CD	IMU 1 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVZ_1SEC(2)	V95L1058CD	IMU 2 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVZ_1SEC(3)	V95L2058CD	IMU 3 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
ETD1(1)	V99U2845CC	ETD1(1) IMU-1 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD1(2)	V99U2848CC	ETD1(2) IMU-1 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD1(3)	V99U2851CC	ETD1(3) IMU-1 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD2(1)	V99U2846CC	ETD2(1) IMU-2 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
ETD2(2)	V99U2849CC	ETD2(2) IMU-2 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD2(3)	V99U2852CC	ETD2(3) IMU-2 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD3(1)	V99U2847CC	ETD3(1) IMU-3 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD3(2)	V99U2850CC	ETD3(2) IMU-3 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD3(3)	V99U2853CC	ETD3(3) IMU-3 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
FAIL_ACCEL_SF(1)	V95X0081XD	IMU 1 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ACCEL_SF(2)	V95X1081XD	IMU 2 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ACCEL_SF(3)	V95X2081XD	IMU 3 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(1)	V95X0030XD	IMU 1 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(2)	V95X1030XD	IMU 2 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(3)	V95X2030XD	IMU 3 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(1)	V95X0031XD	IMU 1 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(2)	V95X1031XD	IMU 2 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(3)	V95X2031XD	IMU 3 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(1)	V95X0034XD	IMU 1 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_IR_NULL(2)	V95X1034XD	IMU 2 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(3)	V95X2034XD	IMU 3 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(1)	V95X0037XD	IMU 1 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(2)	V95X1037XD	IMU 2 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(3)	V95X2037XD	IMU 3 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(1)	V95X0035XD	IMU 1 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(2)	V95X1035XD	IMU 2 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(3)	V95X2035XD	IMU 3 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(1)	V95Q0076CD	IMU 1 HEX DISCRETE WORD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(2)	V95Q1076CD	IMU 2 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(3)	V95Q2076CD	IMU 3 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE2(1)	V95Q0077CD	IMU 1 HEX MODE/BITE STATUS WORD	GROUND IMU DISP GROUND IMU DISP TLM					
HDW_BITE2(2)	V95Q1077CD	IMU 2 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
HDW_BITE2(3)	V95Q2077CD	IMU 3 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
IMU_1_SEL_STATUS	V95X0021XD	IMU 1 SELECT STATUS	GROUND IMU DISP TLM					
IMU_2_SEL_STATUS	V95X1021XD	IMU 2 SELECT STATUS	GROUND IMU DISP TLM					

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
IMU_3_SEL_STATUS	V95X2021XD	IMU 3 SELECT STATUS	GROUND	IMU DISP				
IMU_FAIL_IND(1)	V95X0023XD	IMU 1 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IMU_FAIL_IND(2)	V95X1023XD	IMU 2 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IMU_FAIL_IND(3)	V95X2023XD	IMU 3 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IRANG(1)	V95H0053CD	IMU 1 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
IRANG(2)	V95H1053CD	IMU 2 COMP INNER ROLL RES ANGLE	GROUND IMU DISP DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
IRANG(3)	V95H2053CD	IMU 3 COMP INNER ROLL RES ANGLE	GROUND IMU DISP DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
LATCOMP(1)	V95X0085XD	IMU 1 LARGE ANGLE TORQ COMPLETE	GROUND IMU DISP DL FMT 32/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
LATCOMP(2)	V95X1085XD	IMU 2 LARGE ANGLE TORQ COMPLETE	DL FMT 32/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
LATCOMP(3)	V95X2085XD	IMU 3 LARGE ANGLE TORQ COMPLETE	DL FMT 32/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
OPER_CMD(1)	V71K2576XE	IMU-1 OPERATE MODE CMD	GROUND IMU DISP IMU 1 TLM				93017G	*
OPER_CMD(1)	V95X0655XB	IMU 1 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*



TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
OPER_CMD(2)	V71K3576XE	IMU-2 OPERATE MODE CMD	GROUND IMU DISP IMU 2				93017G	*
OPER_CMD(2)	V95X0656XB	IMU 2 OPERATE MODE CMD	TLM DL FMT 44/1				93017G	*
OPER_CMD(3)	V95X0657XB	IMU 3 OPERATE MODE CMD	DL FMT 45/1 DL FMT 60/1				93017G	*
ORANG(1)	V95H0054CD	IMU 1 COMP OUTER ROLL RES ANGLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG			93017G	*
ORANG(2)	V95H1054CD	IMU 2 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
ORANG(3)	V95H2054CD	IMU 3 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(1)	V95H0050CD	IMU 1 COMP PITCH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(2)	V95H1050CD	IMU 2 COMP PITCH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(3)	V95H2050CD	IMU 3 COMP PITCH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PN(1)	V99U2830CC	IMU 1 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	FT/S			93017G	*
PN(2)	V99U2831CC	IMU 2 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PN(3)	V99U2832CC	IMU 3 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PUP(1)	V99U2836CC	IMU 1 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PUP(2)	V99U2837CC	IMU 2 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PUP(3)	V99U2838CC	IMU 3 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(1)	V99U2833CC	IMU 1 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(2)	V99U2834CC	IMU 2 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(3)	V99U2835CC	IMU 3 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PWR_ON(1)	V95X0020XD	IMU 1 POWER ON	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PWR_ON(2)	V95X1020XD	IMU 2 POWER ON	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PWR_ON(3)	V95X2020XD	IMU 3 POWER ON	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PX(1)	V71K2521BE	IMU-1 TORQUE X CMD	WD1B0-4 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PX(2)	V71K3521BE	IMU-2 TORQUE X CMD	WD1B0-4 IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PX(3)	V71K4521BE	IMU-3 TORQUE X CMD	WD1B0-4 IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PY(1)	V71K2526BE	IMU-1 TORQUE Y CMD	WD1B5-9 IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
			IMU 1					

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PY(2)	V71K3526BE	IMU-2 TORQUE Y CMD	WD1B5-9	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	ARCS		93017G	*
PY(3)	V71K4526BE	IMU-3 TORQUE Y CMD	WD1B5-9	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	ARCS		93017G	*
PZ(1)	V71K2531BE	IMU-1 TORQUE Z CMD	WD1B10-14	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 1	ARCS		93017G	*
PZ(2)	V71K3531BE	IMU-2 TORQUE Z CMD	WD1B10-14	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	ARCS		93017G	*
PZ(3)	V71K4531BE	IMU-3 TORQUE Z CMD	WD1B10-14	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	ARCS		93017G	*
S/W_BITE(1)	V95X0046XD	IMU 1 SW BITE STATUS		GROUND IMU DISP			92297B	
S/W_BITE(2)	V95X1046XD	IMU 2 SW BITE STATUS		GROUND IMU DISP			92297B	
S/W_BITE(3)	V95X2046XD	IMU 3 SW BITE STATUS		GROUND IMU DISP			92297B	
SLEW_X_NEG(1)	V71K2543BE	IMU-1 SLEW X NEG	WD2B2	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_X_NEG(2)	V71K3543BE	IMU-2 SLEW X NEG	WD2B2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_X_NEG(3)	V71K4543BE	IMU-3 SLEW X NEG	WD2B2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_X_POS(1)	V71K2542BE	IMU-1 SLEW X POS	WD2B1	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_X_POS(2)	V71K3542BE	IMU-2 SLEW X POS	WD2B1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_X_POS(3)	V71K4542BE	IMU-3 SLEW X POS	WD2B1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_NEG(1)	V71K2545BE	IMU-1 SLEW Y NEG	WD2B4	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_NEG(2)	V71K3545BE	IMU-2 SLEW Y NEG	WD2B4	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_NEG(3)	V71K4545BE	IMU-3 SLEW Y NEG	WD2B4	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_POS(1)	V71K2544BE	IMU-1 SLEW Y POS	WD2B3	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_POS(2)	V71K3544BE	IMU-2 SLEW Y POS	WD2B3	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Y_POS(3)	V71K4544BE	IMU-3 SLEW Y POS	WD2B3	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_NEG(1)	V71K2547BE	IMU-1 SLEW Z NEG	WD2B6	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_NEG(2)	V71K3547BE	IMU-2 SLEW Z NEG	WD2B6	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
SLEW_Z_NEG(3)	V71K4547BE	IMU-3 SLEW Z NEG	WD2B6	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/S		93017G	*
				IMU 3				

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Z_POS(1)	V71K2546BE	IMU-1 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Z_POS(2)	V71K3546BE	IMU-2 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Z_POS(3)	V71K4546BE	IMU-3 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
THETA1(1)	V99U3220CC	IMU-1 NORTH COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA1(2)	V99U3223CC	IMU-1 WEST COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA1(3)	V99U3226CC	IMU-1 UP COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA2(1)	V99U3221CC	IMU-2 NORTH COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA2(2)	V99U3224CC	IMU-2 WEST COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA2(3)	V99U3227CC	IMU-2 UP COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA3(1)	V99U3222CC	IMU-3 NORTH COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA3(2)	V99U3225CC	IMU-3 WEST COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
THETA3(3)	V99U3228CC	IMU-3 UP COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
VRSS(1)	V95L0060CD	IMU 1 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S2			93017G	*
VRSS(2)	V95L1060CD	IMU 2 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	FT/S2			93017G	*
VRSS(3)	V95L2060CD	IMU 3 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	FT/S2			93017G	*
WRCF(1)	V95R0660CD	IMU 1 COMP AND FLTRD RED AXIS RATE	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 GROUND IMU DISP	DEG/HR			93017G	*
WRCF(2)	V95R0661CD	IMU 2 COMP AND FLTRD RED AXIS RATE	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR			93017G	*
WRCF(3)	V95R0662CD	IMU 3 COMP AND FLTRD RED AXIS RATE	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 GROUND IMU DISP	DEG/HR			93017G	*
	V71K4576XE	IMU-3 OPERATE MODE CMD	IMU 3 TLM				93017G	*
	V72M6633PC	MDM FF01 DSCR OUT SET	CD 13 CH 0 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V72M6683PC	MDM FF02 DSCR OUT SET	CD 13 CH 0 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V72M6733PC	MDM FF03 DSCR OUT SET	CD 13 CH 0 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2842PD	CGMB_IMU_FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.2.2-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU ATTITUDE DETERMINATION (V4.10)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V95M2843PD	CGMB_PWR_ON_DFG	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
	V95M2845PC	CGMB_SUBM_ACT_IP7	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
	V95M2846PD	CGMB_POS_COMP	DL FMT 32/A				93017G	*
			DL FMT 44/1					
			DL FMT 45/1					
			DL FMT 60/1					
	V95M2850PD	CGMB_SW_BITE\$(1:)	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
	V95M2851PD	CGMB_SW_BITE\$(2:)	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					
	V95M2852PD	CGMB_SW_BITE\$(3:)	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					

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

This page intentionally left blank.



TABLE 4.5.4.2.2-3. IMU ATTITUDE DETERMINATION (V4.10) 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 4.5.4.2.2-4. IMU ATTITUDE DETERMINATION (V4.10) 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 4.5.4.2.2-5. IMU ATTITUDE DETERMINATION (V4.10) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
DEG_PER_RAD RADIAN TO DEGREE CONVERSION FACTOR	V97U0112C	00	+5.72957795131E+01	DEG/RAD	F		S	C A6.9 G4.10 G4.126 G4.127 G4.128 G4.175 G4.20 G4.201 G4.204 G4.208 G4.21 G4.213 G4.220 G4.226 G4.227 G4.23 G4.234 G4.237 G4.24 G4.25 G4.35 G4.36 G4.5 G4.6 G4.66 G4.8 G4.9 G4.97 G5.26 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
GIM_FLIP_B1 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-I	V90H7625C	00	+8.0	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B2 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-II	V90H7626C	00	+1.0	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	

TABLE 4.5.4.2.2-5. IMU ATTITUDE DETERMINATION (V4.10) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
GIM_FLIP_B3 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-III	V90H7627C	00	+2.60	E+02 DEG	F	S	P	G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B4 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-IV	V90H7628C	00	+2.80	E+02 DEG	F	S	P	G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GO EARTH GRAV ACCEL CONSTANT	V90A7622C	00	+3.2174049	E+01 FT/SEC**2	F	S	P	A6.9 G4.10 G4.105 G4.126 G4.204 G4.208 G4.22 G4.220 G4.227 G4.234 G4.237 G4.36 G4.8 G4.9 G5.27 V4.10 V4.11 V4.11B V4.11C	93090E	
IRL1 INNER ROLL NULL LIMIT 1	V90H7633C	00	+2.40	E+01 DEG	F	S	P	V4.9A G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
IRL2 INNER ROLL NULL LIMIT 2	V90H7634C	00	+3.360	E+02 DEG	F	S	P	G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
KTN NOMINAL GYRO TORQUER SCALE FACTOR	V90G7621C	00	-5.0	E-01 ARC-SEC/PULSE	F	S	P	G4.208 V4.10 V4.11 V4.11B	90374C	

TABLE 4.5.4.2.2-5. IMU ATTITUDE DETERMINATION (V4.10) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
RAD RADIAN TO ARC-SEC CONVERSION	V97U6133C	00	+2.0626481	E+05	ARC-SEC/RAD	F	S	P A6.9 G4.208 G4.38 V4.10 V4.11 V4.9A	90374C	
RESLAGT APPROXIMATE MAXIMUM DATA SKEW TIME	V90W7642C	00	+7.0	E-03	SEC	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
RESLIMO RESOLVER LIMIT	V90H7640C	00	+1.0	E+00	DEG	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
SFH NOMINAL ACCELEROMETER SCALE FACTOR HIGH-GAIN	V96U7004C	00	+3.444880	E-03	FT/SEC/PULSE	F	S	P G4.208 V4.10 V4.11B V4.11C	90374C	
SFL NOMINAL ACCELEROMETER SCALE FACTOR LOW-GAIN	V90A7644C	00	+3.444880	E-02	FT/SEC/PULSE	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
T_OP_LIMIT TIME IN OPERATE TEST LIMIT	V90W7623C	00	+3.00	E+02	SEC	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
VCMAX VELOCITY COUNTER OVER-FLOW FACTOR EQUALS MSB OF COUNTER	V90Q7637C	00	+2.0	E+15	PULSES	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
VELSUMM50X(1) IMU-1 ACUM SENSED CHANGE X VEL	V95L0065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50X(2) IMU-2 ACUM SENSED CHANGE X VEL	V95L1065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50X(3) IMU-3 ACUM SENSED CHANGE X VEL	V95L2065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	

TABLE 4.5.4.2.2-5. IMU ATTITUDE DETERMINATION (V4.10) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
VELSUMM50Y(1) IMU-1 ACUM SENSED CHANGE Y VEL	V95L0066C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Y(2) IMU-2 ACUM SENSED CHANGE Y VEL	V95L1066C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Y(3) IMU-3 ACUM SENSED CHANGE Y VEL	V95L2066C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(1) IMU-1 ACUM SENSED CHANGE Z VEL	V95L0067C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(2) IMU-2 ACUM SENSED CHANGE Z VEL	V95L1067C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(3) IMU-3 ACUM SENSED CHANGE Z VEL	V95L2067C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	

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

### 4.5.4.3 IMU Hangar Calibration Modules.

The purpose of this section is to define the processing required to perform a long term calibration of the IMU gyro, accelerometer, resolver, and gimbal parameters during hangar operations. The processing requirements are defined in three modules: Hangar Calibration A (HANG\_CALA), Hangar Calibration B (HANG\_CALB), and Hangar Calibration C (HANG\_CALC). Tables 4.5.4.3-1, 4.5.4.3-2, and 4.5.4.3-3 identify the parameters calibrated during Hangar Calibration A, Hangar Calibration B, and Hangar Calibration C, respectively. The Hangar Calibration parameters identified in Tables 4.5.4.3-1 and 2, may be set to generic IMU values, written to, or read from mass memory via Preflight IMU Control Monitor item entry. (Note: the parameter DDFR is calibrated by Hanger Calibration A, but is not stored in mass memory.)

Table 4.5.4.3-1. Hangar Calibration A Parameters		
Parameter	Definition	Units
KIX, Y, Z	Accelerometer scale factors	μg/g
KOX, Y, Z	Low-gain accelerometer biases	μg
KIXH, YH, ZH	High-gain accelerometer scale factors	μg/g
KOXH, YH, ZH	High-gain accelerometer biases	μg
KTX, Y, Z	Gyro torquer scale factors	deg/hr/deg/hr
DFX, Y, Z	Gyro restraints	deg/hr
DSX, Z	Gyro mass unbalance (spin axis)	deg/hr/g
DIX, Z	Gyro mass unbalance (input axis)	deg/hr/g
DOZ	Gyro mass unbalance (output axis)	deg/hr/g
KSX, Y, Z	Accelerometer low-gain symmetry	μg/g
DELTXYX DELTZX DELTZY	Accelerometer misalignments (DELTXYX = Y accelerometer misalignment toward the X reference, etc.)	rad
BXY BXZ BYX BYZ BZX BZY	Gyro misalignments (BXY = X gyro misalignment toward the Y reference, etc.)	rad
DFR	Redundant gyro restraint	deg/hr
DDFR*	Delta redundant gyro restraint	deg/hr
DIR	Redundant gyro input axis mass unbalance	deg/hr/g
DOR	Redundant gyro output axis mass unbalance	deg/hr/g
DSR	Redundant gyro spin axis mass unbalance	deg/hr/g
KXR, YR, ZR	Redundant gyro scale factors	deg/hr/deg/hr

\*Not stored in mass memory

Table 4.5.4.3-2. Hanger Calibration B Parameters		
Parameter	Definition	Units
PO	Pitch resolver offset	deg
IRO	Inner roll resolver offset	deg
AZO	Azimuth resolver offset	deg
DP	Nonorthogonality between the outer roll and pitch gimbals	rad
BXZ	Gyro misalignments (BXZ = X gyro misalignment toward the Z reference, etc.)	rad
BZX		
BYZ		
BZY		
DELTXZ	Accelerometer misalignments (DELTXZ = X accelerometer misalignment toward the Z reference, etc.)	rad
DELTXZ		
DELTZY		
DELTYZ		

Table 4.5.4.3-3. Hanger Calibration C Parameters		
Parameter	Definition	Units
M12B	Difference vector between relative attitude measured by resolvers and acclerometers for IMU 1 and 2 in body coordinates.	rad
M13B	Difference vector between relative attitude measured by resolvers and accelerometers for IMU 1 and 3 in body coordinates.	rad
M23B	Difference vector between relative attitude measured by resolvers and accelerometer for IMU 2 and 3 in body coordinates.	rad



#### 4.5.4.3.1 Hangar Calibration A (HANG\_CALA).

The purpose of Hangar Calibration A is to collect acceleration and drift data in various predetermined cluster orientations to enable the calibration of IMU gyro and accelerometer parameters identified in Table 4.5.4.3-1.

HANG\_CALA will calibrate all selected IMU's in the OPERATE mode. The clusters are torqued to as many as 13 predefined orientations with use of the cluster repositioning sequence. Once the clusters are in these positions, the ground sequence is utilized to obtain drift and vertical acceleration estimates. In three of the cardinal positions, a technique employing excess rates is used to collect data for computation of gyro misalignments and torquer scale factors. In two other cardinal positions, successive estimates of west gyro drift are obtained, and a least squares fit of the data is used to obtain estimates of up channel drift. HANG\_CALA collects the gyro calibration data and the high-gain accelerometer calibration data with the accelerometer/Capri gain set to high gain for each of the orientations specified by the high-gain cluster positions control word. Low-gain accelerometer calibration data are then collected with the accelerometer/Capri gain set to low gain for each orientation specified by the low-gain cluster positions control word, except position 7. Low-gain calibration data is not collected for position 7. After the final position, the error terms (deltas) associated with each calibration parameter are computed. All parameters are automatically updated at the end of the calibration. Prior to execution of Hangar Calibration A, an alternate calibration sequence may be selected by manually entering into the GPC, via memory read-write, the appropriate value for the high-gain cluster positions control word and/or the low-gain cluster positions control word.

A. Functional Requirements. The HANG\_CALA module performs the following functions:

1. Collect acceleration and drift data in each of specified cluster orientations.
2. Compute accelerometer bias, scale factor, symmetry, and misalignment error terms.
3. Compute gyro torquer scale factor, restraint, misalignment, and mass unbalance error terms.
4. Compute redundant gyro scale factor, restraint, and mass unbalance error terms.
5. Update all calibration parameters upon completion of error term computations.
6. Provide for selection of predefined cluster orientations.

B. Interface Requirements. The input/output interfaces associated with HANG\_CALA are listed in Tables 4.5.4.3.1-1 and 4.5.4.3.1-2. Where two range values are listed for one parameter, the first value is for the KT-70 IMU and the second value is for the HAINS IMU.

C. Detailed Requirements. HANG\_CALA shall calibrate all selected IMU's that are in the OPERATE mode. HANG\_CALA shall sequence through the positions specified by the user.

When Hangar Calibration A is requested by the user, it is required that the memory locations utilized for the stored data terms (AL, AH, NETD, WETD, ETC) be zeroed. If other than a full calibration (13 positions) is commanded, the parameter error terms for all IMU's shall also be set equal to zero. The current calibration parameters shall not be zeroed.

During each calibration position, the calibration position index NPFA shall indicate the current calibration position. Between positions, (prior to or after the calibration, or during thermal stabilization periods) the index may assume a value not corresponding to an expected calibration position.

The following equations and sequence of computations are required for any of the 13 predefined cluster positions defined in Table 4.5.4.3.1–3. The cluster positions are defined in terms of Euler angle rotations (ALPHA, GAMMA, DELTA) corresponding to successive rotations about the Z, Y, and X axes with the cluster coordinate system initially aligned with the NWU coordinate system.

Note that for HANG\_CALA, K refers to applicable IMU's (K = 1, 2, or 3).

1. a. Set the accelerometer/CAPRI gain equal to high gain for each applicable IMU(K).
- b. Perform ground sequence 8 (refer to Section 4.1.4) for TDI seconds for thermal delay after the accelerometer gain change to high gain with the following inputs:

$$ERN(K) = ERW(K) = ERU(K) = 0,$$

$$\left[ T_R^{PCK} \right] = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \text{ for each applicable IMU(K)}$$

2. a. If in high gain and the high-gain cluster positions control word bit corresponding to this cluster position is not set (HCA\_HI\_POS(NPFA) = 0) proceed to step 14.
- b. If in low gain and the low-gain cluster positions control word bit corresponding to this cluster position is not set (HCA\_LO\_POS(NPFA) = 0) proceed to step 17.
- c. Based on the value of ALPHA, DELTA, and GAMMA (refer to Table 4.5.4.3.1–3 and Figure 4.5.4.3.1–3 for the specified orientation) compute the transformation from reference NWU to desired cluster, as follows:

$$\left[ T_R^{DC} \right] = \begin{bmatrix} (D)(E) & (E)(A) & -B \\ (D)(B)(C) - (A)(F) & (A)(B)(C) + (D)(F) & (C)(E) \\ (D)(B)(F) + (C)(A) & (A)(B)(F) - (C)(D) & (E)(F) \end{bmatrix}$$

where  $A = \text{SIN}(\text{ALPHA}), \quad B = \text{SIN}(\text{GAMMA}),$   
 $C = \text{SIN}(\text{DELTA}), \quad D = \text{COS}(\text{ALPHA}),$   
 $E = \text{COS}(\text{GAMMA}), \quad F = \text{COS}(\text{DELTA}),$

- d. Use the above transformation from NWU-to-desired cluster and the transformation from Nav Base-to-NWU to compute the transformation from Nav Base-to-desired cluster for each applicable IMU(K) as follows:

$$\left[ T_{NB}^{DCK} \right] = \left[ T_R^{DC} \right] \left[ T_{NB}^{NWUK} \right]$$

3. Perform the cluster repositioning sequence to orient the clusters to the required position until the large angle torquing complete flag, LATCOMP, is set by the LAT\_FUNC module for all applicable IMU(K).

4. After completion of the required rotation for each IMU to be calibrated, set transformations from NWU-to-present cluster as follows:

$$\left[ T_R^{PCK} \right] = \left[ T_R^{DC} \right] \text{ for each applicable IMU(K)}$$

5. Estimate tilts with the following initial inputs as indicated below:

$$ERN(K) = ERW(K) = ERU(K) = 0$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

- a. If in high gain, perform ground sequence 3 (refer to Section 4.1.4) for TE seconds for positions 1 through 7 and TCAL1 seconds for positions 8 through 13.
- b. If in low gain, perform ground sequence 3 for TCAL2 seconds for all positions.
6. Compute the excess rates for each applicable IMU(K) as follows:

$$ERN(K) = - \left( \frac{THETA_K(2) (RAD)}{G(TC)} \right)$$

$$ERW(K) = \frac{THETA_K(1) (RAD)}{G(TC)}$$

where RAD is the conversion factor to convert radians to arcseconds. THETA<sub>K</sub>(1) and THETA<sub>K</sub>(2) are west and north tilts (acceleration) in feet per seconds squared for IMU(K) from the LSF\_FILR module. G is the local gravity in feet per seconds squared, and TC seconds is the time to torque out the tilts.

7. Perform ground sequence 2 for TC seconds to torque out tilts with the following initial inputs:

$$ERN(K) = ERN(K),$$

$$ERW(K) = ERW(K), ERU(K) = 0;$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

8. a. Set  $\left[ T_R^{PCK} \right] = \left[ T_R^{DC} \right]$  for each applicable IMU(K)
- b. If in low gain, proceed to step 16.
- c. If in high gain and this calibration position is 1, 2, or 3, proceed to step 9; if this calibration position is 4 or 6, proceed to step 11; otherwise, proceed to step 12.

9. Perform the cluster rocking procedure for this position as follows:
- a. Perform ground sequence 1 for TCAL3 seconds to estimate drifts (tilt rate) with the excess rate applied about north with the following initial inputs:

$$\text{ERN}(K) = \text{MAX\_D\_RATE}, \text{ERU}(K) = 0, \text{ERW}(K) = 0;$$

$$\left[ T_R^{\text{PCK}} \right] \text{ for each applicable IMU}(K)$$

- b. Store the drift estimates from the LSF\_FILR module as follows:

$$\text{NETD}(K,1,\text{NPFA}) = \text{ETD}_k(2) + \left[ \frac{\text{THETA}_k(3)}{G} \right] [\text{ERN}(K)]$$

$$\text{WETD}(K,1,\text{NPFA}) = -\text{ETD}_k(1)$$

where NPFA is the present position number.

- c. Perform ground sequence 1 for 2(TCAL3) seconds to estimate drift (tilt rate) with negative excess rate applied about north (set  $\text{ERN}(K) = -\text{MAX\_D\_RATE}$ ) with the following initial inputs:

$$\text{ERN}(K) = -\text{MAX\_D\_RATE}, \text{ERW}(K) = 0, \text{ERU}(K) = 0;$$

$$\left[ T_R^{\text{PCK}} \right] \text{ for each applicable IMU}(K)$$

- d. Store the drift estimates from the LSF\_FILR module as follows for each applicable IMU(K):

$$\text{NETD}(K,2,\text{NPFA}) = \text{ETD}_k(2) + \left[ \frac{\text{THETA}_k(3)}{G} \right] [\text{ERN}(K)]$$

$$\text{WETD}(K,2,\text{NPFA}) = -\text{ETD}_k(1)$$

- e. Perform ground sequence 1 for TCAL3 seconds to estimate drift (tilt rate) with excess rate applied about north (set  $\text{ERN}(K) = \text{MAX\_D\_RATE}$ ) with the following initial inputs:

$$\text{ERN}(K) = \text{MAX\_D\_RATE}, \text{ERW}(K) = 0, \text{ERU}(K) = 0;$$

$$\left[ T_R^{\text{PCK}} \right] \text{ for each applicable IMU}(K)$$

- f. Store the drift estimates from the LSF\_FILR module as follows for each applicable IMU(K):

$$\text{NETD}(K,2,\text{NPFA}) = \text{ETD}_k(2) + \left[ \frac{\text{THETA}_k(3)}{G} \right] [\text{ERN}(K)]$$

$$\text{WETD}(K,2,\text{NPFA}) = -\text{ETD}_k(1)$$

- g. Perform ground sequence 1 for TCAL3 seconds to estimate drifts with excess rate applied about west (set  $ERW(K) = MAX\_D\_RATE$ ) with the following initial inputs:

$$ERN(K) = 0, ERU(K) = 0, ERW(K) = MAX\_D\_RATE;$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

- h. Store the drift estimates from the LSF\_FILR as follows for each applicable IMU(K):

$$NETD(K,4, NPFA) = ETD_K(2)$$

- i. Perform ground sequence 1 for 2(TCAL3) seconds to estimate drifts with negative excess rate applied about the west axis (set  $ERW(K) = -MAX\_D\_RATE$ ) with the following initial inputs:

$$ERN(K) = 0, ERU(K) = 0,$$

$$ERW(K) = -MAX\_D\_RATE, \left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

- j. Store the drift estimates from the LSF\_FILR module as follows for each applicable IMU(K):

$$NETD(K,5, NPFA) = ETD_K(2)$$

- k. Perform ground sequence 1 for TCAL3 seconds to estimate drifts with excess rate applied about the west axis (set  $ERW(K) = MAX\_D\_RATE$ ) with the following initial inputs:

$$ERN(K) = 0, ERU(K) = 0, ERW(K) = MAX\_D\_RATE;$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

- l. Store the drift estimates from the LSF\_FILR module as follows for each applicable IMU(K):

$$NETD(K,6, NPFA) = ETD_K(2)$$

- m. Set  $\left[ T_R^{PCK} \right] = \left[ T_R^{DC} \right]$  for each applicable IMU(K)

10. Perform the following sequence of operations and computations.

- a. Perform ground sequence 3 for TCAL1 seconds to estimate tilts with the following initial inputs:

$$ERN(K) = 0, ERU(K) = 0, ERW(K) = 0$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

- b. Compute excess rates for each applicable IMU(K) as follows:

$$ERN(K) = \left( \frac{THETA_k(2) (RAD)}{G(TCAL4)} \right)$$

$$ERW(K) = \frac{THETA_k(1) (RAD)}{G(TAL4)}$$

where TCAL4 equals the time in ground sequence.

- c. Perform ground sequence 2 for TCAL4 seconds to torque out the estimated tilts with the following inputs:

$$ERN(K) = ERN(K), ERW(K) = ERW(K), ERU(K) = 0$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

- d. Reset the transformation from NWU-to-present cluster as follows for each applicable IMU(K):

$$\left[ T_R^{PCK} \right] = \left[ T_R^{DC} \right]$$

- e. Proceed to step 12.

11. Perform the successive rate measurements procedure for this position as follows:

- a. Initialize the successive rate measurements procedure with the following values for the accumulated sums of the azimuth and west misalignments for each applicable IMU(K) as follows:

$$PHIW(K) = PHISUM1(K) = PHISUM2(K) = I = 0$$

- b. Perform NAZ iterations of the following sequence of operations and computations:

- (1) Perform ground sequence 3 for TCAL5 seconds to estimate north and west drifts with the following initial inputs:

$$ERN(K) = 0, ERW(K) = 0, ERU(K) = 0,$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

- (2) For each IMU(K), perform the following:

Compute estimates of the north and west drifts and north tilts as follows:

$$SRNETD = ETD_k(2)$$

$$SRWETD = -ETD_k(1)$$

$$NTILT = THETA_k(2)/G$$

Compute the azimuth misalignment for IMU(K) as follows:

$$\text{PHI} = \frac{\text{SRWETD}}{\text{WN}} + \frac{\text{WU}}{\text{WN}} \left[ \text{NTILT} + 1 / 2 \left[ \frac{(\text{SRNETD})(\text{TCAL5})}{\text{RAD}} \right] \right]$$

where TCAL5 is the time in ground sequence and the WU and WN are the up and north components of earth rate, respectively.

Accumulate the azimuth and west alignments sums per IMU(K) as follows:

$$I = I + 1$$

$$\text{PHISUM1}(K) = \text{PHISUM1}(K) + \text{PHI}$$

$$\text{PHISUM2}(K) = \text{PHISUM2}(K) + (\text{PHI})(I)$$

$$\text{PHIW}(K) = \text{PHIW}(K) - \text{THETA}_K(1)/G$$

- (3) If this is the first iteration, store the redundant axis rate and the vertical acceleration and compute the north gyro drift data as follows:

$$\text{AH}(K, \text{NPFA}) = \text{THETA}_K(3)$$

$$\text{ETDN}(K) = \text{ETD}_K(2) + \left[ \frac{\text{THETA}_K(1)}{G} + \frac{[\text{ETD}_K(1)] (\text{TCAL5})}{2(\text{RAD})} \right] (\text{WU})$$

$$\text{ETDR}(K, \text{NPFA}) = \text{WRCF}(K)$$

- c. Compute and store the up-channel drift as a function of the accumulated misalignments sums for each applicable IMU(K) as follows:

$$\text{ETDU}(K) = \frac{-12}{\text{TCAL5}} \left[ \frac{((\text{NAZ} + 1) / 2)[\text{PHISUM1}(K)] - \text{PHISUM2}(K)}{(\text{NAZ} + 1)(\text{NAZ})(\text{NAZ} - 1)} \right] (\text{RAD})$$

- d. Compute the average west misalignment:

$$\text{PHIW}(K, \text{NPFA}) = \frac{1}{\text{NAZ}} [\text{PHIW}(K)]$$

- e. Proceed to step 13.

12. Perform measurements of the cluster drift about north and west and the high-gain vertical acceleration as follows:

- a. Perform ground sequence 3 for TGM = TCAL6 seconds for position 1 and for 45-degree positions (8 through 13) and for TGM = TCAL7 seconds for positions 2, 3, 5, and 7 to estimate north and west channel drift and tilts and the vertical component of acceleration with the following initial inputs:

$$ERW(K) = ERN(K) = 0, \quad ERU(K) = 0,$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$

- b. Store the vertical acceleration from the LSF\_FILR and the redundant axis rate from the RGM\_COMP as follows for each applicable IMU(K):

$$AH(K, NPFA) = THETA_K(3)$$

$$ETDR(K, NPFA) = WRFC(K)$$

where NPFA is the current position number. (AH need not be stored for position 7 and ETDR need not be stored for positions 8 through 13.)

- c. If this is position 1 or a 45-degree position (8 through 13), proceed to step 14; else, store the estimates from the LSF\_FILR as follows for each applicable IMU(K):

$$ETDN(K) = ETD_K(2) + \left[ \frac{THETA_K(1)}{G} + \frac{[ETD_K(1)](TGM)}{2(RAD)} \right] (WU)$$

$$ETDU(K) = 0$$

13. Transform the rates to cluster coordinates as follows for each applicable IMU(K):

$$\begin{bmatrix} ETDX(K, NPFA) \\ ETDY(K, NPFA) \\ ETDZ(K, NPFA) \end{bmatrix} = \left[ T_R^{PCK} \right] \begin{bmatrix} ETDN(K) \\ 0 \\ ETDU(K) \end{bmatrix}$$

where NPFA is the current position number.

14. If high-gain data have been collected for all specified cluster positions, proceed to step 15 for low-gain data collection; otherwise, return to step 2 for the next cluster position.

15. a. Set the accelerometer/CAPRI gain equal to low gain for each applicable IMU(K).

- b. Perform ground sequence 8 (refer to Section 4.1.4) for TD2 seconds for thermal delay after the accelerometer gain change to low gain with the following inputs.

$$ERN(K) = ERW(K) = ERU(K) = 0,$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K)}$$



- c. Return to step 2 to start collecting low-gain data for all specified cluster positions except for position 7. No low-gain data are required for position 7.
16. Perform the low-gain vertical acceleration measurement as follows:

- a. Perform ground sequence 3 for TCAL8 seconds to estimate the vertical component of acceleration with the following initial inputs:

$$ERN(K) = ERU(K) = ERW(K) = 0,$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU}(K)$$

- b. Store the estimate of vertical acceleration for each applicable IMU(K) as follows:

$$AL(K, NPFA) = THETA_K(3)$$

where NPFA is the present position number.

17. If low-gain data have been collected for all specified cluster positions (except position 7), proceed to step 18; otherwise, return to step 2 for the next cluster position other than position 7. Skip position 7.
18. Compute the error terms associated with each of the HANG\_CALA parameters for each IMU(K) in accordance with the equations in the sequence specified in Figure 4.5.4.3.1-1. After all error terms have been computed, perform the calibration parameter update computations for each requested IMU in accordance with the equations in the sequence specified in Figure 4.5.4.3.1-2. After the update has been completed, Hangar Cal A should proceed automatically to the TERM/IDLE submode.

Hangar Cal A stored data terms and parameter error terms utilized in the equations in Figure 4.5.4.3.1-1 (all variables except G and G<sub>o</sub>) need to be saved while in operational sequence 9 so they can be dumped (not downlisted) by the user for later observation.

In addition to the foregoing requirements, whenever the Hangar Cal A submode is in progress, a HANGAR CAL A IN PROGRESS flag shall be set equal to one and made available to DISPLAYS.

A suggested design flow for HANG\_CALA is shown in Figure 4.5.4.3.1-4. Refer to Special Considerations (Item D) for additional discussion regarding the operational use of Hangar Cal A and the associated user interface requirements.

D. Special Considerations. This section identifies user interface requirements associated with Hangar Cal A and discusses the recommended utilization of Hangar Cal A.

1. Hangar Cal A User Interface. The following CRT format is required to control and monitor the Hangar Cal A mechanization defined in previous paragraphs:

HNGR CAL A 20X TERM/IDLE 27X

Item 20X is used for request of Hangar Cal A. The X position displays an asterisk when Hangar Cal A is active.

Item 27X may be used to terminate Hangar Cal A prior to normal completion. The X position displays an asterisk when the program is in the TERM/IDLE submode.

Note that the specific correct item numbers are defined in the D&C FSSR.

2. Hangar Cal A Operations. The following guidelines are recommended for effective utilization of Hangar Cal A capabilities:
  - a. Hangar Cal A should normally be a 13 position calibration of all three IMU's. However, under special circumstances (particularly a lab environment), a calibration with fewer selected positions or a calibration of fewer than three IMU's may be desirable.
  - b. A repeat calibration should normally be performed if particular error terms are determined to be unreasonable or if calibration parameter stability tests are desired.
  - c. It is mandatory that a full 13 position, three IMU calibration be performed in support of all flight operations.
  - d. The time required for a full Hangar Cal A is approximately 8 hours.

Table 4.5.4.3.1-1. HANG\_CALA Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
T <sub>NWU</sub> NB	V99U2790C THRU V99U2816C	TRANSFORMATION: NAVIGATION BASE TO NWU; 1 PER IMU	IMU_ATT	MATRIX	+/-1	NA	OD
T <sub>R</sub> PC		TRANSFORMATION: REFERENCE NWU TO PRESENT CLUSTER; 1 PER IMU	T_UPDATE	MATRIX	+/-1	NA	OD
LATCOMP(1) (2) (3)	V95X0085X V95X1085X V95X2085X	LARGE ANGLE TORQUING COMPLETE FLAG; 1 PER IMU	LAT_FUNC	LOGICAL	0, 1	NA	OD
THETA	V99U3220C THRU V99U3228C	ESTIMATED ACCELERATION VECTOR (NWU ORDER); 1 PER IMU	LSF_FILR	VECTOR	+/-70	FT/SEC **2	OD
ETD	V99U2845C THRU V99U2853C	LSF ESTIMATED DRIFT VECTOR (NWU ORDER); 1 PER IMU	LSF_FILR	VECTOR	+/-100	DEG/HR	OD
G_SITE_N (N = 1-9)	V96A7002C	LOCAL GRAVITY VALUE	I-LOAD	SCALAR	32.08- 32.21	FT/SEC **2	OD
GO	V90A7622C	STANDARD ACCELERATION DUE TO GRAVITY	CONSTANT	SCALAR	32.174048	FT/SEC **2/G	OD
RAD	V97U6133C	CONVERSION FACTOR TO CONVERT RADIANS TO ARC-SECONDS	CONSTANT	SCALAR	206264.8	ARC-SEC /RAD	OD
NAZ	V96R7037C	HANGAR CAL A, SUCCESSIVE RATE CONSTANT	K-LOAD	INTEGER	11	NA	OD
TC	V96L7083C	TILT CORRECTION TIME	K-LOAD	SCALAR	30.08	SEC	OD
TE	V96W7056C	TILT ESTIMATION TIME	K-LOAD	SCALAR	89.92	SEC	OD
TCAL1	V96W7057C	CALIBRATION TIME CONSTANT 1	K-LOAD	SCALAR	29.76	SEC	OD
TCAL2	V96W7058C	CALIBRATION TIME CONSTANT 2	K-LOAD	SCALAR	29.76	SEC	OD
TCAL3	V96W7059C	CALIBRATION TIME CONSTANT 3	K-LOAD	SCALAR	120	SEC	OD
TCAL4	V96W7060C	CALIBRATION TIME CONSTANT 4	K-LOAD	SCALAR	9.92	SEC	OD
TCAL5	V96W7061C	CALIBRATION TIME CONSTANT 5	K-LOAD	SCALAR	600	SEC	OD
TCAL6	V96W7062C	CALIBRATION TIME CONSTANT 6	K-LOAD	SCALAR	120	SEC	OD
TCAL7	V96W7063C	CALIBRATION TIME CONSTANT 7	K-LOAD	SCALAR	360	SEC	OD
TCAL8	V96W7064C	CALIBRATION TIME CONSTANT 8	K-LOAD	SCALAR	179.84	SEC	OD
MAX_D_RATE	V96U7036C	MAXIMUM DIGITAL RATE TO BE USED DURING THE SMALL ANGLE ROTATIONS PROCEDURE	K-LOAD	SCALAR	65	DEG/HR	OD
HCA_LO_POS	V99U9975C	LOW GAIN DESIRED POSITIONS CONTROL WORD	I-LOAD	LOGICAL	16 BITS	ND	OD
HCA_HI_POS	V99U9976C	HIGH GAIN DESIRED POSITIONS CONTROL WORD	I-LOAD	LOGICAL	16 BITS	ND	OD
KTX	V99G2500C V99G2501C V99G2502C	X-GYRO TORQUER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	1+/-0.2	DEG/HR/ DEG/HR	OD
KTY	V99G2503C V99G2504C V99G2505C	Y-GYRO TORQUER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	1+/-0.2	DEG/HR/ DEG/HR	OD
KTZ	V99G2506C V99G2507C V99G2508C	Z-GYRO TORQUER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	1+/-0.2	DEG/HR/ DEG/HR	OD

Table 4.5.4.3.1-1. HANG\_CALA Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
KSX	V99A2510C V99A2511C V99A2512C	X-ACCELEROMETER SYMMETRY FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/-600	μG/G	OD
KSY	V99A2513C V99A2514C V99A2515C	Y-ACCELEROMETER SYMMETRY FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/-600	μG/G	OD
KSZ	V99A2516C V99A2517C V99A2518C	Z-ACCELEROMETER SYMMETRY FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/-600	μG/G	OD
KIXH	V99A2681C V99A2682C V99A2683C	HIGH-GAIN X-ACCELEROMETER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/- 300,000	μG/G	OD
KIYH	V99A2684C V99A2685C V99A2686C	HIGH-GAIN Y-ACCELEROMETER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/- 300,000	μG/G	OD
KIZH	V99A2687C V99A2688C V99A2689C	HIGH-GAIN Z-ACCELEROMETER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/- 300,000	μG/G	OD
KIX	V99A2520C V99A2521C V99A2522C	LOW-GAIN X-ACCELEROMETER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/- 300,000	μG/G	OD
KIY	V99A2523C V99A2524C V99A2525C	LOW-GAIN Y-ACCELEROMETER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/- 300,000	μG/G	OD
KIZ	V99A2526C V99A2527C V99A2528C	LOW-GAIN Z-ACCELEROMETER SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	+/- 300,000	μG/G	OD
KOX	V99G2530C V99G2531C V99G2532C	LOW-GAIN X-ACCELEROMETER BIAS; 1 PER IMU	COMPOOL	SCALAR	+/-10**5	μG	OD
KOY	V99G2533C V99G2534C V99G2535C	LOW-GAIN Y-ACCELEROMETER BIAS; 1 PER IMU	COMPOOL	SCALAR	+/-10**5	μG	OD
KOZ	V99G2536C V99G2537C V99G2538C	LOW-GAIN Z-ACCELEROMETER BIAS; 1 PER IMU	COMPOOL	SCALAR	+/-10**5	μG	OD
KOXH	V99G2670C V99G2671C V99G2672C	HIGH-GAIN X-ACCELEROMETER BIAS; 1 PER IMU	COMPOOL	SCALAR	+/-10**5	μG	OD
KOYH	V99G2673C V99G2674C V99G2675C	HIGH-GAIN Y-ACCELEROMETER BIAS; 1 PER IMU	COMPOOL	SCALAR	+/-10**5	μG	OD
KOZH	V99G2676C V99G2677C V99G2678C	HIGH-GAIN Z-ACCELEROMETER BIAS; 1 PER IMU	COMPOOL	SCALAR	+/-10**5	μG	OD
DELTYX	V99H2540C V99H2541C V99H2542C	Y-ACCELEROMETER MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
DELTZX	V99H2543C V99H2544C V99H2545C	Z-ACCELEROMETER MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
DELTZY	V99H2546C V99H2547C V99H2548C	Z-ACCELEROMETER MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD

Table 4.5.4.3.1-1. HANG\_CALA Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
DFX	V99R2560C V99R2561C V99R2562C	X-GYRO RESTRAINT; 1 PER IMU	COMPOOL	SCALAR	+/-10	DEG/HR	OD
DFY	V99R2563C V99R2564C V99R2565C	Y-GYRO RESTRAINT; 1 PER IMU	COMPOOL	SCALAR	+/-10	DEG/HR	OD
DFZ	V99R2566C V99R2567C V99R2568C	Z-GYRO RESTRAINT; 1 PER IMU	COMPOOL	SCALAR	+/-10	DEG/HR	OD
DIX	V99U2570C V99U2571C V99U2572C	X-GYRO INPUT AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL	SCALAR	+/-6	DEG/HR/G	OD
DIZ	V99U2573C V99U2574C V99U2575C	Z-GYRO INPUT AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL	SCALAR	+/-6	DEG/HR/G	OD
DSX	V99U2576C V99U2577C V99U2578C	X-GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL	SCALAR	+/-6	DEG/HR/G	OD
DSZ	V99U2579C V99U2580C V99U2581C	Z-GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL	SCALAR	+/-6	DEG/HR/G	OD
DOZ	V99U2582C V99U2583C V99U2584C	Z-GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL	SCALAR	+/-6	DEG/HR/G	OD
BXY	V99H2590C V99H2591C V99H2592C	X-GYRO MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
BXZ	V99H2593C V99H2594C V99H2595C	X-GYRO MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
BYX	V99H2596C V99H2597C V99H2598C	Y-GYRO MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
BYZ	V99H2599C V99H2600C V99H2601C	Y-GYRO MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
BZX	V99H2602C V99H2603C V99H2604C	Z-GYRO MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
BZY	V99H2605C V99H2606C V99H2607C	Z-GYRO MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
TD1	V96W7067C	HIGH-GAIN DELAY TIME	K-LOAD	SCALAR	120	SEC	OD
TD2	V96W7068C	LOW-GAIN DELAY TIME	K-LOAD	SCALAR	120	SEC	OD
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0, 1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0, 1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0, 1	NA	OD
DIR	V99U5955C V99U5956C V99U5957C	REDUNDANT GYRO INPUT AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL	SCALAR	±6	DEG/HR/G	OD

Table 4.5.4.3.1-1. HANG\_CALA Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
DOR	V99U5958C V99U5959C V99U5960C	REDUNDANT GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL	SCALAR	±6	DEG/HR/G	OD
DSR	V99U5961C V99U5962C V99U5963C	REDUNDANT GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL	SCALAR	±6	DEG/HR/G	OD
DFR	V99U5952C V99U5953C V99U5954C	REDUNDANT GYRO RESTRAINT; 1 PER IMU	COMPOOL	SCALAR	±10	DEG/HR	OD
KXR	V99U5964C V99U5965C V99U5966C	REDUNDANT GYRO X SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD
KYR	V99U5967C V99U5968C V99U5969C	REDUNDANT GYRO Y SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD
KZR	V99U5970C V99U5971C V99U5972C	REDUNDANT GYRO Z SCALE FACTOR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD
WRCF(1)	V95R0660C	IMU-1 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	RGM_COMP	SCALAR	±120	DEG/HR	OD
WRCF(2)	V95R0661C	IMU-2 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	RGM_COMP	SCALAR	±120	DEG/HR	OD
WRCF(3)	V95R0662C	IMU-3 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	RGM_COMP	SCALAR	±120	DEG/HR	OD
DDFR	V99U5870C V99U5871C V99U5872C	RGM DELTA RESTRAINT 1 PER IMU	COMPOOL	SCALAR	±10	DEG/HR	OD

Table 4.5.4.3.1-2. HANG\_CALA Outputs

Name	MSID	Description	Ouput Destination	Signal Type	Range	Units	Rate (Hz)
ACCEL_SF(1)	V71K2541B	IMU-1 CAPRI SF WD2 BO CMD	IMU-1 TLM	LOGICAL	0, 1	NA	OD
ACCEL_SF(2)	V71K3541B	IMU-2 CAPRI SF WD2 BO CMD	IMU-2 TLM	LOGICAL	0, 1	NA	OD
ACCEL_SF(3)	V71K4541B	IMU-3 CAPRI SF WD2 BO CMD	IMU-3 TLM	LOGICAL	0, 1	NA	OD
$T_R^{PC}$		TRANSFORMATION: REFERENCE NWU TO PRESENT CLUSTER; 1 PER IMU	T_UPDATE	MATRIX	+/-1	NA	OD
$T_{NB}^{DC}$		TRANSFORMATION: NAVIGATION BASE TO DESIRED CLUSTER; 1 PER IMU	LAT_FUNC	MATRIX	+/-1	NA	OD
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
KTXE	V99U3029C V99U3030C V99U3031C	X-GYRO TORQUER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/-1.0	DEG/HR/ DEG/HR	OD
KTYE	V99U3032C V99U3033C V99U3034C	Y-GYRO TORQUER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/-1.0	DEG/HR/ DEG/HR	OD
KTZE	V99U3035C V99U3036C V99U3037C	Z-GYRO TORQUER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/-1.0	DEG/HR/ DEG/HR	OD
KSXE	V99U3180C V99U3181C V99U3182C	X-ACCELEROMETER SYMMETRY FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/-660	$\mu$ G/G	OD
KSYE	V99U3183C V99U3184C V99U3185C	Y-ACCELEROMETER SYMMETRY FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/-660	$\mu$ G/G	OD
KSZE	V99U3186C V99U3187C V99U3188C	Z-ACCELEROMETER SYMMETRY FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/-660	$\mu$ G/G	OD
KIXHE	V99U3150C V99U3151C V99U3152C	HIGH-GAIN X-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	$\mu$ G/G	OD
KIYHE	V99U3153C V99U3154C V99U3155C	HIGH-GAIN Y-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	$\mu$ G/G	OD
KIZHE	V99U3156C V99U3157C V99U3158C	HIGH-GAIN Z-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	$\mu$ G/G	OD
KIXE	V99U3159C V99U3160C V99U3161C	LOW-GAIN X-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/-300,000	$\mu$ G/G	OD
KIYE	V99U3171C V99U3172C V99U3173C	LOW-GAIN Y-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	$\mu$ G/G	OD

Table 4.5.4.3.1-2. HANG\_CALA Outputs

Name	MSID	Description	Ouput Destination	Signal Type	Range	Units	Rate (Hz)
KIZE	V99U3174C V99U3175C V99U3176C	LOW-GAIN Z-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/-300,000	μG/G	OD
KOXE	V99U3134C V99U3135C V99U3136C	LOW-GAIN X-ACCELER-BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	μG	OD
KOYE	V99U3137C V99U3138C V99U3139C	LOW-GAIN Y-ACCELER-BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	μG	OD
KOZE	V99U3140C V99U3141C V99U3142C	LOW-GAIN Z-ACCELER-BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	μG	OD
KOXHE	V99U3125C V99U3126C V99U3127C	HIGH-GAIN X-ACCELER-BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	μG	OD
KOYHE	V99U3128C V99U3129C V99U3130C	HIGH-GAIN Y-ACCELER-BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	μG	OD
KOZHE	V99U3131C V99U3132C V99U3133C	HIGH-GAIN Z-ACCELER-BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	μG	OD
DELTYXE	V99U3203C V99U3204C V99U3205C	Y-ACCELEROMETER MISALIGNMENT ERROR TOWARD THE X REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
DELTZXE	V99U3209C V99U3210C V99U3211C	Z-ACCELEROMETER MISALIGNMENT ERROR TOWARD THE X REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
DELTZYE	V99U3212C V99U3213C V99U3214C	Z-ACCELEROMETER MISALIGNMENT ERROR TOWARD THE Y REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
DFXE	V99U3020C V99U3021C V99U3022C	X-GYRO RESTRAINT ERROR; 1 PER IMU	TLM	SCALAR	+/-10	DEG/HR	OD
DFYE	V99U3023C V99U3024C V99U3025C	Y-GYRO RESTRAINT ERROR; 1 PER IMU	TLM	SCALAR	+/-10	DEG/HR	OD
DFZE	V99U3026C V99U3027C V99U3028C	Z-GYRO RESTRAINT ERROR; 1 PER IMU	TLM	SCALAR	+/-10	DEG/HR	OD
DIXE	V99U3050C V99U3051C V99U3052C	X-GYRO INPUT AXIS MASS UNBALANCE ERROR; 1 PER IMU	TLM	SCALAR	+/-6	DEG/HR/G	OD
DIZE	V99U3057C V99U3058C V99U3059C	Z-GYRO INPUT AXIS MASS UNBALANCE ERROR; 1 PER IMU	TLM	SCALAR	+/-6	DEG/HR/G	OD
BXYE	V99U3090C V99U3091C V99U3092C	X-GYRO MISALIGNMENT ERROR TOWARD THE Y REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
BXZE	V99U3093C V99U3094C V99U3095C	X-GYRO MISALIGNMENT ERROR TOWARD THE Z REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
BYXE	V99U3096C V99U3097C V99U3098C	Y-GYRO MISALIGNMENT ERROR TOWARD THE X REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD



Table 4.5.4.3.1-2. HANG\_CALA Outputs

Name	MSID	Description	Ouput Destination	Signal Type	Range	Units	Rate (Hz)
BYZE	V99U3099C V99U3100C V99U3101C	Y-GYRO MISALIGNMENT ERROR TOWARD THE Z REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
BZXE	V99U3102C V99U3103C V99U3104C	Z-GYRO MISALIGNMENT ERROR TOWARD THE X REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
BZYE	V99U3105C V99U3106C V99U3107C	Z-GYRO MISALIGNMENT ERROR TOWARD THE Y REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
DSXE	V99U3075C V99U3076C V99U3077C	X-GYRO SPIN AXIS MASS UNBALANCE ERROR; 1 PER IMU	TLM	SCALAR	+/-6	DEG/HR/G	OD
DSZE	V99U3083C V99U3084C V99U3085C	Z-GYRO SPIN AXIS MASS UNBALANCE ERROR; 1 PER IMU	TLM	SCALAR	+/-6	DEG/HR/G	OD
DOZE	V99U3070C V99U3071C V99U3072C	Z-GYRO OUTPUT AXIS MASS UNBALANCE ERROR; 1 PER IMU	TLM	SCALAR	+/-6	DEG/HR/G	OD
HNGR_CAL_A	V99X2710X	HANGAR CAL A IN PROGRESS	DISPLAY TLM	LOGICAL	0, 1	NA	OD
KTX	V99G2500C V99G2501C V99G2502C	X-GYRO TORQUER SCALE FACTOR; 1 PER IMU	GYO_COMP TLM	SCALAR	1+/-0.2	DEG/HR/ DEG/HR	OD
KTY	V99G2503C V99G2504C V99G2505C	Y-GYRO TORQUER SCALE FACTOR; 1 PER IMU	GYO_COMP TLM	SCALAR	1+/-0.2	DEG/HR/ DEG/HR	OD
KTZ	V99G2506C V99G2507C V99G2508C	Z-GYRO TORQUER SCALE FACTOR; 1 PER IMU	GYO_COMP TLM	SCALAR	1+/-0.2	DEG/HR/ DEG/HR	OD
KSX	V99A2510C V99A2511C V99A2512C	X-ACCELEROMETER SYMMETRY FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-600	μG/G	OD
KSY	V99A2513C V99A2514C V99A2515C	Y-ACCELEROMETER SYMMETRY FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-600	μG/G	OD
KSZ	V99A2516C V99A2517C V99A2518C	Z-ACCELEROMETER SYMMETRY FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-600	μG/G	OD
KIXH	V99A2681C V99A2682C V99A2683C	HIGH-GAIN X-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/- 300,000	μG/G	OD
KIYH	V99A2684C V99A2685C V99A2686C	HIGH-GAIN Y-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/- 300,000	μG/G	OD
KIZH	V99A2687C V99A2688C V99A2689C	HIGH-GAIN Z-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/- 300,000	μG/G	OD
KIX	V99A2520C V99A2521C V99A2522C	LOW-GAIN X-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-300,000	μG/G	OD
KIY	V99A2523C V99A2524C V99A2525C	LOW-GAIN Y-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/- 300,000	μG/G	OD

Table 4.5.4.3.1-2. HANG\_CALA Outputs

Name	MSID	Description	Ouput Destination	Signal Type	Range	Units	Rate (Hz)
KIZ	V99A2526C V99A2527C V99A2528C	LOW-GAIN Z-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/- 300,000	μG/G	OD
KOX	V99G2530C V99G2531C V99G2532C	LOW-GAIN X-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-10**5	μG	OD
KOY	V99G2533C V99G2534C V99G2535C	LOW-GAIN Y-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-10**5	μG	OD
KOZ	V99G2536C V99G2537C V99G2538C	LOW-GAIN Z-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-10**5	μG	OD
KOXH	V99G2670C V99G2671C V99G2672C	HIGH-GAIN X-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-10**5	μG	OD
KOYH	V99G2673C V99G2674C V99G2675C	HIGH-GAIN Y-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-10**5	μG	OD
KOZH	V99G2676C V99G2677C V99G2678C	HIGH-GAIN Z-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-10**5	μG	OD
DELTYX	V99H2540C V99H2541C V99H2542C	Y-ACCELEROMETER MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-0.05	RAD	OD
DELTZX	V99H2543C V99H2544C V99H2545C	Z-ACCELEROMETER MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-0.05	RAD	OD
DELTZY	V99H2546C V99H2547C V99H2548C	Z-ACCELEROMETER MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	ACP_COMP PFLT_CALA TLM	SCALAR	+/-0.05	RAD	OD
DFX	V99R2560C V99R2561C V99R2562C	X-GYRO RESTRAINT; 1 PER IMU	GYO_COMP PFLT_CALA TLM	SCALAR	+/-10	DEG/HR	OD
DFY	V99R2563C V99R2564C V99R2565C	Y-GYRO RESTRAINT; 1 PER IMU	GYO_COMP PFLT_CALA TLM	SCALAR	+/-10	DEG/HR	OD
DFZ	V99R2566C V99R2567C V99R2568C	Z-GYRO RESTRAINT; 1 PER IMU	GYO_COMP PFLT_CALA TLM	SCALAR	+/-10	DEG/HR	OD
DIX	V99U2570C V99U2571C V99U2572C	X-GYRO INPUT AXIS MASS UNBALANCE; 1 PER IMU	GYO_COMP PFLT_CALA TLM	SCALAR	+/-6	DEG/HR/G	OD
DIZ	V99U2573C V99U2574C V99U2575C	Z-GYRO INPUT AXIS MASS UNBALANCE; 1 PER IMU	GYO_COMP PFLT_CALA TLM	SCALAR	+/-6	DEG/HR/G	OD
DSX	V99U2576C V99U2577C V99U2578C	X-GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	GYO_COMP TLM PFLT_CALA	SCALAR	+/-6	DEG/HR/G	OD
DSZ	V99U2579C V99U2580C V99U2581C	Z-GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	GYO_COMP TLM PFLT_CALA	SCALAR	+/-6	DEG/HR/G	OD
DOZ	V99U2582C V99U2583C V99U2584C	Z-GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	GYO_COMP TLM PFLT_CALA	SCALAR	+/-6	DEG/HR/G	OD

Table 4.5.4.3.1-2. HANG\_CALA Outputs

Name	MSID	Description	Ouput Destination	Signal Type	Range	Units	Rate (Hz)
BXY	V99H2590C V99H2591C V99H2592C	X-GYRO MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
BXZ	V99H2593C V99H2594C V99H2595C	X-GYRO MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
BYX	V99H2596C V99H2597C V99H2598C	Y-GYRO MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
BYZ	V99H2599C V99H2600C V99H2601C	Y-GYRO MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
BZX	V99H2602C V99H2603C V99H2604C	Z-GYRO MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
BZY	V99H2605C V99H2606C V99H2607C	Z-GYRO MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
DIR	V99U5955C V99U5956C V99U5957C	REDUNDANT GRYO INPUT AXIS MASS UNBALANCE; 1 PER IMU	RGM_COMP PFLT_CALA	SCALAR	+/-6	DEG/HR/G	OD
DOR	V99U5958C V99U5959C V99U5960C	REDUNDANT GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	RGM_COMP PFLT_CALA	SCALAR	+/-6	DEG/HR/G	OD
DSR	V99U5961C V99U5962C V99U5963C	REDUNDANT GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	RGM_COMP PFLT_CALA	SCALAR	+/-6	DEG/HR/G	OD
DFR	V99U5952C V99U5953C V99U5954C	REDUNDANT GYRO RESTRAINT; 1 PER IMU	RGM_COMP PFLT_CALA	SCALAR	+/-10	DEG/HR	OD
KXR	V99U5964C V99U5965C V99U5966C	REDUNDANT GYRO X SCALE FACTOR; 1 PER IMU	RGM_COMP PFLT_CALA	SCALAR	+/-1	DEG/HR/ DEG/HR	OD
KYR	V99U5967C V99U5968C V99U5969C	REDUNDANT GYRO Y SCALE FACTOR; 1 PER IMU	RGM_COMP PFLT_CALA	SCALAR	± 1	DEG/HR/ DEG/HR	OD
KZR	V99U5970C V99U5971C V99U5972C	REDUNDANT GYRO Z SCALE FACTOR; 1 PER IMU	RGM_COMP PFLT_CALA	SCALAR	± 1	DEG/HR/ DEG/HR	OD
DIRE	V99U3603C V99U3604C V99U3605C	REDUNDANT GYRO INPUT AXIS MASS UNB ERROR; 1 PER IMU	COMPOOL	SCALAR	± 6	DEG/HR/G	OD
DORE	V99U3606C V99U3607C V99U3608C	REDUNDANT GYRO OUTPUT AXIS MASS UNB ERROR; 1 PER IMU	COMPOOL	SCALAR	± 6	DEG/HR/G	OD
DSRE	V99U3609C V99U3610C V99U3611C	REDUNDANT GYRO SPIN AXIS MASS UNB ERROR; 1 PER IMU	COMPOOL	SCALAR	± 6	DEG/HR/G	OD
DFRE	V99U3600C V99U3601C V99U3602C	REDUNDANT GYRO RESTRAINT ERROR; 1 PER IMU	COMPOOL	SCALAR	±10	DEG/HR	OD
KXRE	V99U3612C V99U3613C V99U3614C	REDUNDANT GYRO X SCALE FACTOR ERROR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD

Table 4.5.4.3.1-2. HANG\_CALA Outputs

Name	MSID	Description	Ouput Destination	Signal Type	Range	Units	Rate (Hz)
KYRE	V99U3615C V99U3616C V99U3617C	REDUNDANT GYRO Y SCALE FACTOR ERROR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD
KZRE	V99U3618C V99U3619C V99U3620C	REDUNDANT GYRO Z SCALE FACTOR ERROR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD
NPFA	V99U2721C	HANG/PFLT CAL A PRES POSITION NO.	TLM	INTEGER	1-14	ND	OD
DDFR	V99U5870C V99U5871C V99U5872C	RGM DELTA RESTRAINT; 1 PER IMU	RGM_COMP PFLT_CALA	SCALAR	±10	DEG/HR	OD
DDFRE	V99U3621C V99U3622C V99U3623C	RGM DELTA RESTRAINT ERROR; 1 PER IMU	COMPOOL TLM	SCALAR	±10	DEG/HR	OD

Table 4.5.4.3.1-3. HANG\_CALA Cluster Positions

Position No. (NPS)	*Cluster Position With Respect to Rotations About Z, Y, X ALPHA, GAMMA, DELTA	Procedure No.
1	(-90, -90, 0)	1
2	( 0, 0, 0)	1
3	( 90, 0, 90)	1
4	(180, 90, 0)	3
5	(180, 0, -90)	2
6	( 90, 180, 0)	3
7	(-90, 0, -90)	2
8	( 0, 135, 0)	2
9	( 0, -45, 0)	2
10	( 0, 45, -90)	2
11	( 0, -135, -90)	2
12	( 90, 0, -135)	2
13	( 90, 0, 45)	2

\*Starting initially with the cluster coordinate system aligned with the NWU coordinate system

Table 4.5.4.3.1-4. HANG\_CALA Parameters Vs. Required Positions and Time

Parameter	Approximate Time Per Position (min)												
	37	36	36	125	19	124	11	16	17	15	18	15	18
	Position												
	1	2	3	4	5	6	7	8	9	10	11	12	13
KOX, KOXH	X			X				X	X	X	X	X	X
KOY, KOYH			X		X			X	X	X	X	X	X
KOZ, KOZH		X				X		X	X	X	X	X	X
KIX, KIXH	X			X									
KIY, KIYH			X		X								
KIZ, KIZH		X				X							
KSX	X			X				X	X	X	X	X	X
KSY			X		X			X	X	X	X	X	X
KSZ		X				X		X	X	X	X	X	X
DELTXY	X		X	X	X					X	X		
DELTZX	X	X		X		X		X	X				
DELTZY		X	X		X	X						X	X
DFX	X	X	X	X	X	X		X	X	X	X	X	X
DFY	X	X	X		X	X		X	X	X	X	X	X
DFZ	X	X	X	X		X	X	X	X	X	X	X	X
DIX	X	X	X	X	X	X		X	X	X	X	X	X
DIZ	X	X	X	X	X	X	X	X	X	X	X	X	X
DSX	X	X	X	X	X	X		X	X	X	X	X	X
DSZ	X	X	X		X	X	X					X	X
KTX		X	X		X								
KTY	X	X				X							
KTZ	X		X	X									
BXY	X	X	X	X	X					X	X		
BXZ	X	X	X	X		X		X	X				
BYX		X											
BYZ	X	X	X		X	X						X	X
BZX			X										
BZY	X												
DOZ	X	X	X	X		X	X	X	X	X	X	X	X

Table 4.5.4.3.1-4. HANG_CALA Parameters Vs. Required Positions and Time													
Parameter	Approximate Time Per Position (min)												
	37	36	36	125	19	124	11	16	17	15	18	15	18
	Position												
	1	2	3	4	5	6	7	8	9	10	11	12	13
KXR	X	X	X	X	X	X	X						
KYR	X	X		X	X	X	X						
KZR	X	X	X	X	X	X	X						
DFR	X	X	X	X	X	X							
DIR	X			X									
DOR			X				X						
DSR		X				X							
DDFR	X	X	X	X	X	X	X						

Error Parameters and Equations		Units
$KIXE(K)$	$= - \left( \frac{AL(K,1) + AL(K,4)}{2(G) (10^{-6})} \right)$	$\mu\text{g/g}$
$KIXHE(K)$	$= - \left( \frac{AH(K,1) + AH(K,4)}{2(G) (10^{-6})} \right)$	$\mu\text{g/g}$
$KIYE(K)$	$= - \left( \frac{AL(K,3) + AL(K,5)}{2(G) (10^{-6})} \right)$	$\mu\text{g/g}$
$KIXHE(K)$	$= - \left( \frac{AH(K,3) + AH(K,5)}{2(G) (10^{-6})} \right)$	$\mu\text{g/g}$
$KIZE(K)$	$= - \left( \frac{AL(K,2) + AH(K,6)}{2(G) (10^{-6})} \right)$	$\mu\text{g/g}$
$KIZHE(K)$	$= - \left( \frac{AH(K,2) + AH(K,6)}{2(G) (10^{-6})} \right)$	$\mu\text{g/g}$
$KTXE(K)$	$= \frac{KIXHE(K)}{10^6} + \left( \frac{NETD(K,1,2) + NETD(K,3,2) - 2(NETD(K,2,2))}{4(MAX\_D\_RATE)} \right)$	$\text{deg/hr/deg/hr}$
$KTYE(K)$	$= \frac{KIZHE(K)}{10^6} + \left( \frac{NETD(K,1,1) + NETD(K,3,1) - 2(NETD(K,2,1))}{4(MAX\_D\_RATE)} \right)$	$\text{deg/hr/deg/hr}$
$KTZE(K)$	$= \frac{KIXHE(K)}{10^6} + \left( \frac{NETD(K,1,3) + NETD(K,3,3) - 2(NETD(K,2,3))}{4(MAX\_D\_RATE)} \right)$	$\text{deg/hr/deg/hr}$
$DELTZX(K)$	$= - \left( \frac{AL(K,8) + AL(K,9)}{G} + \right) \left( \frac{KIXE(K) + KIZE(K)}{10^6} \right)$	rad
$DELTXY(K)$	$= - \left( \frac{AL(K,10) + AL(K,11)}{G} + \right) \left( \frac{KIXE(K) + KIYE(K)}{10^6} \right)$	rad
$DELTZY(K)$	$= - \left( \frac{AL(K,12) + AL(K,13)}{G} + \right) \left( \frac{KIYE(K) + KIZE(K)}{10^6} \right)$	rad
$BXYE(K)$	$= - \left( \frac{NETD(K,4,2) + NETD(K,6,2) - 2(NETD(K,5,2))}{4 (MAX\_D\_RATE)} \right) + DELTXYE(K)$	rad
$BXZE(K)$	$= - \left( \frac{WETD(K,1,3) + WETD(K,3,3) - 2(WETD(K,2,3))}{4 (MAX\_D\_RATE)} \right) + DELTZX(K)$	rad
$BYXE(K)$	$= - \left( \frac{WETD(K,1,2) + WETD(K,3,2) - 2(WETD(K,2,2))}{4 (MAX\_D\_RATE)} \right)$	rad
$BYZE(K)$	$= - \left( \frac{NETD(K,4,1) + NETD(K,6,1) - 2(NETD(K,5,1))}{4 (MAX\_D\_RATE)} \right) + DELTZY(K)$	rad

FIGURE 4.5.4.3.1-1.(1) HANG\_CALA Error Parameter Computations (Sheet 1 of 3)

Error Parameters and Equations	Units
$BZX E(K) = - \left( \frac{NETD(K,4,3) + NETD(K,6,3) - 2 (NETD(K,5,3))}{4 (MAX\_D\_RATE)} \right)$	rad
$BZY E(K) = - \left( \frac{WETD(K,1,1) + WETD(K,3,1) - 2 (WETD(K,2,1))}{4 (MAX\_D\_RATE)} \right)$	rad
$KOXE(K) = \frac{-AL(K,1) + AL(K,4) - AL(K,8) + AL(K,9) - AL(K,10) + AL(K,11) + AL(K,12) - AL(K,13)}{2 (G_0) (10^{-6}) (\sqrt{2} - 1)}$	μ g
$KOYE(K) = \frac{-AL(K,3) + AL(K,5) + AL(K,8) - AL(K,9) - AL(K,10) + AL(K,11) - AL(K,12) + AL(K,13)}{2 (G_0) (10^{-6}) (\sqrt{2} - 1)}$	μ g
$KOZE(K) = \frac{-AL(K,2) + AL(K,6) - (AL(K,8) + AL(K,9) + AL(K,10) - AL(K,11) - AL(K,12) + AL(K,13))}{2 (G_0) (10^{-6}) (\sqrt{2} - 1)}$	μ g
$KSXE(K) = - \frac{-AL(K,1) + AL(K,4)}{2 (G) (10^{-6})} + (KOXE(K)) \left( \frac{G}{G_0} \right)$	μg/g
$KSYE(K) = - \frac{-AL(K,3) + AL(K,5)}{2 (G) (10^{-6})} + (KOYE(K)) \left( \frac{G}{G_0} \right)$	μg/g
$KSZE(K) = - \frac{-AL(K,2) + AL(K,6)}{2 (G) (10^{-6})} + (KOZE(K)) \left( \frac{G}{G_0} \right)$	μg/g
$KOXHE(K) = \frac{AH(K,1) - AH(K,4)}{2 (G_0) (10^{-6})} + (KSXE(K)) \left( \frac{G}{G_0} \right)$	μg/g
$KOYHE(K) = \frac{AH(K,3) - AH(K,5)}{2 (G_0) (10^{-6})} + (KSYE(K)) \left( \frac{G}{G_0} \right)$	μg/g
$KOZHE(K) = \frac{AH(K,2) - AH(K,6)}{2 (G_0) (10^{-6})} + (KSZE(K)) \left( \frac{G}{G_0} \right)$	μg/g
$DFXE(K) = ETDX(K,2) - (KTXE(K)) (WN) + (BXZE(K)) (WU) - KOXHE(K) \frac{(G_0)}{(G) (10^6)} (WU)$	deg/hr
$DFYE(K) = ETDY(K,6) - (BYZE(K)) (WU) + (KTYE(K)) (WN) - \frac{(KOYHE(K)) (G_0) (WU)}{(G) (10^6)}$	deg/hr
$DFZE(K) = \frac{ETDZ(K,E) + ETDZ(K,7)}{2} - (KTZE(K)) (WN) - \frac{(KOZHE(K)) (G_0) (WU)}{(G) (10^6)}$	deg/hr
$DIXE(K) = (-ETDX(K,4) + DFXE(K) - (KTXE(K)) (WU)) + (WN) (BXZE(K) - DELTZXE(K) - \frac{KOZHE(K)}{10^6} \left( \frac{G_0}{G} \right) + PHIW(K,4)) \left( \frac{G_0}{G} \right)$	deg/hr/g

FIGURE 4.5.4.3.1-1.(2) HANG\_CALA Error Parameter Computations (Sheet 2 of 3)



Error Parameters and Equations	Units
$DSXE(K) = \left( -ETDX(K,5) + DFXE(K) - (KTXE(K)) (WN) + (BXYE(K)) (WU) + \frac{(KOXHE(K)) (G_0) (WU)}{(G) (10^6)} \right) \left( \frac{G_0}{G} \right)$	deg/hr/g
$DOZE(K) = \left( ETDZ(K,4) + DFZE(K) - (KTZE(K)) (WN) + (BZXE(K)) + DELTZXE(K)) WU - \frac{(KOXHE(K)) (G_0) (WU)}{(G) (10^6)} \right) \left( \frac{G_0}{G} \right)$	deg/hr/g
$DSZE(K) = \left( \frac{ETDZ(K,7) - ETDZ(K,3)}{2} - (BZYE(K)) + DELTZYE(K)) WU \right) \left( \frac{G_0}{G} \right)$	deg/hr/g
$DIZE(K) = \left( (-ETDZ(K,6) + DFZE(K) - (KTZE(K)) (WU)) + (WN) (BZYE(K) - \frac{KOYHE(K)}{10^6}) + PHIW(K,6)) \right) \left( \frac{G_0}{G} \right)$	deg/hr/g
$KXRE(K) = [ETDR(K,1) + ETDR(K,2) - 2 ETDR(K,3) + ETDR(K,4) - 5 ETDR(K,5) + ETDR(K,6) + 3 ETDR(K,7)] / (6 WN)$	
$KYRE(K) = [ETDR(K,1) - ETDR(K,2) + ETDR(K,4) - ETDR(K,5) - ETDR(K,6) + ETDR(K,7)] / 2 WN$	
$KZRE(K) = [-ETDR(K,1) - ETDR(K,2) + 2 ETDR(K,3) - ETDR(K,4) - ETDR(K,5) - ETDR(K,6) + 3 ETDR(K,7)] / (6 WN)$	
$DFRE(K) = [ETDR(K,1) - ETDR(K,2) + ETDR(K,3) + ETDR(K,4) + ETDR(K,5) + ETDR(K,6)] / 6.0 - [KXR(K) + KXRE(K)] [DFXE(K)] - [KYR(K) + KYRE(K)] [DFYE(K)]$	
$DIRE(K) = \frac{ETDR(K,1) - ETDR(K,4) - (KYRE(K) + KZRE(K)) (WN)}{2.0} - [KXRE(K)] (WU) - [KXR(K) + KXRE(K)] [DIXE(K)] + (KYR(K) + KYRE(K)) [DSXE(K)]$	
$DORE(K) = \frac{ETDR(K,3) - ETDR(K,7)}{2.0} - [KYRE(K)] (WU) - [KXR(K) + KXRE(K)] [DSXE(K)] - [KYR(K) + KYRE(K)] [DIXE(K)]$	
$DSRE(K) = \frac{ETDR(K,2) - ETDR(K,6) - [KXRE(K) + KYRE(K)] (WN)}{2.0} - [KZRE(K)] (WU)$	
$DDFRE(K) = \frac{C(DOR(K) + DORE(K)) - (DIR(K) + DIRE(K))}{C - 1}$	
<p>where:</p> $C = \frac{KXR(K) + KXRE(K)}{KYR(K) + KYRE(K)}$	

FIGURE 4.5.4.3.1-1.(3) HANG\_CALA Error Parameter Computations (Sheet 3 of 3)

Parameters and Equations	Units
$KIX(K) = \frac{KIX(K) + KIXE(K)}{1 - KIXE(K) 10^{-6}}$	μg/g
$KIY(K) = \frac{KIY(K) + KIYE(K)}{1 - KIYE(K) 10^{-6}}$	μg/g
$KIZ(K) = \frac{KIZ(K) + KIZE(K)}{1 - KIZE(K) 10^{-6}}$	μg/g
$KIXH(K) = \frac{KIXH(K) + KIXHE(K)}{1 - KIXHE(K) 10^{-6}}$	μg/g
$KIYH(K) = \frac{KIYH(K) + KIYHE(K)}{1 - KIYHE(K) 10^{-6}}$	μg/g
$KIZH(K) = \frac{KIZH(K) + KIZHE(K)}{1 - KIZHE(K) 10^{-6}}$	μg/g
$KTX(K) = KTX(K) (1 + KTXE(K))$	deg/hr/deg/hr
$KTY(K) = KTY(K) (1 + KTYE(K))$	deg/hr/deg/hr
$KTZ(K) = KTZ(K) (1 + KTZE(K))$	deg/hr/deg/hr
$DELTZX(K) = DELTZX(K) + DELTZXE(K)$	rad
$DELTXY(K) = DELTXY(K) + DELTXYE(K)$	rad
$DELTZY(K) = DELTZY(K) + DELTZYE(K)$	rad
$BXY(K) = BXY(K) + BXYE(K)$	rad
$BXZ(K) = BXZ(K) + BXZE(K)$	rad
$BYX(K) = BYX(K) + BYXE(K)$	rad
$BYZ(K) = BYZ(K) + BYZE(K)$	rad
$BZX(K) = BZX(K) + BZXE(K)$	rad
$BZY(K) = BZY(K) + BZYE(K)$	rad

FIGURE 4.5.4.3.1-2.(1) HANG\_CALA Calibration Parameter Update Equations (Sheet 1 of 3)

Parameters and Equations	Units
$KOZ(K) = KOZ(K) + KOZE(K)$	$\mu g$
$KOX(K) = KOX(K) + KOXE(K)$	$\mu g$
$KOY(K) = KOY(K) + KOYE(K)$	$\mu g$
$KSX(K) = \frac{KSX(K) + (1 + (KIX(K)) 10^{-6}) (KSXE(K))}{1 - (KIXE(K)) 10^{-6}}$	$\mu g/g$
$KSY(K) = \frac{KSY(K) + (1 + (KIY(K)) 10^{-6}) (KSYE(K))}{1 - (KIYE(K)) 10^{-6}}$	$\mu g/g$
$KSZ(K) = \frac{KSZ(K) + (1 + (KIZ(K)) 10^{-6}) (KSZE(K))}{1 - (KIZE(K)) 10^{-6}}$	$\mu g/g$
$KOXH(K) = KOXH(K) + KOXHE(K)$	$\mu g$
$KOYH(K) = KOYH(K) + KOYHE(K)$	$\mu g$
$KOZH(K) = KOZH(K) + KOZHE(K)$	$\mu g$
$DFX(K) = DFX(K) + DFXE(K)$	deg/hr
$DFY(K) = DFY(K) + DFYE(K)$	deg/hr
$DFZ(K) = DFZ(K) + DFZE(K)$	deg/hr
$DIX(K) = DIX(K) + DIXE(K)$	deg/hr/g
$DIZ(K) = DIZ(K) + DIZE(K)$	deg/hr/g
$DSX(K) = DSX(K) + DSXE(K)$	deg/hr/g
$DSZ(K) = DSZ(K) + DSZE(K)$	deg/hr/g
$DOZ(K) = DOZ(K) + DOZE(K)$	deg/hr/g
$KXR(K) = KXR(K) + KXRE(K)$	deg/hr/deg/hr
$KYR(K) = KYR(K) + KYRE(K)$	deg/hr/deg/hr

FIGURE 4.5.4.3.1-2.(2) HANG\_CALA Calibration Parameter Update Equations (Sheet 2 of 3)

Parameters and Equations	Units
$KZR(K) = KZR(K) + KZRE(K)$	deg/hr/deg/hr
$DFR(K) = DFR(K) + DRFE(K)$	deg/hr
$DIR(K) = DIR(K) + DIRE(K) - DDFRE(K)$	deg/hr/g
$DOR(K) = DOR(K) + DORE(K) - DDFRE(K)$	deg/hr/g
$DSR(K) = DSR(K) + DSRE(K) - DDFRE(K)$	deg/hr/g
$DDFR(K) = DDFR(K) + DDFRE(K)$	deg/hr

FIGURE 4.5.4.3.1-2.(3) HANG\_CALA Calibration Parameter Update Equations (Sheet 3 of 3)

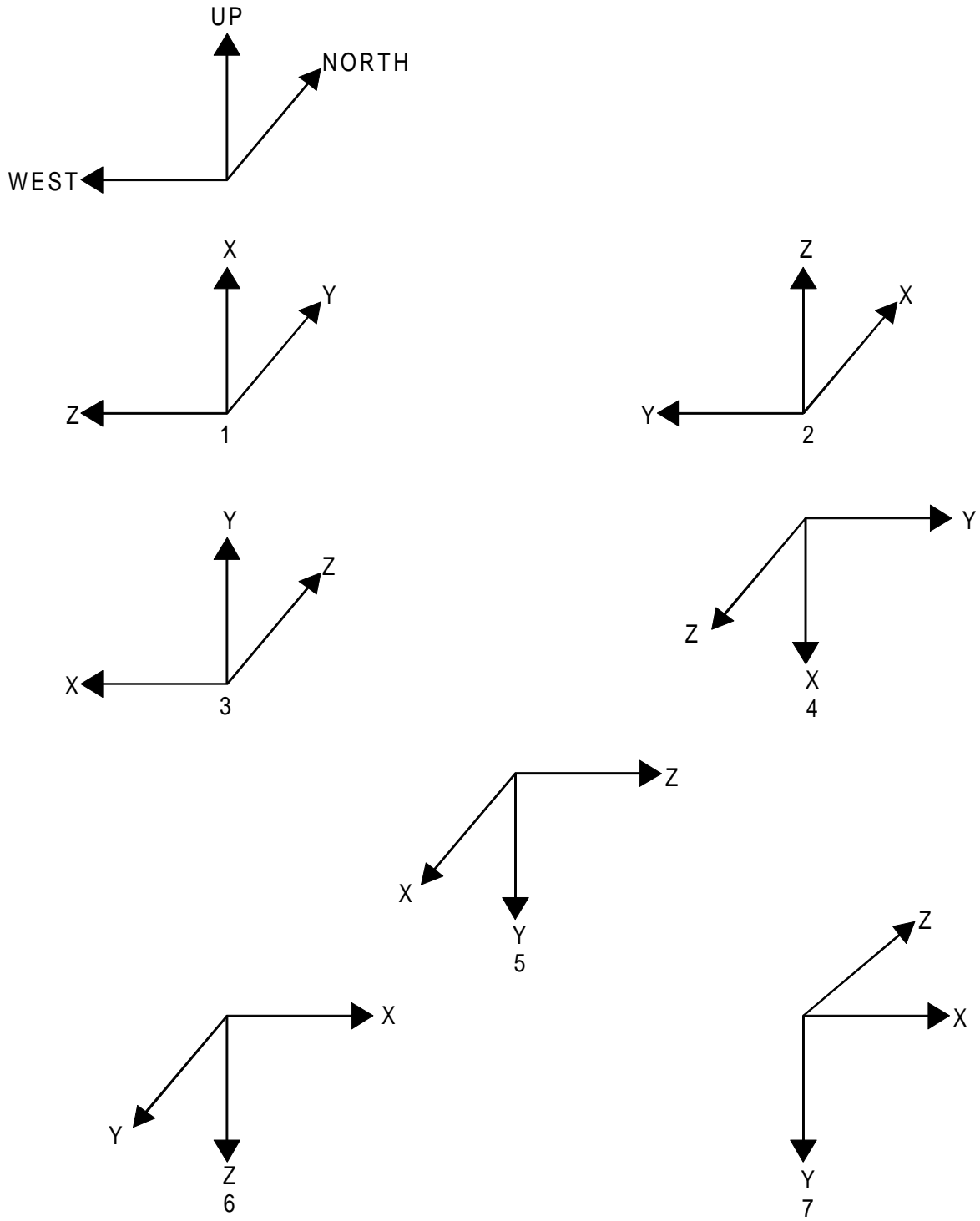


FIGURE 4.5.4.3.1-3.(1) IMU Cluster Calibration Positions (Sheet 1 of 2)

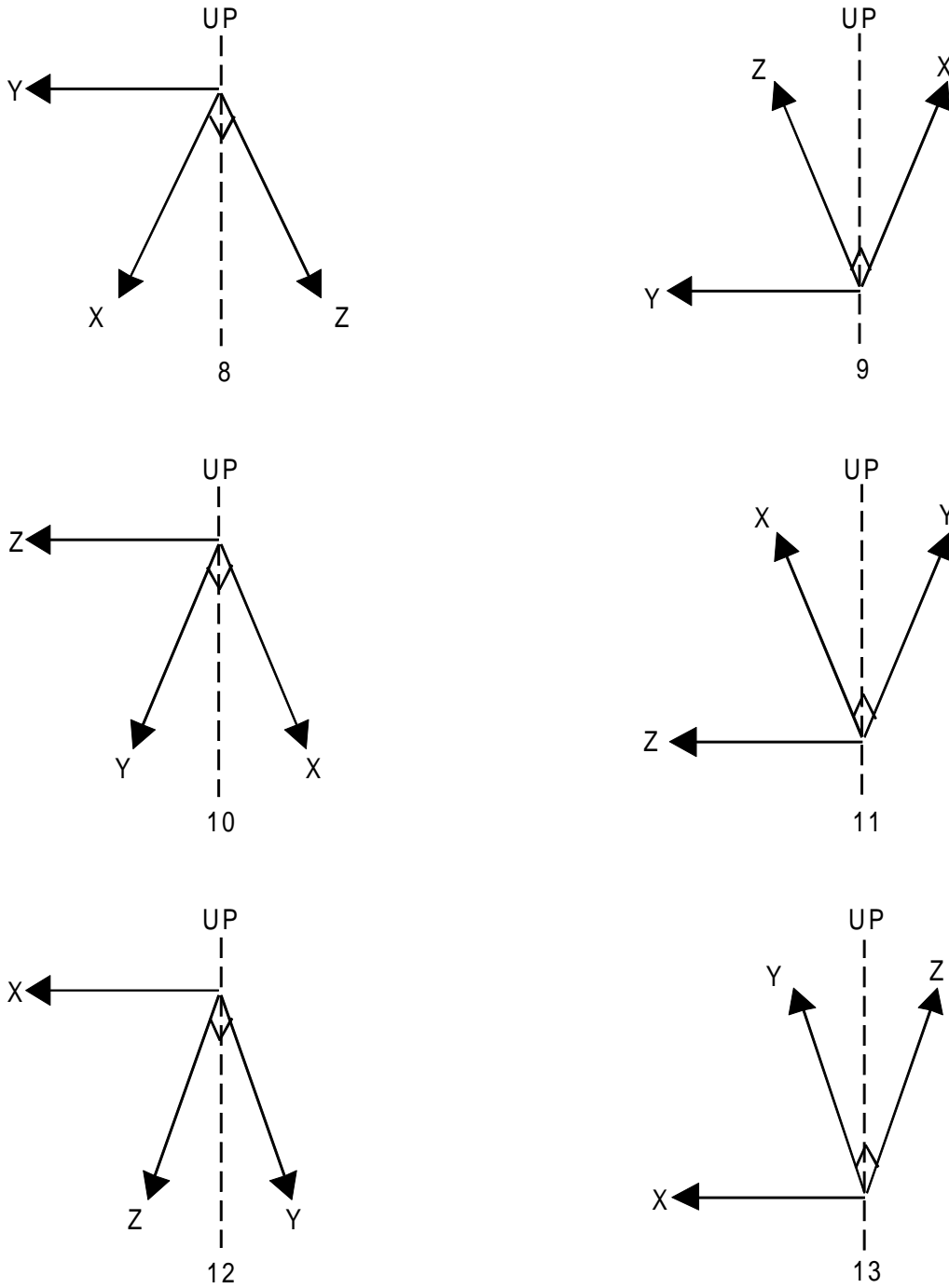


FIGURE 4.5.4.3.1-3.(2) IMU Cluster Calibration Positions (Sheet 2 of 2)

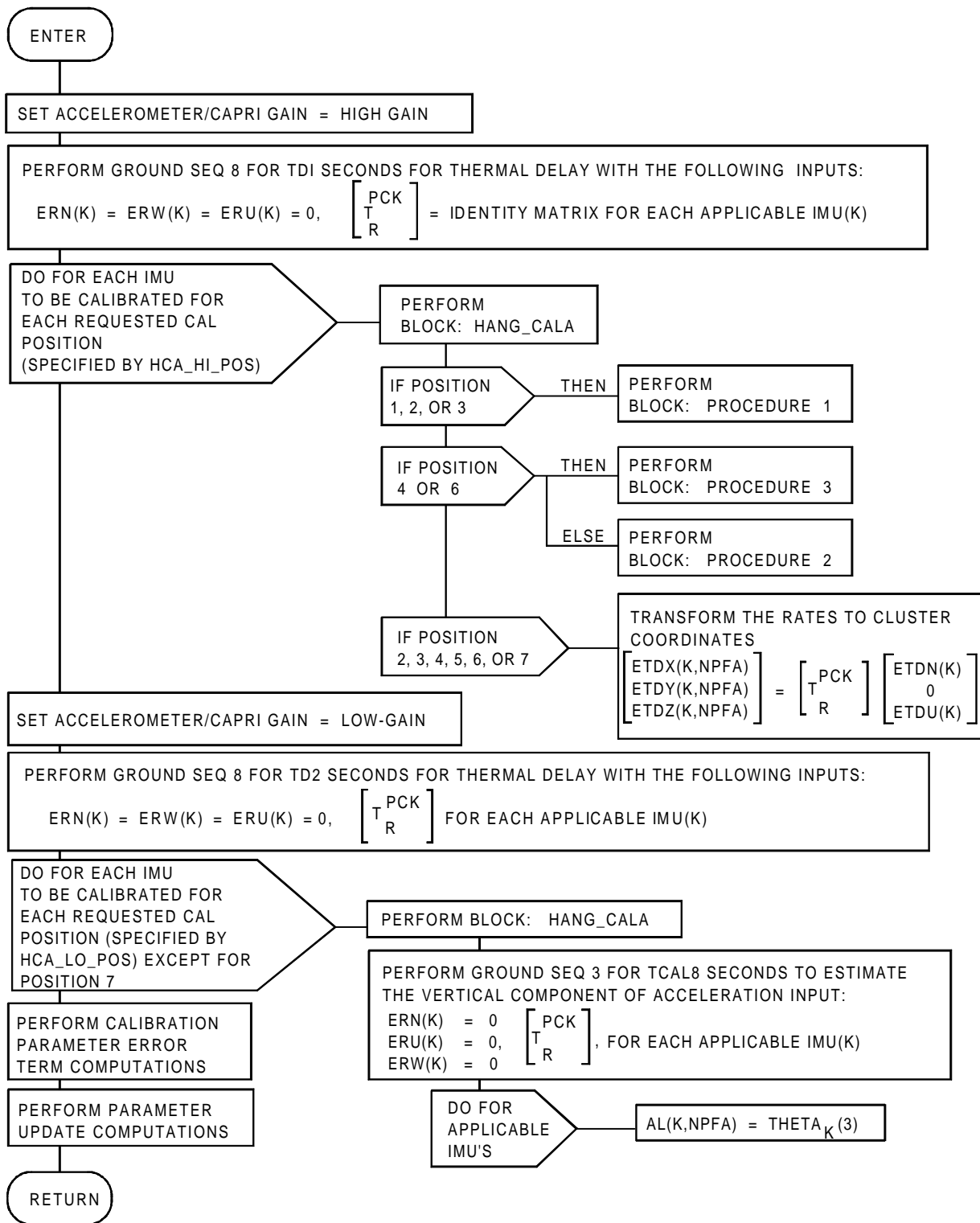


FIGURE 4.5.4.3.1-4.(1) HANG\_CALA Flow Diagram (Sheet 1 of 9)

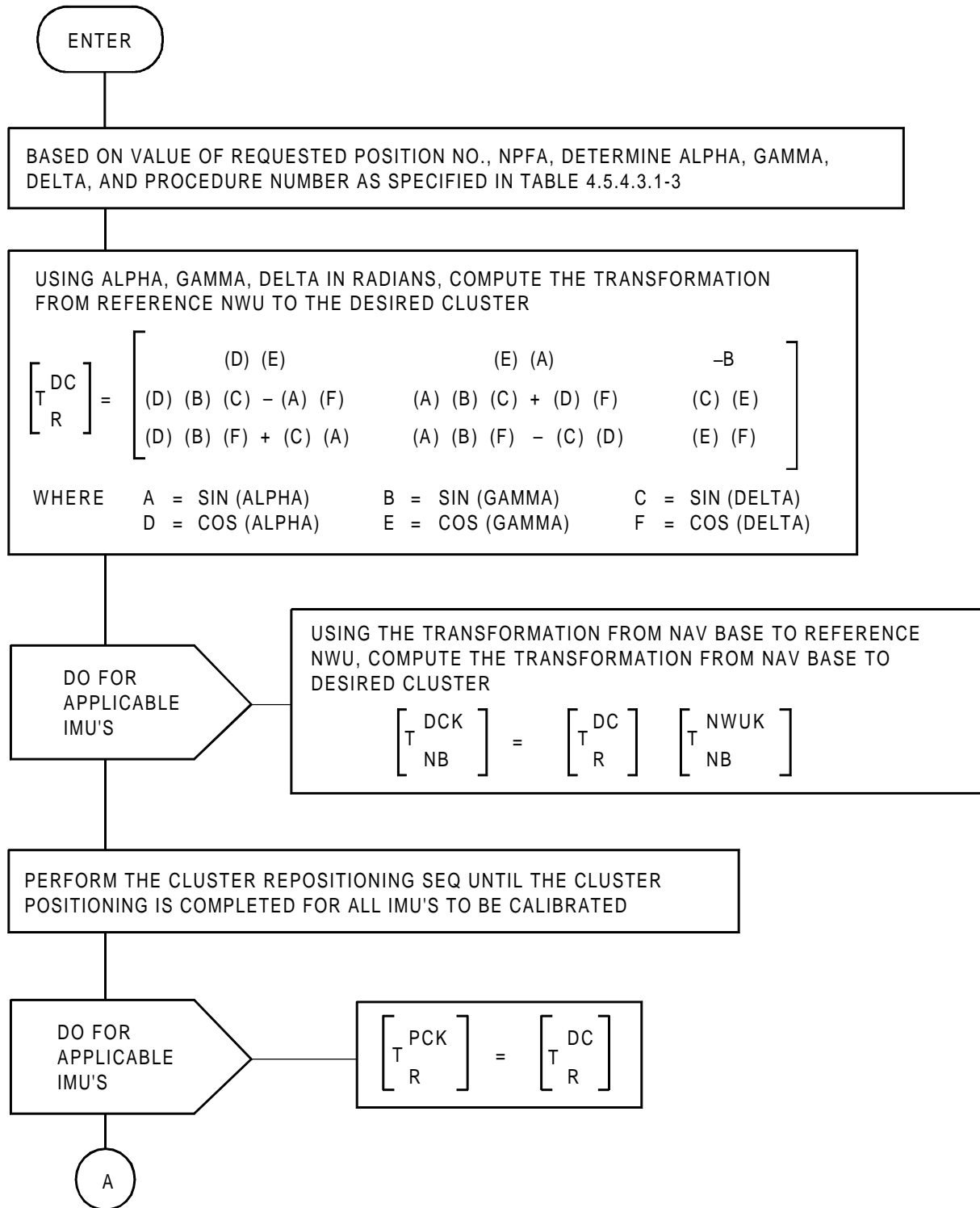


FIGURE 4.5.4.3.1-4.(2) HANG\_CALA (Block: HANG\_CALA1) Flow Diagram (Sheet 2 of 9)



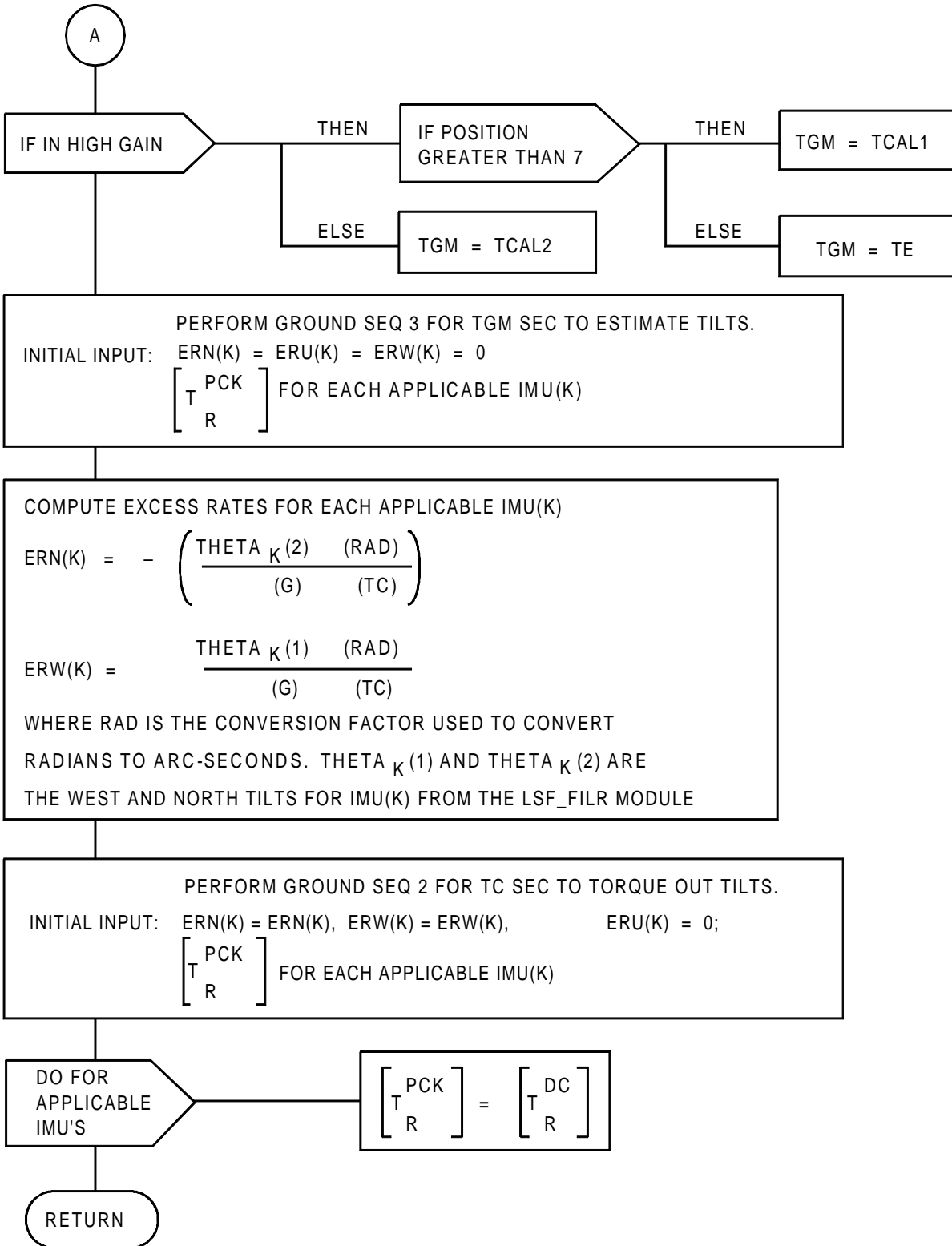


FIGURE 4.5.4.3.1-4.(3) HANG\_CALA (Block: HANG\_CALA1) Flow Diagram (Sheet 3 of 9)

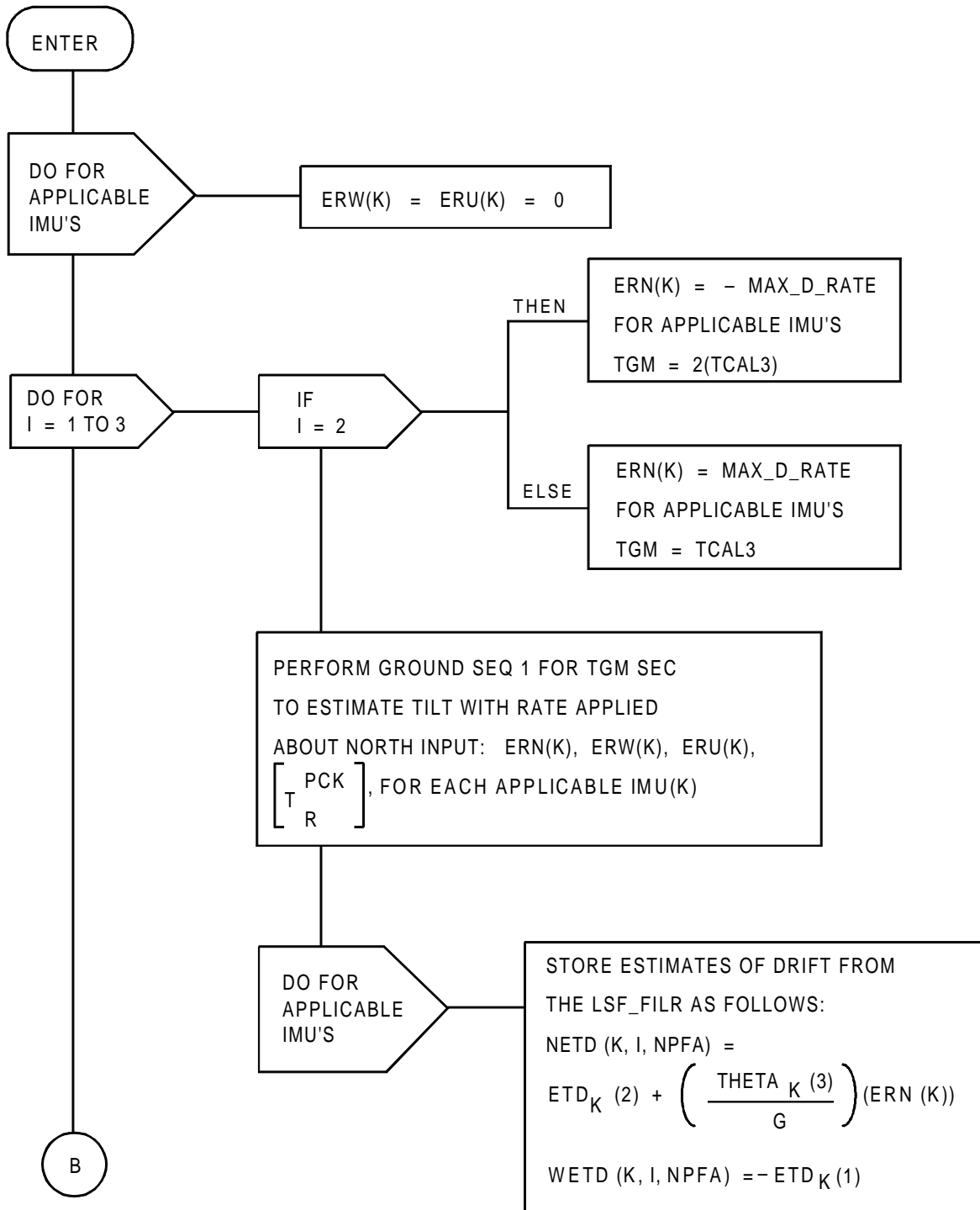


FIGURE 4.5.4.3.1-4.(4) HANG\_CALA (Block: Procedure 1) Flow Diagram (Sheet 4 of 9)

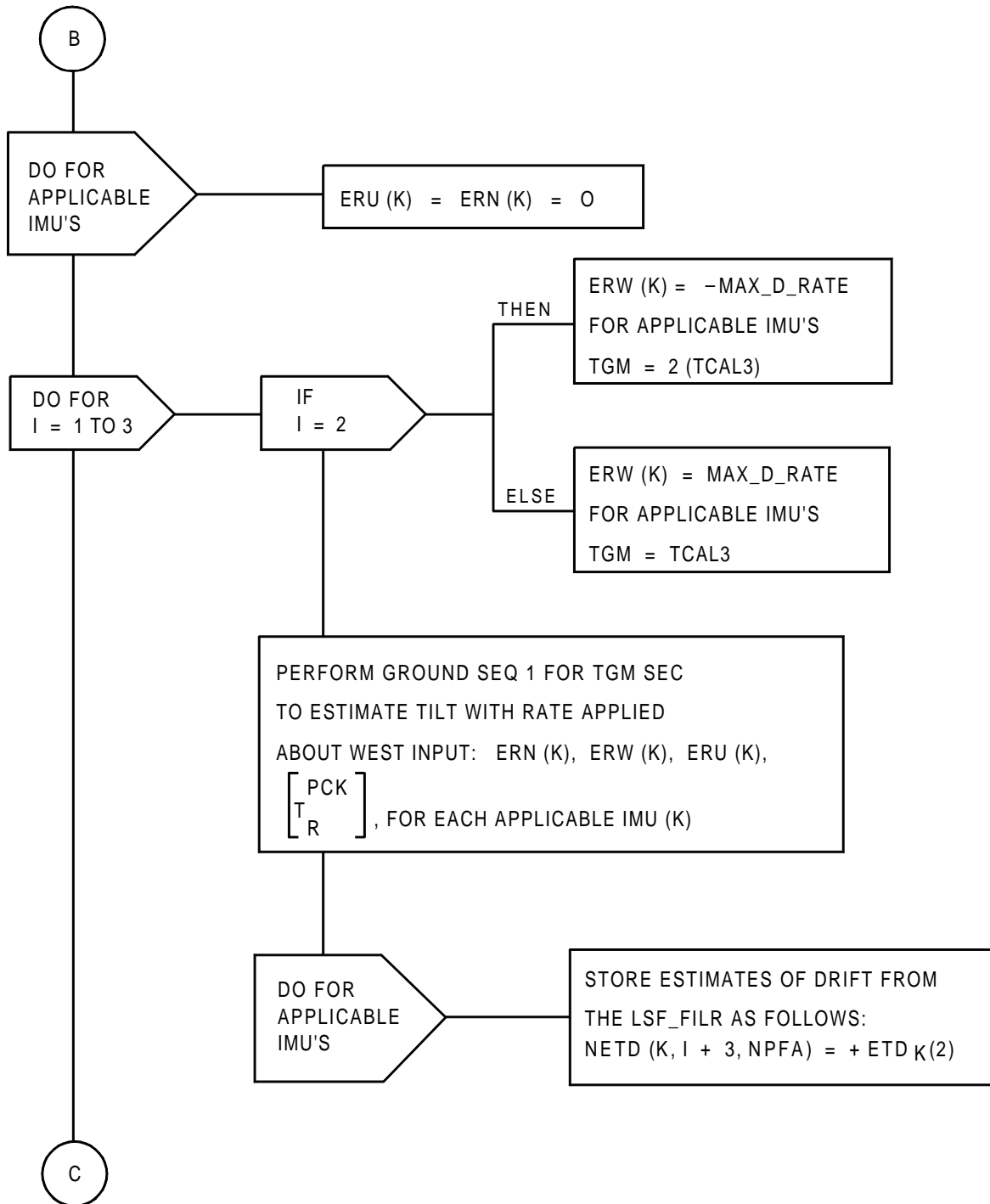


FIGURE 4.5.4.3.1-4.(5) HANG\_CALA (Block: Procedure 1 cont) Flow Diagram (Sheet 5 of 9)

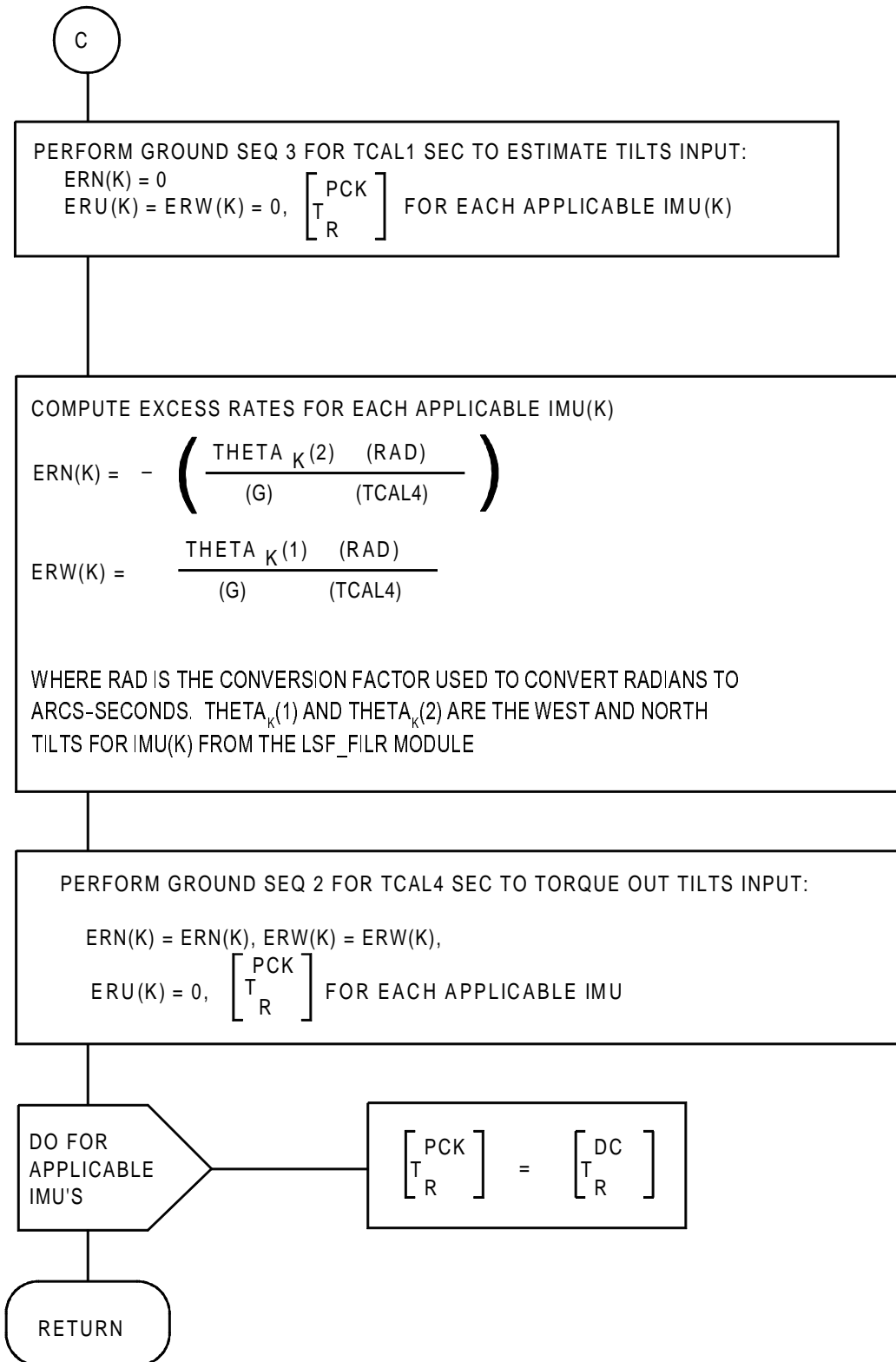


FIGURE 4.5.4.3.1-4.(6) HANG\_CALA (Block: Procedure 1 cont) Flow Diagram (Sheet 6 of 9)

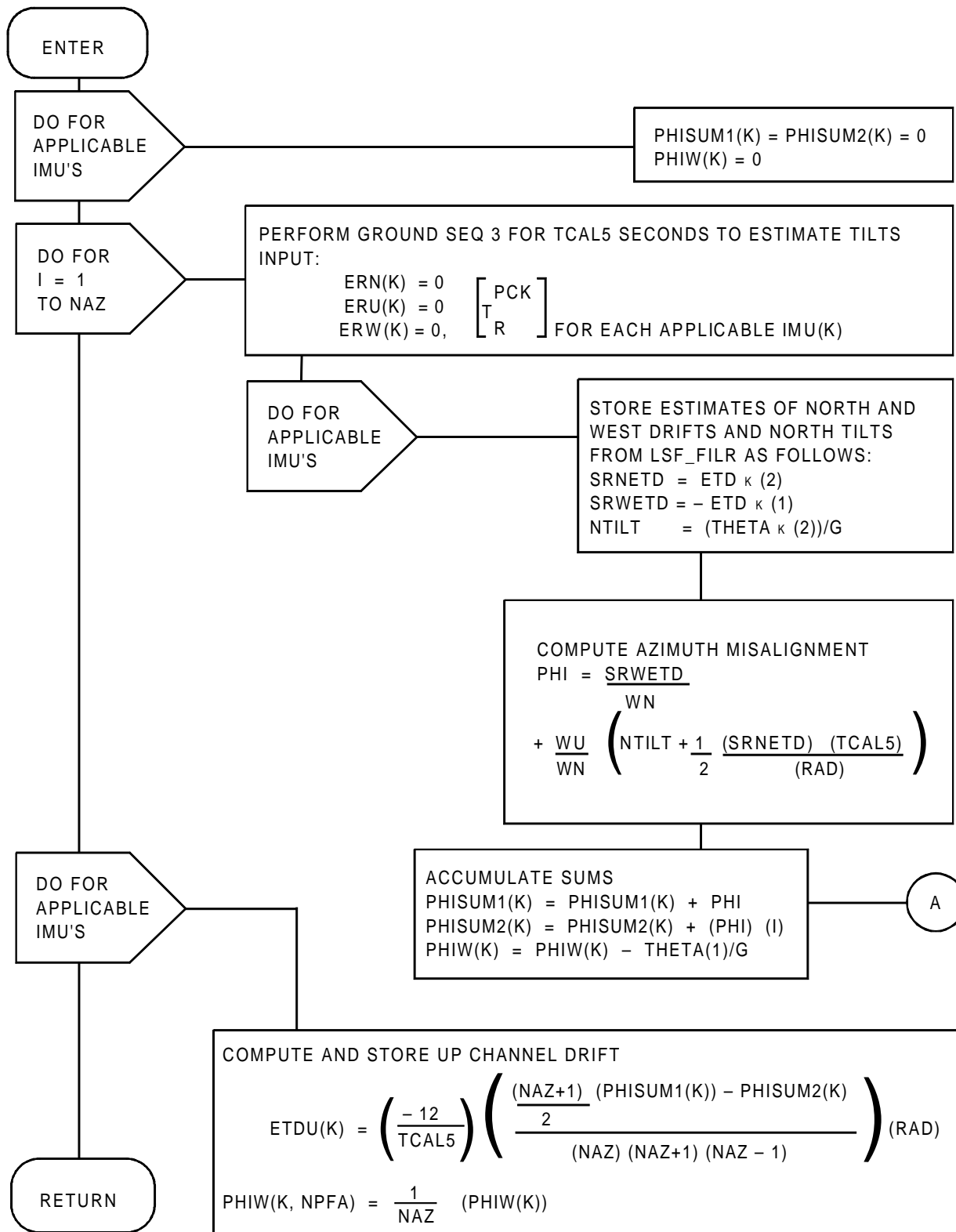


FIGURE 4.5.4.3.1-4.(7) HANG\_CALA (Block: Procedure 3) Flow Diagram (Sheet 7 of 9)

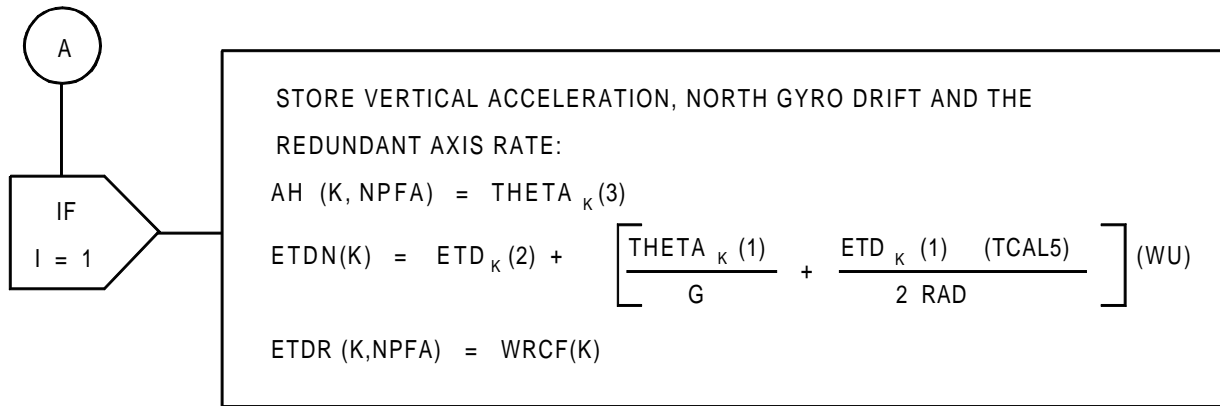


FIGURE 4.5.4.3.1-4.(8) HANG\_CALA (Block: Procedure 3) Flow Diagram (Sheet 8 of 9)

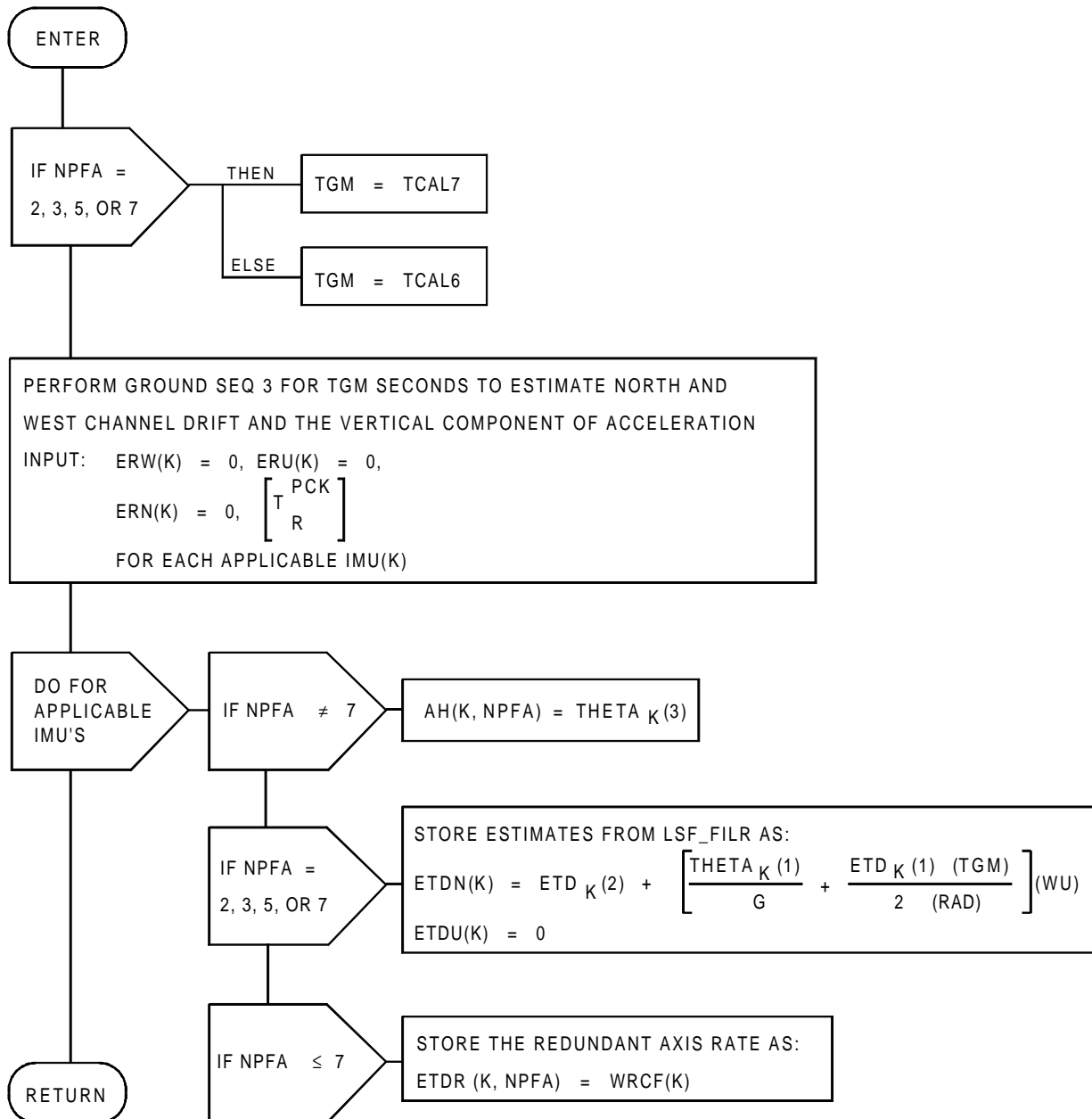


FIGURE 4.5.4.3.1-4.(9) HANG\_CALA (Block: Procedure 2) Flow Diagram (Sheet 9 of 9)

#### 4.5.4.3.2 Hangar Calibration B (HANG\_CALB).

The purpose of Hangar Calibration B is to perform a series of tests on an IMU and to use the data obtained to compute the azimuth, inner roll, and pitch resolver offset errors; outer roll gimbal nonorthogonality error; and gyro and accelerometer misalignment errors identified in Table 4.5.4.3-2.

For each IMU to be calibrated, designated IMU B, a second IMU, designated IMU A, is used as a stable reference. (Thus, Hangar Calibration B requires that at least two selected IMU's be operating.) IMU B is subjected to a series of four calibration conditions. The cluster is positioned and torqued such that the required error signals will appear in resolver readouts. Parameter error terms are computed as data becomes available. All parameters are updated, automatically, at the end of the calibration.

A. Functional Requirements. The HANG\_CALB module performs the following functions:

1. Collect the relative drift rate vector in each of the four calibration conditions for each of the IMU's being calibrated.
2. Compute the azimuth, inner roll, and pitch resolver offset errors, roll gimbal nonorthogonality error, and gyro misalignment and accelerometer misalignment error parameters.
3. Update the resolver offset, roll gimbal nonorthogonality, gyro misalignment, and accelerometer misalignment calibration parameters.

B. Interface Requirements. The input/output interfaces associated with HANG\_CALB are listed in Tables 4.5.4.3.2-1 and 4.5.4.3.2-2. Where two range values are listed for one parameter, the first value is for the KT-70 IMU and the second value is for the HAINS IMU.

C. Detailed Requirements. Hangar Calibration B requires that at least two selected IMU's be in the OPERATE mode in order to perform calibration. For each IMU to be calibrated (designated B), a reference IMU (designated A) is required. For each IMU to be calibrated, there are four calibration conditions (two different positions, each with different rates applied) required to obtain error information (estimated rate vectors).

When Hangar Calibration B is requested by the user, the current calibration parameters shall not be zeroed. When three IMU's are operating and Hangar Calibration B is requested, the program shall automatically calibrate IMU's 1, 2, 3 in sequential order with IMU's 3, 3, 1 used for reference IMU's, respectively. If two selected IMU's are in the OPERATE mode, both IMU's shall be calibrated in ascending order with the other operating IMU used for reference in each case.

For any IMU B to be calibrated, the following equations and sequences of computations are required:

1. Set the accelerometer scale factor to high gain.



2. Set the initial values for  $\bar{E}R_{CB}$ ,  $\left[ T_{CASE}^{DC} \right]$ , and  $\bar{PFLAG}_B$  for this test condition (starting with the first condition) as follows:

- a. If first condition, then

$$\bar{E}R_{CB} = \begin{bmatrix} W_{x1} \\ W_{y1} \\ W_{z1} \end{bmatrix}, \left[ T_{CASE}^{DC} \right] = \left[ T_{CASE}^{DC12} \right], \bar{PFLAG}_B = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$$

- b. If second condition, then

$$\bar{E}R_{CB} = \begin{bmatrix} W_{x2} \\ W_{y2} \\ W_{z2} \end{bmatrix}, \left[ T_{CASE}^{DC} \right] = \left[ T_{CASE}^{DC12} \right], \bar{PFLAG}_B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

- c. If third condition, then

$$\bar{E}R_{CB} = \begin{bmatrix} W_{x3} \\ W_{y3} \\ W_{z3} \end{bmatrix}, \left[ T_{CASE}^{DC} \right] = \left[ T_{CASE}^{DC34} \right], \bar{PFLAG}_B = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$$

- d. If fourth condition, then

$$\bar{E}R_{CB} = \begin{bmatrix} W_{x4} \\ W_{y4} \\ W_{z4} \end{bmatrix}, \left[ T_{CASE}^{DC} \right] = \left[ T_{CASE}^{DC34} \right], \bar{PFLAG}_B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

- e. For all calibration conditions,  $\bar{PFLAG}_A = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

where  $\bar{E}R_{CB}$ ,  $\left[ T_{CASE}^{DC} \right]$ , and  $\bar{PFLAG}$  are as follows:

$\bar{E}R_{CB}$  is the excess rate vector in cluster B coordinates

$\left[ T_{CASE}^{DC} \right]$  is the transformation from case-to-desired cluster

$\bar{PFLAG}$  is the three-element vector flag that designates the three cluster axes on which sinusoidal excess rates will be applied. The A or B subscript identifies the applicable IMU.

Note: All gimbal angles for the TCASE\_DC12 are 3.516°. For TCASE\_DC34, the roll and pitch gimbal angles are 3.516° and the azimuth gimbal angle is 183.516°.

3. a. Compute the transformations from Nav Base-to-desired cluster as follows:

$$\begin{bmatrix} T_{NB}^{DCB} \end{bmatrix} = \begin{bmatrix} T_{CASE}^{DC} \end{bmatrix} \begin{bmatrix} T_{NB}^{CASE(B)} \end{bmatrix}, \quad \begin{bmatrix} T_{NB}^{DCA} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

- b. Compute the transformation from reference NWU-to-desired cluster B as follows:

$$\begin{bmatrix} T_R^{DCB} \end{bmatrix} = \begin{bmatrix} T_{NB}^{DCR} \end{bmatrix} \begin{bmatrix} T_{NB}^{NWU(B)} \end{bmatrix}^T$$

4. Perform the cluster repositioning sequence to orient IMU B and IMU A cluster to the required positions with the following input:

$$\begin{bmatrix} T_{NB}^{DCB} \end{bmatrix}, \begin{bmatrix} T_{NB}^{DCA} \end{bmatrix}$$

5. a. Set the transformation from reference NWU-to-present cluster equal to the transformation from reference NWU-to-desired cluster A and B:

$$\begin{bmatrix} T_R^{PCB} \end{bmatrix} = \begin{bmatrix} T_R^{DCB} \end{bmatrix}$$

$$\begin{bmatrix} T_R^{PCA} \end{bmatrix} = \begin{bmatrix} T_{NB}^{NWU(A)} \end{bmatrix}^T$$

- b. Perform ground sequence 8 for THCB1 seconds for IMU A and IMU B with the following initial inputs:

$$ERN(K) = 0, ERW(K) = 0, ERU(K) = 0, \text{ for } K = A, B$$

6. Perform three iterations of the following:

- a. Compute the initial value for cluster B excess rate to be used in the SINE\_EXRTE module as follows:

$$\begin{bmatrix} ERNI(B) \\ ERWI(B) \\ ERUI(B) \end{bmatrix} = \begin{bmatrix} T_R^{PCB} \end{bmatrix}^T \overline{ER}_{CB}$$

- b. Perform ground sequence 5 for IMU A and ground sequence 6 for IMU B for TGS seconds (TGS = THCB2 on first iteration) with the following inputs:

$$ERNI(B), ERWI(B), ERUI(B), ERNI(A) = 0, ERWI(A) = 0$$

$$ERUI(A) = 0$$

$$\text{OUTPUT: } \overline{PHIDBA} \text{ (which is equivalent to PHIDIJ)}$$

- c. Convert the relative rate vector to cluster B coordinates as follows:

$$\overline{R}ELRATEB_{FLAGB} = \begin{bmatrix} T \\ R \end{bmatrix}^{PCB} \overline{P}HIDBA$$

where FLAGB is the iteration number

- d. If this is the first iteration, set TGS = 2(THCB2); if this is the second iteration, set TGS = (THCB2); otherwise, compute the average rate vector as follows:

$$\overline{A}VGRATEB = 1/4[\overline{R}ELRATEB_1 + \overline{R}ELRATEB_3 - 2(\overline{R}ELRATEB_2)][RA]$$

- e. If this is the third iteration, proceed to step 7; otherwise set the excess rate vector in cluster B coordinates to the negative of the previous excess rate vector in cluster coordinates as follows:

$$\overline{E}R_{CB} = -\overline{E}R_{CB}$$

7. Perform the following:

- a. If first condition, then

$$\overline{R}ATEB1 = \overline{A}VGRATEB$$

- b. If second condition, then

(1) Set  $\overline{R}ATEB2 = \overline{A}VGRATEB$

- (2) Compute the azimuth resolver offset error and roll gimbal nonorthogonality error as follows:

$$AZOE(B) = \left[ \frac{RATEB2(1)}{WY2} \right] (RADDEG)$$

$$DPE(B) = \frac{RATEB2(1)}{WY2} + \frac{RATEB1(2)}{WX1}$$

- c. If third condition, then

(1) Set  $\overline{R}ATEB3 = \overline{A}VGRATEB$

- (2) Compute the pitch resolver offset error and the X-gyro input axis offset error toward the Z reference as follows:

$$POE(B) = \left[ \frac{RATEB3(3) - RATEB1(3)}{-2WX3} \right] (RADDEG)$$

$$MXZE(B) = \left[ \frac{RATEB3(3) + RATEB1(3)}{2WX3} \right]$$

d. If fourth condition, then

- (1) Set  $\overline{\text{RATEB4}} = \overline{\text{AVGRATEB}}$
- (2) Compute the inner roll resolver offset error and Y-gyro input axis offset error toward the Z reference as follows:

$$\text{IROE(B)} = \left[ \frac{\text{RATEB4(3)} - \text{RATEB2(3)}}{2\text{WY4}} \right] \text{ (RADDEG)}$$

$$\text{MXZE(B)} = \left[ \frac{\text{RATEB4(3)} + \text{RATEB2(3)}}{2\text{WY4}} \right]$$

8. If not the fourth calibration condition of the last IMU to be calibrated, return to step 1; otherwise, perform the calibration update computations for each requested IMU in accordance with the equations in Table 4.5.4.3.2–3. Terminate Hangar Calibration B processing and begin TERM/IDLE processing. All terms utilized in the equations in Table 4.5.4.3.2–3 need to be saved while in operational sequence 9 in order that they can be dumped (not downlisted) by the user to the ACE station for later observation.

In addition to the foregoing requirements, whenever the Hangar Cal B submode is in progress, a HANGAR CAL B IN PROGRESS flag shall be set equal to one and made available to DISPLAYS.

A suggested design flow that satisfies the HANG\_CALB requirements is shown in Figure 4.5.4.3.2–1.

D. Special Considerations. This section identifies user interface requirements associated with Hangar Calibration B and discusses the recommended use of Hangar Calibration B from an operational viewpoint.

1. Hangar Calibration B User Interface. The following CRT format is required to control and monitor the Hangar Calibration B mechanization defined in previous paragraphs:

```
HNGR_CAL_B 21X    TERM/IDLE 27X
```

Item 21X is used to request Hangar Calibration B. The X position will display an asterisk when Hangar Calibration B is active.

Item 27X may be used to terminate Hangar Calibration B prior to normal completion. The X position displays an asterisk when the program is in the TERM/IDLE submode.

Note that the specific correct item numbers are defined in the D&C FSSR.

2. Hangar Calibration B Operations. The following guidelines are recommended for effective use of Hangar Calibration B capabilities.
  - a. A successful Hangar Calibration A followed by IMU Attitude Determination should normally be completed immediately prior to performing Hangar Calibration B. A return to warmup STANDBY mode or power interruptions between Hangar Calibration A and B are to be avoided.

- b. Each selected operating IMU is calibrated by executing Item 21X. Hangar Calibration B requires that at least two IMU's be in the OPERATE mode.
- c. A repeat calibration should normally be performed if the error terms are determined to be unreasonable, or if calibration parameters stability tests are desired.
- d. Hangar Calibration B requires approximately 150 minutes.

Table 4.5.4.3.2-1. HANG\_CALB Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
T <sub>DC12</sub> CASE	V96U7038C THRU V96U7046C	TRANSFORMATION: IMU CASE TO DESIRED CLUSTER; FOR TEST CONDITION 1 and 2 ELE VALUE 1.1 0.9962389 1.2 -5.745788 X10** <sub>-2</sub> 1.3 6.485765 X10** <sub>-2</sub> 2.1 6.121183 X10** <sub>-2</sub> 2.2 0.9964696 2.3 -5.745788 X10** <sub>-2</sub> 3.1 -6.132727 X10** <sub>-2</sub> 3.2 6.121183 X10** <sub>-2</sub> 3.3 0.9962389	CONSTANT	MATRIX	SEE VALUES IN DESCRIPTION COL	NA	OD
T <sub>DC34</sub> CASE	V96U7047C THRU V96U7055C	TRANSFORMATION: IMU CASE TO DESIRED CLUSTER; FOR TEST CONDITION 3 AND 4 ELE VALUE 1.1 -0.9962389 1.2 5.745788 X10** <sub>-2</sub> 1.3 -6.485765 X10** <sub>-2</sub> 2.1 -6.121183 X10** <sub>-2</sub> 2.2 -0.9964696 2.3 5.745788 X10** <sub>-2</sub> 3.1 -6.132727 X10** <sub>-2</sub> 3.2 6.121183 X10** <sub>-2</sub> 3.3 0.9962383	CONSTANT	MATRIX	SEE VALUES IN DESCRIPTION COL	NA	OD
T <sub>NWU</sub> NB	V99U2790C THRU V99U2816C	TRANSFORMATION: NAVIGATION BASE TO NWU; 1 PER IMU	IMU_ATT	MATRIX	+/-1	NA	OD
T <sub>CASE</sub> NB	V96U7132C THRU V96U7158C	TRANSFORMATION: NAVIGATION BASE TO IMU CASE; 1 PER IMU	I-LOAD	MATRIX	+/-1	NA	OD
THCB1	V96W7065C	HANGAR CAL B, TIME CONSTANT 1	K-LOAD	SCALAR	60.16	SEC	OD
THCB2	V96W7066C	HANGAR CAL B, TIME CONSTANT 2	K-LOAD	SCALAR	360	SEC	OD
LATCOMP(1) LATCOMP(2) LATCOMP(3)	V95X0085X V95X1085X V95X2085X	LARGE ANGLE TORQUING COMPLETE FLAG; 1 PER IMU	LAT_FUNC	LOGICAL	0, 1	NA	OD
AZO	V99H2610C V99H2611C V99H2612C	AZIMUTH RESOLVER OFFSET; 1 PER IMU	COMPOOL	SCALAR	+/-5	DEG	OD
IRO	V99H2615C V99H2616C V99H2617C	INNER ROLL RESOLVER OFFSET; 1 PER IMU	COMPOOL	SCALAR	+/-5	DEG	OD

Table 4.5.4.3.2-1. HANG\_CALB Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
PO	V99H2620C V99H2621C V99H2622C	PITCH RESOLVER OFFSET; 1 PER IMU	COMPOOL	SCALAR	+/-5	DEG	OD
DP(1)	V99H2660C	IMU-1 ROLL/PITCH NONORTHOGONALITY	COMPOOL	SCALAR	+/-0.006	RAD	OD
DP(2)	V99H2661C	IMU-2 ROLL/PITCH NONORTHOGONALITY	COMPOOL	SCALAR	+/-0.006	RAD	OD
DP(3)	V99H2662C	IMU-3 ROLL/PITCH NONORTHOGONALITY	COMPOOL	SCALAR	+/-0.006	RAD	OD
BZY	V99H2605C V99H2606C V99H2607C	Z-GYRO MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	HANG_CALA COMPOOL	SCALAR	+/-0.05	RAD	OD
BZX	V99H2602C V99H2603C V99H2604C	Z-GYRO MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	HANG_CALA COMPOOL	SCALAR	+/-0.05	RAD	OD
BYZ	V99H2599C V99H2600C V99H2601C	Y-GYRO MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	HANG_CALA COMPOOL	SCALAR	+/-0.05	RAD	OD
BXZ	V99H2593C V99H2594C V99H2595C	X-GYRO MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	HANG_CALA COMPOOL	SCALAR	+/-0.05	RAD	OD
DELTZX	V99H2543C V99H2544C V99H2545C	Z-ACCELEROMETER MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	HANG_CALA COMPOOL	SCALAR	+/-0.05	RAD	OD
DELTZY	V99H2546C V99H2547C V99H2548C	Z-ACCELEROMETER MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	HANG_CALA COMPOOL	SCALAR	+/-0.05	RAD	OD
DELTXZ	V99H2552C V99H2553C V99H2554C	X-ACCELEROMETER MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
DELTYZ	V99H2549C V99H2550C V99H2551C	Y-ACCELEROMETER MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	COMPOOL	SCALAR	+/-0.05	RAD	OD
RAD	V96U7006C	CONVERSION FACTOR TO CONVERT RADIAN TO ARC-SECONDS	CONSTANT	SCALAR	206264.8	ARC- SEC /RAD	OD
RADDEG	V96U7007C	CONVERSION FACTOR FROM RADIAN TO DEGREES	CONSTANT	SCALAR	57.29578	DEG/ RAD	OD
PHIDIJ	V99U3581C THRU V99U3589C	RELATIVE RATE ERROR VECTOR BETWEEN CLUSTERS I AND J; 1 PER IMU PAIR	CL_CLRATE	VECTOR	+/-1	RAD/S EC	OD
WX1	V96U7028C	ER VECTOR X1	K-LOAD	SCALAR	59.77434	DEG/ HR	OD
WX2	V96U7029C	ER VECTOR X2	K-LOAD	SCALAR	-3.679636	DEG/ HR	OD
WX3	V99U5172C	ER VECTOR X3	K-LOAD	SCALAR	59.77434	DEG/ HR	OD
WX4	V99U5173C	ER VECTOR X4	K-LOAD	SCALAR	-3.679636	DEG/ HR	OD
WY1	V96U7030C	ER VECTOR Y1	K-LOAD	SCALAR	3.672709	DEG/ HR	OD

Table 4.5.4.3.2-1. HANG_CALB Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
WY2	V96U7031C	ER VECTOR Y2	K-LOAD	SCALAR	59.88706	DEG/HR	OD
WY3	V99U5174C	ER VECTOR Y3	K-LOAD	SCALAR	3.672709	DEG/HR	OD
WY4	V99U5175C	ER VECTOR Y4	K-LOAD	SCALAR	59.88706	DEG/HR	OD
WZ1	V96U7032C	ER VECTOR Z1	K-LOAD	SCALAR	-3.679636	DEG/HR	OD
WZ2	V96U7033C	ER VECTOR Z2	K-LOAD	SCALAR	0	DEG/HR	OD
WZ3	V96U7034C	ER VECTOR Z3	K-LOAD	SCALAR	3.679636	DEG/HR	OD
WZ4	V99U5176C	ER VECTOR Z4	I-LOAD	SCALAR		DEG/HR	OD
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0,1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0,1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0,1	NA	OD

Table 4.5.4.3.2-2. HANG_CALB Outputs							
Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
MXZE	V99U3114C V99U3115C V99U3116C	X-GYRO INPUT AXIS OFFSET ERROR TOWARD THE Z REFERENCE; 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
MYZE	V99U3117C V99U3118C V99U3119C	Y-GYRO INPUT AXIS OFFSET ERROR TOWARD THE Z REFERENCE, 1 PER IMU	TLM	SCALAR	+/-0.05	RAD	OD
DP(1)	V99H2660C	IMU-1 ROLL/PITCH NONORTHOGONALITY	TNB_CL ATT_PROC ST SOP TLM	SCALAR	+/-0.006	RAD	OD
DP(2)	V99H2661C	IMU-2 ROLL/PITCH NONORTHOGONALITY	TNB_CL ATT_PROC ST SOP TLM	SCALAR	+/-0.006	RAD	OD
DP(3)	V99H2662C	IMU-3 ROLL/PITCH NONORTHOGONALITY	TNB_CL ATT_PROC ST SOP TLM	SCALAR	+/-0.006	RAD	OD
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
HCB_IMU	V99U2723C	HANG CAL B IMU BEING CALIBRATED	TLM	INTEGER	1 - 3	NA	OD

Table 4.5.4.3.2-2. HANG\_CALB Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
PFLAG		3-ELEMENT VECTOR FLAG DESIGNATING THE CLUSTER AXES TO APPLY SINUSOIDAL EXCESS RATES (ELEMENTS 1,2,3 CORRESPOND TO THE X,Y,Z CLUSTERAXIS RESPECTIVELY); 1 PER IMU	SINE_EXRTE	VECTOR	0,1	NA	OD
ERNI		INITIAL NORTH COMP OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	SINE_EXRTE	SCALER	+/-45	DEG/HR	OD
ERWI		INITIAL WEST COMP OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	SINE_EXRTE	SCALAR	+/-45	DEG/HR	OD
ERUI		INITIAL UP COMP OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	SINE_EXRTE	SCALAR	+/-45	DEG/HR	OD
HNGR_CAL_B	V99X2711X	HANGAR CAL B IN PROGRESS	DISPLAYS TLM	LOGICAL	0,1	NA	OD
HCALBP	V99U2722C	HANG CAL B PRES POSN NO	TLM	INTEGER	1 - 4	NA	OD
T <sub>R</sub> <sup>PC</sup>		TRANSFORMATION: REFERENCE NWU TO PRESENT CLUSTER; 1 PER IMU	T_UPDATE SINE_EXRTE	MATRIX	+/-1	NA	OD
T <sub>NB</sub> <sup>DC</sup>	V99U3350C THRU V99U3376C	TRANSFORMATION: NAVIGATION BASE TO DESIRED CLUSTER; 1 PER IMU	LAT_FUNC	MATRIX	+/-1	NA	OD
AZO	V99H2610C V99H2611C V99H2612C	AZIMUTH RESOLVER OFFSET; 1 PER IMU	RES_PROC TLM	SCALAR	+/-5	DEG	OD
IRO	V99H2615C V99H2616C V99H2617C	INNER ROLL RESOLVER OFFSET; 1 PER IMU	RES_PROC TLM	SCALAR	+/-5	DEG	OD
PO	V99H2620C V99H2621C V99H2622C	PITCH RESOLVER OFFSET; 1 PER IMU	RES_PROC TLM	SCALAR	+/-5	DEG	OD
BXZ	V99H2593C V99H2594C V99H2595C	X-GYRO MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
BZX	V99H2602C V99H2603C V99H2604C	Z-GYRO MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
BYZ	V99H2599C V99H2600C V99H2601C	Y-GYRO MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
BZY	V99H2605C V99H2606C V99H2607C	Z-GYRO MISALIGNMENT TOWARD Y REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD
DELTXZ	V99H2552C V99H2553C V99H2554C	X-ACCELEROMETER MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-0.05	RAD	OD
DELTYZ	V99H2549C V99H2550C V99H2551C	Y-ACCELEROMETER MISALIGNMENT TOWARD THE Z REFERENCE; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-0.05	RAD	OD
DELTZX	V99H2543C V99H2544C V99H2545C	Z-ACCELEROMETER MISALIGNMENT TOWARD THE X REFERENCE; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-0.05	RAD	OD



Table 4.5.4.3.2-2. HANG\_CALB Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
DELTZY	V99H2546C V99H2547C V99H2548C	Z-ACCELEROMETER MISALIGNMENT TOWARD THE Y REFERENCE; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-0.05	RAD	OD
AZOE	V99U3001C V99U3002C V99U3003C	AZIMUTH RESOLVER OFFSET ERROR; 1 PER IMU	TLM	SCALAR	+/-5	DEG	OD
IROE	V99U3004C V99U3005C V99U3006C	INNER ROLL RESOLVER OFFSET ERROR; 1 PER IMU	TLM	SCALAR	+/-5	DEG	OD
POE	V99U3010C V99U3011C V99U3012C	PITCH RESOLVER OFFSET ERROR; 1 PER IMU	TLM	SCALAR	+/-5	DEG	OD
DPE	V99U3013C V99U3014C V99U3015C	NONORTHOGONALITY ERROR BETWEEN THE OUTER ROLL AND PITCH GIMBAL AXIS; 1 PER IMU	TLM	SCALAR	+/-0.006	RAD	OD
ACCEL_ SF(1)	V71K2541B	IMU-1 CAPRI SF WD2 B0 CMD	IMU-1 TLM	LOGICAL	0,1	NA	OD
ACCEL_ SF(2)	V71K3541B	IMU-2 CAPRI SF WD2 B0 CMD	IMU-2 TLM	LOGICAL	0,1	NA	OD
ACCEL_ SF(3)	V71K4541B	IMU-3 CAPRI SF WD2 B0 CMD	IMU-3 TLM	LOGICAL	0,1	NA	OD
B24	V99H2605C V99H2606C V99H2607C	Z-GYRO MISALIGNMENT TOWARD THE Y-REFERENCE; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-0.05	RAD	OD

Table 4.5.4.3.2-3. HANG_CALB Calibration Parameter Update Equations		
Description	Parameters and Equations	Units
Pitch resolver offset; IMU-K, K = 1, 2, 3	$PO(K) = PO(K) + POE(K)$	deg
Inner roll resolver offset	$IRO(K) = IRO(K) + IROE(K)$	deg
Azimuth resolver offset	$AZO(K) = AZO(K) + AZOE(K)$	deg
Nonorthogonality between the outer roll and pitch gimbal	$DP(K) = DP(K) + DPE(K)$	rad
X-gyro misalignment towards the Z reference	$BXZ(K) = BXZ(K) + MXZE(K)$	rad
X-accelerometer misalignment towards the Z reference	$DELTXZ(K) = DELTXZ(K) - MXZE(K)$	rad
Z-accelerometer misalignment towards the X reference	$DELTZX(K) = DELTZX(K) + MXZE(K)$	rad
Z-gyro misalignment towards the X reference	$BZX(K) = BZX(K) - MXZE(K)$	rad
Y-gyro misalignment towards the Z reference	$BYZ(K) = BYZ(K) + MYZE(K)$	rad
Y-accelerometer misalignment towards the Z reference	$DELTYZ(K) = DELTYZ(K) - MYZE(K)$	rad
Z-accelerometer misalignment towards the Y reference	$DELTZY(K) = DELTZY(K) + MYZE(K)$	rad
Z-gyro misalignment towards the Y reference	$BZY(K) = BZY(K) - MYZE(K)$	rad

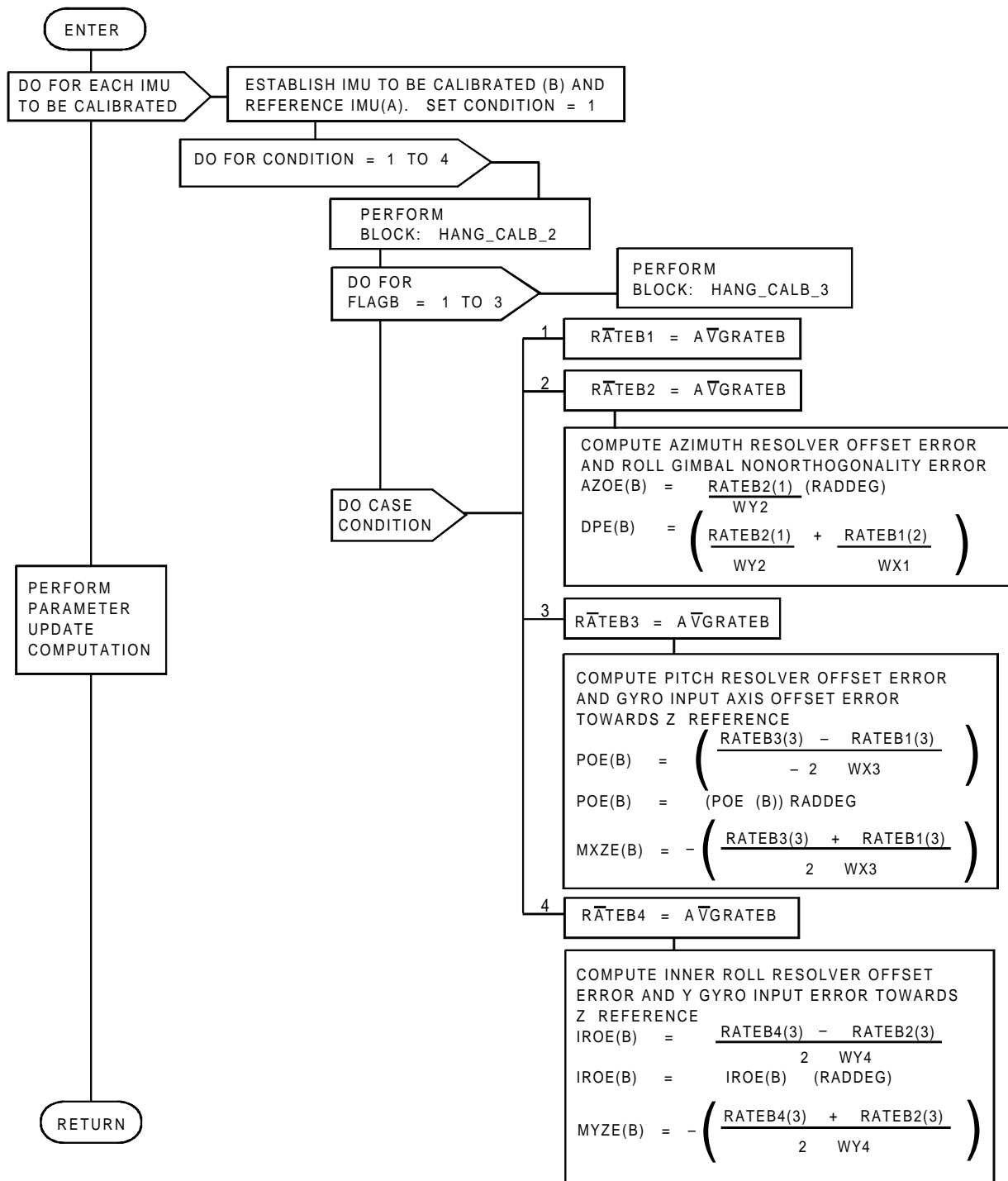


FIGURE 4.5.4.3.2-1.(1) HANG\_CALB Flow Diagram (Sheet 1 of 4)

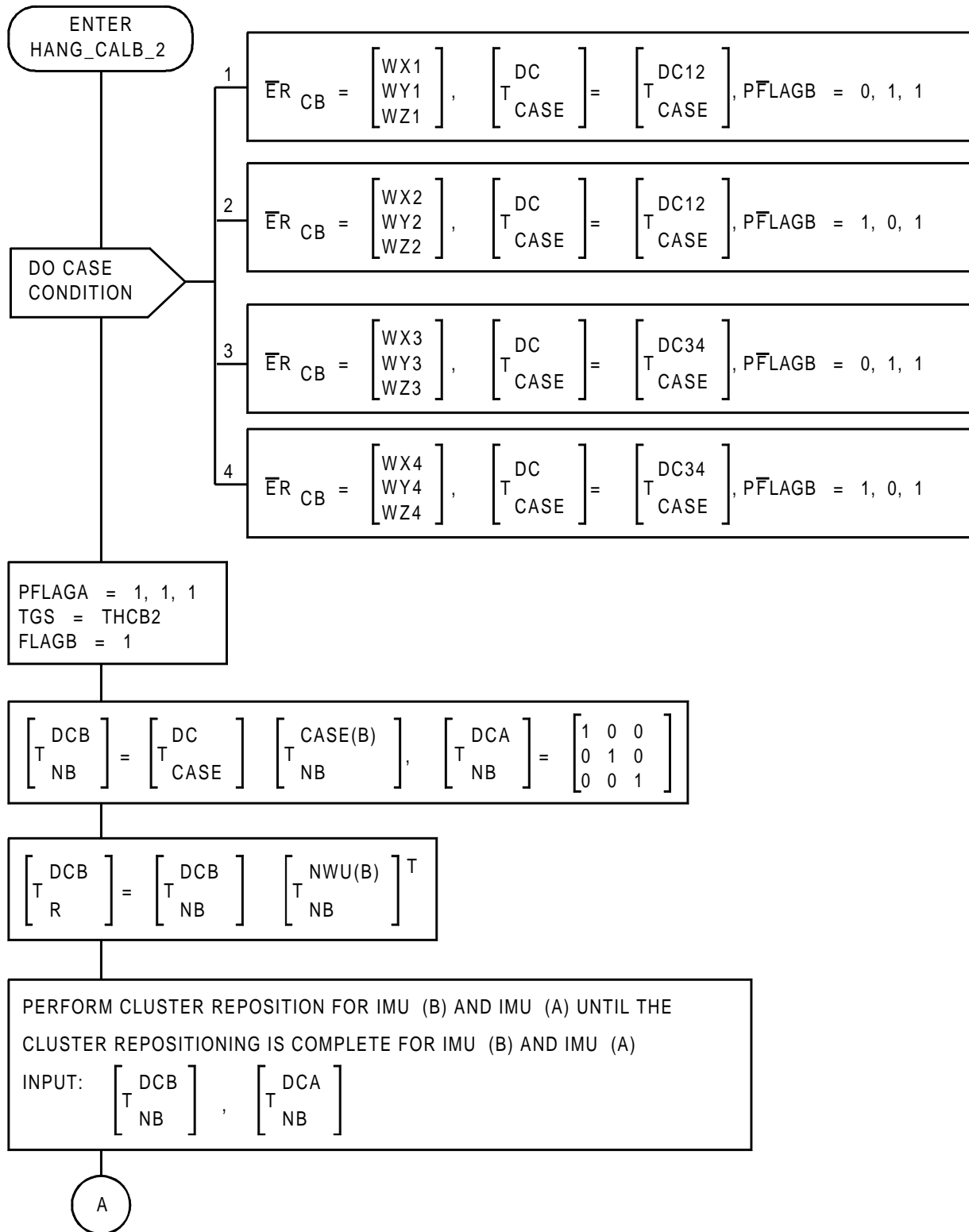


FIGURE 4.5.4.3.2-1.(2) HANG\_CALB (Block: HANG\_CALB\_2) Flow Diagram (Sheet 2 of 4)

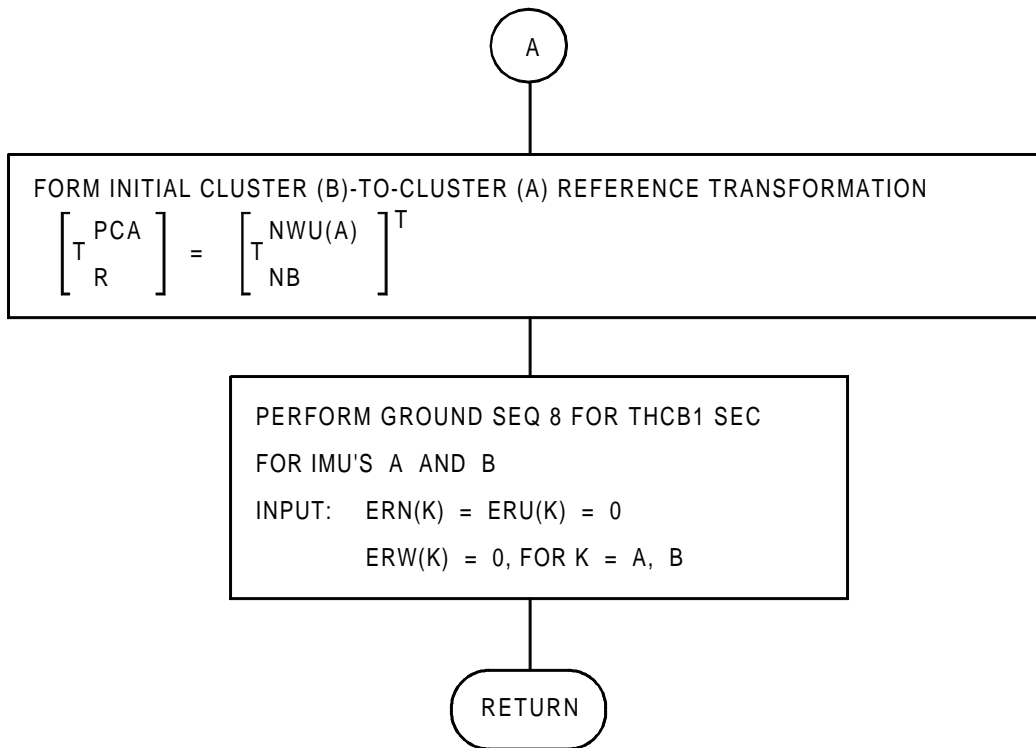


FIGURE 4.5.4.3.2-1.(3) HANG\_CALB (Block: HANG\_CALB\_2) Flow Diagram (Sheet 3 of 4)

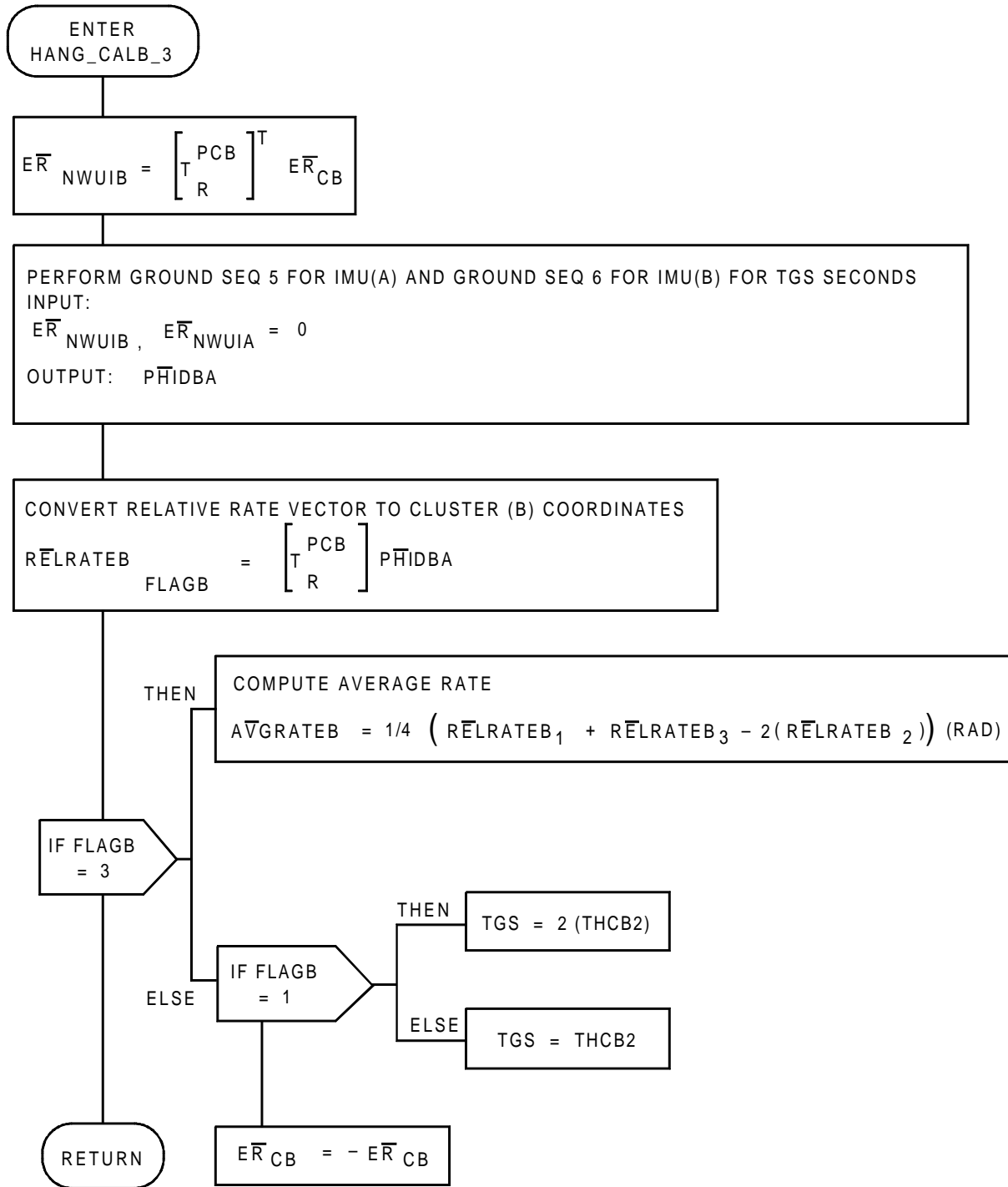


FIGURE 4.5.4.3.2-1.(4) HANG\_CALB (Block: HANG\_CALB\_3) Flow Diagram (Sheet 4 of 4)

#### 4.5.4.3.3 Hangar Calibration C (HANG\_CALC).

The purpose of Hangar Calibration C is to compute the IMU-to-IMU transformations for the selected launch orientation. Relative attitude error angles are computed.

The HANG\_CALC submode sequentially orients the three IMU's in gyrocompass alignment. A 60-second data taking period is provided in which relative attitude is determined using both accelerometer data and resolver data. Comparison of this data determines resolver errors, about the level axes, to the accuracy of the accelerometers. The error angles that are computed are transformed to body coordinates and stored.

HANG\_CALC will calibrate all IMU's in the OPERATE mode. Normally it will not be executed unless all IMU's are in OPERATE, but for checkout purposes it is allowed if at least two IMU's are in OPERATE.

A. Functional Requirement. The HANG\_CALC module performs the following function for each applicable IMU pair:

Compute a difference vector between the relative attitude between clusters as measured by the resolvers and accelerometers for each IMU pair in OPERATE.

B. Interface Requirements. The input/output interfaces associated with the HANG\_CALC submode are listed in Tables 4.5.4.3.3-1 and 4.5.4.3.3-2.

C. Detailed Requirements. The following sequences of operations are required for each applicable IMU pair simultaneously. Pairs are defined as follows:

If three selected IMU's are in OPERATE, then  $ij = 1,2; 1,3; 2,3$ .

If two selected IMU's are in OPERATE, then  $ij = 1,2; 1,3; \text{ or } 2,3$ ; according to which is applicable.

1. Set the accelerometer loops to high gain.
2. Determine the desired cluster orientation for each IMU.

$$\begin{bmatrix} T_{NB}^{DC} \end{bmatrix} = \begin{bmatrix} T_{NB}^{GCD} \end{bmatrix}$$

$$\begin{bmatrix} T_R^{PC} \end{bmatrix} = \begin{bmatrix} T_{NB}^{GCD} \end{bmatrix} \begin{bmatrix} T_{NB}^{NWU} \end{bmatrix}^T$$

3. Perform the cluster repositioning sequence (refer to Section 4.1.4) until the appropriate above defined cluster orientation (see step 2) is achieved for each IMU.
4. Perform ground sequence 8 (refer to Section 4.1.4) for TSC seconds for thermal stabilization. The initialization required is:

$$ER_i = 0$$

for  $i = N, W, U$

Note that  $\begin{bmatrix} T_R^{PC} \end{bmatrix}$  is initialized by step 2

5. Perform ground sequence 9 (refer to Section 4.1.4) for TCALC seconds. The initialization required is the same as in step 4 above. The required outputs are:  $\overline{\text{PHIDIJ}}$ ,  $\overline{\text{PHIIJ}}$ ,  $\overline{\text{ETD}}$ , and  $\overline{\text{THETA}}$ .
6. Compute the difference vectors in reference NWU coordinates:

$$\begin{aligned} \overline{M12}_{\text{NWU}} &= \left( \overline{\text{PHI12}} + \frac{1}{2} \text{TCALC} \right) (\overline{\text{PHID12}}) \\ &\quad - (\overline{\text{CTHETA2}} - \overline{\text{CTHETA1}}) / G \\ &\quad - \left( \frac{\text{TCALC}}{2(\text{RAD})} \right) (\overline{\text{ETDP2}} - \overline{\text{ETDP1}}) \end{aligned}$$

$$\begin{aligned} \overline{M13}_{\text{NWU}} &= \left( \overline{\text{PHI13}} + \frac{1}{2} \text{TCALC} \right) (\overline{\text{PHID13}}) \\ &\quad - (\overline{\text{CTHETA3}} - \overline{\text{CTHETA1}}) / G \\ &\quad - \left( \frac{\text{TCALC}}{2(\text{RAD})} \right) (\overline{\text{ETDP3}} - \overline{\text{ETDP1}}) \end{aligned}$$

$$\begin{aligned} \overline{M23}_{\text{NWU}} &= \left( \overline{\text{PHI23}} + \frac{1}{2} \text{TCALC} \right) (\overline{\text{PHID23}}) \\ &\quad - (\overline{\text{CTHETA3}} - \overline{\text{CTHETA2}}) / G \\ &\quad - \left( \frac{\text{TCALC}}{2(\text{RAD})} \right) (\overline{\text{ETDP3}} - \overline{\text{ETDP2}}) \end{aligned}$$

where:

$$\overline{\text{ETDPI}} = \begin{bmatrix} \overline{\text{ETD}(2)} \\ -\overline{\text{ETD}(1)} \\ 0 \end{bmatrix}, \quad \overline{\text{CTHETAi}} = \begin{bmatrix} \overline{\text{THETA}(2)} \\ -\overline{\text{THETA}(1)} \\ 0 \end{bmatrix}$$

for  $i = \text{IMU } 1, 2, \text{ or } 3$

and

$$\overline{\text{PHIij}} = \overline{\text{PHIIJ}}$$

$$\overline{\text{PHIDij}} = \overline{\text{PHIDIJ}}$$

for  $i = 1, 2$  and  $j = 2, 3$



7. Zero the third element of  $\bar{M}12_{NWU}$  ,  $\bar{M}13_{NWU}$  , and  $\bar{M}23_{NWU}$
8. Transform the resulting vector into body coordinates

$$\bar{M}12B = \left[ T_{NB}^{BODY} \right] \left[ T_{NB}^{NWU} \right]^T \left[ M12_{NWU} \right]$$

$$\bar{M}13B = \left[ T_{NB}^{BODY} \right] \left[ T_{NB}^{NWU} \right]^T \left[ M13_{NWU} \right]$$

$$\bar{M}23B = \left[ T_{NB}^{BODY} \right] \left[ T_{NB}^{NWU} \right]^T \left[ M23_{NWU} \right]$$

9. Proceed to the TERM/IDLE submode.

D. Special Considerations. This section identifies user interface requirements associated with Hangar Calibration C and discusses the recommended use of Hangar Calibration C from the operational viewpoint.

1. Hangar Calibration C User Interface. The following CRT format is required to control and monitor the Hangar Calibration C mechanization defined in previous paragraphs:

HNGR\_CAL\_C 22X      TERM/IDLE 27X

Item 22X is used to request Hangar Calibration C. The X position will display an asterisk when Hangar Calibration C is active.

Item 27X may be used to terminate Hangar Calibration C prior to normal completion. The X position displays an asterisk when the program is in the TERM/IDLE submode.

Note that the specific correct item numbers are defined in the D&C FSSR.

2. Hangar Calibration C Operations. The following guidelines are recommended for effective utilization of Hangar Calibration C capabilities:
  - a. Successful Hangar Calibrations A and B should normally be completed immediately prior to performing Hangar Calibration C. A return to warmup STANDBY mode or power interruptions between Hangar Calibration B and C are to be avoided.
  - b. Each selected operating IMU is calibrated by executing Item 22X. It is required that at least two operating IMU's be selected.
  - c. A repeat calibration should normally be performed if the difference vectors are determined to be unreasonable.
  - d. Hangar Calibration C requires approximately 3 minutes.
  - e. If the desired launch orientation is not known or is subject to change prior to launch, Hangar Cal C should be executed twice, once with each set of  $\left[ T_{NB}^{GCD} \right]$  orientations.

This would allow generating relative attitude error angles for either of the possible launch orientations.

Table 4.5.4.3.3-1. HANG\_CALC Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Unit	Rate (Hz)
PHIJ	V99U3571C THRU V99U3579C	MISALIGNMENT VECTOR BETWEEN CLUSTERS I AND J; 1 PER IMU PAIR	CL_CLRATE	VECTOR	+/-57.3	RAD	OD
PHIDIJ	V99R3581C THRU V99R3589C	RELATIVE RATE VECTOR BETWEEN CLUSTERS I AND J; 1 PER IMU PAIR	CL_CLRATE	VECTOR	+/-57.3E-1	RAD/SEC	OD
ETD	V99U2845C THRU V99U2853C	LSF ESTIMATED DRIFT VECTOR NWU ORDER; 1 PER IMU	LSF_FILR	VECTOR	+/-100	DEG/HR	OD
T <sub>NB</sub> <sup>GCD(1)</sup>	V96U7092C V96U7093C V96U7094C V96U7086C V96U7087C V96U7088C V96U7089C V96U7090C V96U7091C	TRANSFORMATION: NAV BASE TO DESIRED GYROCOMPASS ORIENTATION IMU-1	I-LOAD	MATRIX	+/-1	NA	OD
T <sub>NB</sub> <sup>GCD(2)</sup>	V96U7159C V96U7161C V96U7163C V96U7165C V96U7167C V96U7169C V96U7171C V96U7173C V96U7175C	TRANSFORMATION: NAV BASE TO DESIRED GYROCOMPASS ORIENTATION IMU-2	I-LOAD	MATRIX	+/-1	NA	OD
T <sub>NB</sub> <sup>GCD(3)</sup>	V96U7160C V96U7162C V96U7164C V96U7166C V96U7168C V96U7170C V96U7172C V96U7174C V96U7176C	TRANSFORMATION: NAV BASE TO DESIRED GYROCOMPASS ORIENTATION IMU-3	I-LOAD	MATRIX	+/-1	NA	OD
THETA	V99U3220C THRU V99U3228C	ESTIMATED ACCELERATION VECTOR (NWU ORDER); 1 PER IMU -	LSF_FILR	VECTOR	+/-70	FT/SEC/ SEC	OD
T <sub>NB</sub> <sup>NWU</sup>	V99U2790C THRU V99U2816C	TRANSFORMATION: NAVIGATION BASE TO NWU; 1 PER IMU	IMU_ATT	MATRIX	+/-1	NA	ONCE
T <sub>NB</sub> <sup>BODY</sup>	V96U7096C THRU V96U7104C	TRANSFORMATION: NAVIGATION BASE TO BODY	I-LOAD	MATRIX	+/-1	NA	OD
TCALC	V96U7177C	CAL C MEAS PERIOD	K-LOAD	SCALAR	60.0	SEC	OD
TSC	V96W7178C	THERMAL STABILIZATION TIME-CALC	K-LOAD	SCALAR	30.0	SEC	OD
RAD	V96U7006C	THE CONVERSION FACTOR TO CONVERT RADIANS TO ARC SECONDS	CONSTANT	SCALAR	206264.8	ARC-SEC /RAD	OD
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0,1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	IMU_BITE DISPLAYS	LOGICAL	0,1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	IMU BITE DISPLAYS	LOGICAL	0,1	NA	OD

Table 4.5.4.3.3-2. HANG\_CALC Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
T <sub>R</sub> <sup>PC</sup>		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER; 1 PER IMU	T_UPDATE	MATRIX	+/-1	NA	3.125
T <sub>NB</sub> <sup>DC</sup>	V99U3350C THRU V99U3376C	TRANSFORMATION: NAVIGATION BASE TO DESIRED CLUSTER; 1 PER IMU	LAT_FUNC	MATRIX	+/-1	NA	OD
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	3.125
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	3.125
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	3.125
M12B_X M12B_Y M12B_Z	V99U3551C V99U3552C V99U3553C	IMU-1/2 REL ATTITUDE ERROR	TLM	VECTOR		RAD	ONCE
M13B_X M13B_Y M13B_Z	V99U3554C V99U3555C V99U3556C	IMU-1/3 REL ATTITUDE ERROR	TLM	VECTOR		RAD	ONCE
M23B_X M23B_Y M23B_Z	V99U3557C V99U3558C V99U3559C	IMU-2/3 REL ATTITUDE ERROR	TLM	VECTOR		RAD	ONCE
ACCEL_SF(1)	V71K2541B	IMU-1 CAPRI SF WD2 B0 CMD	IMU-1 TLM	LOGICAL	0,1	NA	OD
ACCEL_SF(2)	V71K3541B	IMU-2 CAPRI SF WD2 B0 CMD	IMU-2 TLM	LOGICAL	0,1	NA	OD
ACCEL_SF(3)	V71K4541B	IMU-3 CAPRI SF WD2 B0 CMD	IMU-3 TLM	LOGICAL	0,1	NA	OD
HANG_CAL_C	V99X2712X	HANGAR CAL C IN PROGRESS	DISPLAYS TLM	LOGICAL	0,1	NA	OD

#### 4.5.4.3.4 Parameter Tables for IMU Ground Calibrations.

The IDD inputs and outputs are listed in Tables 4.5.4.3.4-1 and 4.5.4.3.4-2. Values for the I-loads are contained in the I-load requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.5.4.3.4-3. K-loads are listed in Table 4.5.4.3.4-4. Constants are listed in Table 4.5.4.3.4-5.

TABLE 4.5.4.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS  
(V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TNB_NWU_1,1	V99U2790C	NAV BASE TO NWU,IMU-1/ELEMENT 1,1	IMU ATT DET		SPL		93017G	*
1TNB_NWU_1,2	V99U2791C	NAV BASE TO NWU,IMU-1/ELEMENT 1,2	IMU ATT DET		SPL		93017G	*
1TNB_NWU_1,3	V99U2792C	NAV BASE TO NWU,IMU-1/ELEMENT 1,3	IMU ATT DET		SPL		93017G	*
1TNB_NWU_2,1	V99U2793C	NAV BASE TO NWU,IMU-1/ELEMENT 2,1	IMU ATT DET		SPL		93017G	*
1TNB_NWU_2,2	V99U2794C	NAV BASE TO NWU,IMU-1/ELEMENT 2,2	IMU ATT DET		SPL		93017G	*
1TNB_NWU_2,3	V99U2795C	NAV BASE TO NWU,IMU-1/ELEMENT 2,3	IMU ATT DET		SPL		93017G	*
1TNB_NWU_3,1	V99U2796C	NAV BASE TO NWU,IMU-1/ELEMENT 3,1	IMU ATT DET		SPL		93017G	*
1TNB_NWU_3,2	V99U2797C	NAV BASE TO NWU,IMU-1/ELEMENT 3,2	IMU ATT DET		SPL		93017G	*
1TNB_NWU_3,3	V99U2798C	NAV BASE TO NWU,IMU-1/ELEMENT 3,3	IMU ATT DET		SPL		93017G	*
2TNB_NWU_1,1	V99U2799C	NAV BASE TO NWU,IMU-2/ELEMENT 1,1	IMU ATT DET		SPL		93017G	*
2TNB_NWU_1,2	V99U2800C	NAV BASE TO NWU,IMU-2/ELEMENT 1,2	IMU ATT DET		SPL		93017G	*
2TNB_NWU_1,3	V99U2801C	NAV BASE TO NWU,IMU-2/ELEMENT 1,3	IMU ATT DET		SPL		93017G	*
2TNB_NWU_2,1	V99U2802C	NAV BASE TO NWU,IMU-2/ELEMENT 2,1	IMU ATT DET		SPL		93017G	*
2TNB_NWU_2,2	V99U2803C	NAV BASE TO NWU,IMU-2/ELEMENT 2,2	IMU ATT DET		SPL		93017G	*
2TNB_NWU_2,3	V99U2804C	NAV BASE TO NWU,IMU-2/ELEMENT 2,3	IMU ATT DET		SPL		93017G	*
2TNB_NWU_3,1	V99U2805C	NAV BASE TO NWU,IMU-2/ELEMENT 3,1	IMU ATT DET		SPL		93017G	*
2TNB_NWU_3,2	V99U2806C	NAV BASE TO NWU,IMU-2/ELEMENT 3,2	IMU ATT DET		SPL		93017G	*
2TNB_NWU_3,3	V99U2807C	NAV BASE TO NWU,IMU-2/ELEMENT 3,3	IMU ATT DET		SPL		93017G	*
3TNB_NWU_1,1	V99U2808C	NAV BASE TO NWU,IMU-3/ELEMENT 1,1	IMU ATT DET		SPL		93017G	*
3TNB_NWU_1,2	V99U2809C	NAV BASE TO NWU,IMU-3/ELEMENT 1,2	IMU ATT DET		SPL		93017G	*
3TNB_NWU_1,3	V99U2810C	NAV BASE TO NWU,IMU-3/ELEMENT 1,3	IMU ATT DET		SPL		93017G	*
3TNB_NWU_2,1	V99U2811C	NAV BASE TO NWU,IMU-3/ELEMENT 2,1	IMU ATT DET		SPL		93017G	*
3TNB_NWU_2,2	V99U2812C	NAV BASE TO NWU,IMU-3/ELEMENT 2,2	IMU ATT DET		SPL		93017G	*
3TNB_NWU_2,3	V99U2813C	NAV BASE TO NWU,IMU-3/ELEMENT 2,3	IMU ATT DET		SPL		93017G	*
3TNB_NWU_3,1	V99U2814C	NAV BASE TO NWU,IMU-3/ELEMENT 3,1	IMU ATT DET		SPL		93017G	*
3TNB_NWU_3,2	V99U2815C	NAV BASE TO NWU,IMU-3/ELEMENT 3,2	IMU ATT DET		SPL		93017G	*
3TNB_NWU_3,3	V99U2816C	NAV BASE TO NWU,IMU-3/ELEMENT 3,3	IMU ATT DET		SPL		93017G	*
AD_FAIL(1)	V71X2023B	IMU-1 A/D FAIL	WD1B2	IMU 1	BD		93017G	*
AD_FAIL(2)	V71X3023B	IMU-2 A/D FAIL	WD1B2	IMU 2	BD		93017G	*
AD_FAIL(3)	V71X4023B	IMU-3 A/D FAIL	WD1B2	IMU 3	BD		93017G	*
AZO(1)	V99H2610CB	AZIMUTH RESOLVER OFFSET(1)	MASS MEM	DEG				
AZO(2)	V99H2611CB	AZIMUTH RESOLVER OFFSET(2)	MASS MEM	DEG				
AZO(3)	V99H2612CB	AZIMUTH RESOLVER OFFSET(3)	MASS MEM	DEG				
BXY(1)	V99H2590CB	X-GYRO MISALIGNMENT TO Y-REF(1)	MASS MEM	RAD			90525D	
BXY(2)	V99H2591CB	X-GYRO MISALIGNMENT TO Y-REF(2)	MASS MEM	RAD			90525D	
BXY(3)	V99H2592CB	X-GYRO MISALIGNMENT TO Y-REF(3)	MASS MEM	RAD			90525D	
BXZ(1)	V99H2593CB	X-GYRO MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD			90525D	
BXZ(2)	V99H2594CB	X-GYRO MISALIGNMENT TO Z-REF(2)	MASS MEM	RAD			90525D	
BXZ(3)	V99H2595CB	X-GYRO MISALIGNMENT TO Z-REF(3)	MASS MEM	RAD			90525D	
BYX(1)	V99H2596CB	Y-GYRO MISALIGNMENT TO X-REF(1)	MASS MEM	RAD			90525D	
BYX(2)	V99H2597CB	Y-GYRO MISALIGNMENT TO X-REF(2)	MASS MEM	RAD			90525D	
BYX(3)	V99H2598CB	Y-GYRO MISALIGNMENT TO X-REF(3)	MASS MEM	RAD			90525D	
BYZ(1)	V99H2599CB	Y-GYRO MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD			90525D	
BYZ(2)	V99H2600CB	Y-GYRO MISALIGNMENT TO Z-REF(2)	MASS MEM	RAD			90525D	
BYZ(3)	V99H2601CB	Y-GYRO MISALIGNMENT TO Z-REF(3)	MASS MEM	RAD			90525D	

TABLE 4.5.4.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BZX(1)	V99H2602CB	Z-GYRO MISALIGNMENT TO X-REF(1)	MASS MEM	RAD			90525D	
BZX(2)	V99H2603CB	Z-GYRO MISALIGNMENT TO X-REF(2)	MASS MEM	RAD			90525D	
BZX(3)	V99H2604CB	Z-GYRO MISALIGNMENT TO X-REF(3)	MASS MEM	RAD			90525D	
BZY(1)	V99H2605CB	Z-GYRO MISALIGNMENT TO Y-REF(1)	MASS MEM	RAD			90525D	
BZY(2)	V99H2606CB	Z-GYRO MISALIGNMENT TO Y-REF(2)	MASS MEM	RAD			90525D	
BZY(3)	V99H2607CB	Z-GYRO MISALIGNMENT TO Y-REF(3)	MASS MEM	RAD			90525D	
CAP_TEMP_RDY(1)	V71X2406X	IMU 1 CAPRI TEMP READY	IMU 1		BD		93017G	*
CAP_TEMP_RDY(2)	V71X3406X	IMU 2 CAPRI TEMP READY	IMU 2		BD		93017G	*
CAP_TEMP_RDY(3)	V71X4406X	IMU 3 CAPRI TEMP READY	IMU 3		BD		93017G	*
CAP_TEMP_SAFE(1)	V71X2407X	IMU 1 CAPRI TEMP SAFE	IMU 1		BD		93017G	*
CAP_TEMP_SAFE(2)	V71X3407X	IMU 2 CAPRI TEMP SAFE	IMU 2		BD		93017G	*
CAP_TEMP_SAFE(3)	V71X4407X	IMU 3 CAPRI TEMP SAFE	IMU 3		BD		93017G	*
CVX(1)	V71L2200B	IMU-1 ACCUMD VX	WD10 IMU 1		HXU		93017G	*
CVX(2)	V71L3200B	IMU-2 ACCUMD VX	WD10 IMU 2		HXU		93017G	*
CVX(3)	V71L4200B	IMU-3 ACCUMD VX	WD10 IMU 3		HXU		93017G	*
CVY(1)	V71L2220B	IMU-1 ACCUMD VY	WD11 IMU 1		HXU		93017G	*
CVY(2)	V71L3220B	IMU-2 ACCUMD VY	WD11 IMU 2		HXU		93017G	*
CVY(3)	V71L4220B	IMU-3 ACCUMD VY	WD11 IMU 3	PULSES	HXU		93017G	*
CVZ(1)	V71L2240B	IMU-1 ACCUMD VZ	WD12 IMU 1		HXU		93017G	*
CVZ(2)	V71L3240B	IMU-2 ACCUMD VZ	WD12 IMU 2		HXU		93017G	*
CVZ(3)	V71L4240B	IMU-3 ACCUMD VZ	WD12 IMU 3	PULSES	HXU		93017G	*
D1/D8_SEQR(1)	V71X2032B	IMU-1 D1/D8 SEQUENCER	WD1B11 IMU 1		BD		93017G	*
D1/D8_SEQR(2)	V71X3032B	IMU-2 D1/D8 SEQUENCER	WD1B11 IMU 2		BD		93017G	*
D1/D8_SEQR(3)	V71X4032B	IMU-3 D1/D8 SEQUENCER	WD1B11 IMU 3		BD		93017G	*
D2_SEQR(1)	V71X2033B	IMU-1 D2 SEQUENCER	WD1B12 IMU 1		BD		93017G	*
D2_SEQR(2)	V71X3033B	IMU-2 D2 SEQUENCER	WD1B12 IMU 2		BD		93017G	*
D2_SEQR(3)	V71X4033B	IMU-3 D2 SEQUENCER	WD1B12 IMU 3		BD		93017G	*
D3_SEQR(1)	V71X2034B	IMU-1 D3 SEQUENCER	WD1B13 IMU 1		BD		93017G	*
D3_SEQR(2)	V71X3034B	IMU-2 D3 SEQUENCER	WD1B13 IMU 2		BD		93017G	*
D3_SEQR(3)	V71X4034B	IMU-3 D3 SEQUENCER	WD1B13 IMU 3		BD		93017G	*
D4_SEQR(1)	V71X2035B	IMU-1 D4 SEQUENCER	WD1B14 IMU 1		BD		93017G	*
D4_SEQR(2)	V71X3035B	IMU-2 D4 SEQUENCER	WD1B14 IMU 2		BD		93017G	*
D4_SEQR(3)	V71X4035B	IMU-3 D4 SEQUENCER	WD1B14 IMU 3		BD		93017G	*
D5_SEQR(1)	V71X2036B	IMU-1 D5 SEQUENCER	WD1B15 IMU 1		BD		93017G	*
D5_SEQR(2)	V71X3036B	IMU-2 D5 SEQUENCER	WD1B15 IMU 2		BD		93017G	*
D5_SEQR(3)	V71X4036B	IMU-3 D5 SEQUENCER	WD1B15 IMU 3		BD		93017G	*
DCDC_1_FAIL(1)	V71X2026B	IMU-1 DC/DC NO 1 FAIL	WD1B5 IMU 1		BD		93017G	*
DCDC_1_FAIL(2)	V71X3026B	IMU-2 DC/DC NO 1 FAIL	WD1B5 IMU 2		BD		93017G	*
DCDC_1_FAIL(3)	V71X4026B	IMU-3 DC/DC NO 1 FAIL	WD1B5 IMU 3		BD		93017G	*
DELTXZ(1)	V99H2552CB	X-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD				
DELTXZ(2)	V99H2553CB	X-ACCEL MISALIGNMENT TO Z-REF(2)	MASS MEM	RAD				
DELTXZ(3)	V99H2554CB	X-ACCEL MISALIGNMENT TO Z-REF(3)	MASS MEM	RAD				
DELTYX(1)	V99H2540CB	Y-ACCEL MISALIGNMENT TO X-REF(1)	MASS MEM	RAD			90525D	
DELTYX(2)	V99H2541CB	Y-ACCEL MISALIGNMENT TO X-REF(2)	MASS MEM	RAD			90525D	
DELTYX(3)	V99H2542CB	Y-ACCEL MISALIGNMENT TO X-REF(3)	MASS MEM	RAD			90525D	

TABLE 4.5.4.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS  
(V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTZY(1)	V99H2549CB	Y-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD				
DELTZY(2)	V99H2550CB	Y-ACCEL MISALIGNMENT TO Z-REF(2)	MASS MEM	RAD				
DELTZY(3)	V99H2551CB	Y-ACCEL MISALIGNMENT TO Z-REF(3)	MASS MEM	RAD				
DELTZX(1)	V99H2543CB	Z-ACCEL MISALIGNMENT TO X-REF(1)	MASS MEM	RAD			90525D	
DELTZX(2)	V99H2544CB	Z-ACCEL MISALIGNMENT TO X-REF(2)	MASS MEM	RAD			90525D	
DELTZX(3)	V99H2545CB	Z-ACCEL MISALIGNMENT TO X-REF(3)	MASS MEM	RAD			90525D	
DELTZY(1)	V99H2546CB	Z-ACCEL MISALIGNMENT TO Y-REF(1)	MASS MEM	RAD			90525D	
DELTZY(2)	V99H2547CB	Z-ACCEL MISALIGNMENT TO Y-REF(2)	MASS MEM	RAD			90525D	
DELTZY(3)	V99H2548CB	Z-ACCEL MISALIGNMENT TO Y-REF(3)	MASS MEM	RAD			90525D	
DFR(1)	V99U5952CB	IMU 1 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFR(2)	V99U5953CB	IMU 2 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFR(3)	V99U5954CB	IMU 3 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFX(1)	V99R2560CC	X-GYRO RESTRAINT(1)	MASS MEM	DEG/HR			90525D	
DFX(2)	V99R2561CC	X-GYRO RESTRAINT(2)	MASS MEM	DEG/HR			90525D	
DFX(3)	V99R2562CC	X-GYRO RESTRAINT(3)	MASS MEM	DEG/HR			90525D	
DFY(1)	V99R2563CC	Y-GYRO RESTRAINT(1)	MASS MEM	DEG/HR			90525D	
DFY(2)	V99R2564CC	Y-GYRO RESTRAINT(2)	MASS MEM	DEG/HR			90525D	
DFY(3)	V99R2565CC	Y-GYRO RESTRAINT(3)	MASS MEM	DEG/HR			90525D	
DFZ(1)	V99R2566CC	Z-GYRO RESTRAINT(1)	MASS MEM	DEG/HR			90525D	
DFZ(2)	V99R2567CC	Z-GYRO RESTRAINT(2)	MASS MEM	DEG/HR			90525D	
DFZ(3)	V99R2568CC	Z-GYRO RESTRAINT(3)	MASS MEM	DEG/HR			90525D	
DIR(1)	V99U5955CB	IMU 1 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR(2)	V99U5956CB	IMU 2 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR(3)	V99U5957CB	IMU 3 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIX(1)	V99U2570CB	X-GYRO IN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DIX(2)	V99U2571CB	X-GYRO IN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DIX(3)	V99U2572CB	X-GYRO IN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DIZ(1)	V99U2573CB	Z-GYRO IN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DIZ(2)	V99U2574CB	Z-GYRO IN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DIZ(3)	V99U2575CB	Z-GYRO IN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DOR(1)	V99U5958CB	IMU 1 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR(2)	V99U5959CB	IMU 2 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR(3)	V99U5960CB	IMU 3 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOZ(1)	V99U2582CB	Z-GYRO OUT AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DOZ(2)	V99U2583CB	Z-GYRO OUT AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DOZ(3)	V99U2584CB	Z-GYRO OUT AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DP(1)	V99H2660CB	IMU 1 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(2)	V99H2661CB	IMU 2 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(3)	V99H2662CB	IMU 3 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DSR(1)	V99U5961CB	IMU 1 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(2)	V99U5962CB	IMU 2 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(3)	V99U5963CB	IMU 3 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSX(1)	V99U2576CB	X-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSX(2)	V99U2577CB	X-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSX(3)	V99U2578CB	X-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	

TABLE 4.5.4.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DSZ(1)	V99U2579CB	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSZ(2)	V99U2580CB	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSZ(3)	V99U2581CB	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
ECHO_13(1)	V71M2260P	IMU-1 ECHO 1	WD13 IMU 1		HMD		93017G	*
ECHO_13(2)	V71M3260P	IMU-2 ECHO 1	WD13 IMU 2		HMD		93017G	*
ECHO_13(3)	V71M4260P	IMU-3 ECHO 1	WD13 IMU 3		HMD		93017G	*
ECHO_14(1)	V71M2280P	IMU-1 ECHO 2	WD14 IMU 1		HMD		93017G	*
ECHO_14(2)	V71M3280P	IMU-2 ECHO 2	WD14 IMU 2		HMD		93017G	*
ECHO_14(3)	V71M4280P	IMU-3 ECHO 2	WD14 IMU 3		HMD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(1)	V71X2027B	IMU 1 FLTR DC2/DSCRET PWR SUP FAIL	IMU 1		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(2)	V71X3027B	IMU 2 FLTR DC2/DSCRET PWR SUP FAIL	IMU 2		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(3)	V71X4027B	IMU 3 FLTR DC2/DSCRET PWR SUP FAIL	IMU 3		BD		93017G	*
IMU_CF(1)	V91X3101X	IMU 1 COMMFAULT	FCOS				92354	
IMU_CF(2)	V91X3131X	IMU 2 COMMFAULT	FCOS				92354	
IMU_CF(3)	V91X3161X	IMU 3 COMMFAULT	FCOS				92354	
IN_OPERATE(1)	V71X2403XB	IMU-1 IN OPERATE MODE	IMU 1				93017G	*
IN_OPERATE(2)	V71X3403XB	IMU-2 IN OPERATE MODE	IMU 2				93017G	*
IN_OPERATE(3)	V71X4403XB	IMU-3 IN OPERATE MODE	IMU 3				93017G	*
IO/MUX_FAIL(1)	V71X2022B	IMU 1 IO/MUX FAIL	WD1B1 IMU 1		BD		93017G	*
IO/MUX_FAIL(2)	V71X3022B	IMU 2 IO/MUX FAIL	WD1B1 IMU 2		BD		93017G	*
IO/MUX_FAIL(3)	V71X4022B	IMU 3 IO/MUX FAIL	WD1B1 IMU 3		BD		93017G	*
IRO(1)	V99H2615CB	INNER ROLL RESOLVER OFFSET(1)	MASS MEM	DEG				
IRO(2)	V99H2616CB	INNER ROLL RESOLVER OFFSET(2)	MASS MEM	DEG				
IRO(3)	V99H2617CB	INNER ROLL RESOLVER OFFSET(3)	MASS MEM	DEG				
KIX(1)	V99A2520CB	LOW GAIN X-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIX(2)	V99A2521CB	LOW GAIN X-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIX(3)	V99A2522CB	LOW GAIN X-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	
KIXH(1)	V99A2681CB	HIGH-GAIN X-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIXH(2)	V99A2682CB	HIGH-GAIN X-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIXH(3)	V99A2683CB	HIGH-GAIN X-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIY(1)	V99A2523CB	LOW GAIN Y-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIY(2)	V99A2524CB	LOW GAIN Y-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIY(3)	V99A2525CB	LOW GAIN Y-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	
KIYH(1)	V99A2684CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIYH(2)	V99A2685CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIYH(3)	V99A2686CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIZ(1)	V99A2526CB	LOW GAIN Z-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIZ(2)	V99A2527CB	LOW GAIN Z-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIZ(3)	V99A2528CB	LOW GAIN Z-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	
KIZH(1)	V99A2687CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIZH(2)	V99A2688CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIZH(3)	V99A2689CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KOX(1)	V99G2530CC	LOW GAIN X ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	
KOX(2)	V99G2531CC	LOW GAIN X ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOX(3)	V99G2532CC	LOW GAIN X ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	

TABLE 4.5.4.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS  
(V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOXH(1)	V99G2670CB	HIGH-GAIN X-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOXH(2)	V99G2671CB	HIGH-GAIN X-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOXH(3)	V99G2672CB	HIGH-GAIN X-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOY(1)	V99G2533CC	LOW GAIN Y ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	
KOY(2)	V99G2534CC	LOW GAIN Y ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOY(3)	V99G2535CC	LOW GAIN Y ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	
KOYH(1)	V99G2673CB	HIGH-GAIN Y-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOYH(2)	V99G2674CB	HIGH-GAIN Y-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOYH(3)	V99G2675CB	HIGH-GAIN Y-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOZ(1)	V99G2536CC	LOW GAIN Z ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	
KOZ(2)	V99G2537CC	LOW GAIN Z ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOZ(3)	V99G2538CC	LOW GAIN Z ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	
KOZH(1)	V99G2676CB	HIGH-GAIN Z-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOZH(2)	V99G2677CB	HIGH-GAIN Z-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOZH(3)	V99G2678CB	HIGH-GAIN Z-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KSX(1)	V99A2510CB	X-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSX(2)	V99A2511CB	X-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSX(3)	V99A2512CB	X-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	
KSY(1)	V99A2513CB	Y-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSY(2)	V99A2514CB	Y-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSY(3)	V99A2515CB	Y-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	
KSZ(1)	V99A2516CB	Z-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSZ(2)	V99A2517CB	Z-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSZ(3)	V99A2518CB	Z-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	
KT70/HAINS_GOOD(1)	V71X2021B	IMU 1 KT70/HAINS GOOD	WD1B0 IMU 1		BD		93017G	*
KT70/HAINS_GOOD(2)	V71X3021B	IMU 2 KT70/HAINS GOOD	WD1B0 IMU 2		BD		93017G	*
KT70/HAINS_GOOD(3)	V71X4021B	IMU 3 KT70/HAINS GOOD	WD1B0 IMU 3		BD		93017G	*
KTX(1)	V99G2500CB	X-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(2)	V99G2501CB	X-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(3)	V99G2502CB	X-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(1)	V99G2503CB	Y-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(2)	V99G2504CB	Y-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(3)	V99G2505CB	Y-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(1)	V99G2506CB	Z-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(2)	V99G2507CB	Z-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(3)	V99G2508CB	Z-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90185A	
KXR(1)	V99U5964CB	IMU 1 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KXR(2)	V99U5965CB	IMU 2 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KXR(3)	V99U5966CB	IMU 3 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(1)	V99U5967CB	IMU 1 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(2)	V99U5968CB	IMU 2 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(3)	V99U5969CB	IMU 3 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(1)	V99U5970CB	IMU 1 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(2)	V99U5971CB	IMU 2 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(3)	V99U5972CB	IMU 3 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	



TABLE 4.5.4.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
MODE_BITE(1)	V71M2020P	IMU 1 MODE STATUS WD1	IMU 1		HMD		93017G	*
MODE_BITE(2)	V71M3020P	IMU 2 MODE STATUS WD1	IMU 2		HMD		93017G	*
MODE_BITE(3)	V71M4020P	IMU 3 MODE STATUS WD1	IMU 3		HMD		93017G	*
OMEGA_R(1)	V71R2040B	IMU-1 OMEGA R	WD2 IMU 1	DEG/HR	HFS		93017G	*
OMEGA_R(2)	V71R3040B	IMU-2 OMEGA R	WD2 IMU 2	DEG/HR	HFS		93017G	*
OMEGA_R(3)	V71R4040B	IMU-3 OMEGA R	WD2 IMU 3	DEG/HR	HFS		93017G	*
OPER/STBY(1)	V93X6020X	IMU 1 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(2)	V93X6021X	IMU 2 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(3)	V93X6022X	IMU 3 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
PC/CRCT_CRD_OVRTMP(1)	V71X2029B	IMU 1 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 1		BD		93017G	*
PC/CRCT_CRD_OVRTMP(2)	V71X3029B	IMU 2 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 2		BD		93017G	*
PC/CRCT_CRD_OVRTMP(3)	V71X4029B	IMU 3 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 3		BD		93017G	*
PLAT_FAIL(1)	V71X2024B	IMU-1 PLATFORM FAIL	WD1B3 IMU 1		BD		93017G	*
PLAT_FAIL(2)	V71X3024B	IMU-2 PLATFORM FAIL	WD1B3 IMU 2		BD		93017G	*
PLAT_FAIL(3)	V71X4024B	IMU-3 PLATFORM FAIL	WD1B3 IMU 3		BD		93017G	*
PLAT_TEMP_RDY(1)	V71X2404X	IMU 1 PLATFORM TEMP READY	IMU 1		BD		93017G	*
PLAT_TEMP_RDY(2)	V71X3404X	IMU 2 PLATFORM TEMP READY	IMU 2		BD		93017G	*
PLAT_TEMP_RDY(3)	V71X4404X	IMU 3 PLATFORM TEMP READY	IMU 3		BD		93017G	*
PLAT_TEMP_SAFE(1)	V71X2405X	IMU 1 PLATFORM TEMP SAFE	IMU 1		BD		93017G	*
PLAT_TEMP_SAFE(2)	V71X3405X	IMU 2 PLATFORM TEMP SAFE	IMU 2		BD		93017G	*
PLAT_TEMP_SAFE(3)	V71X4405X	IMU 3 PLATFORM TEMP SAFE	IMU 3		BD		93017G	*
PO(1)	V99H2620CB	PITCH RESOLVER OFFSET(1)	MASS MEM	DEG				
PO(2)	V99H2621CB	PITCH RESOLVER OFFSET(2)	MASS MEM	DEG				
PO(3)	V99H2622CB	PITCH RESOLVER OFFSET(3)	MASS MEM	DEG				
PRESS/COMM_GOOD(1)	V71X2401X	IMU 1 PRESSURE/COMMUNICATION GOOD	IMU 1		BD		93017G	*
PRESS/COMM_GOOD(2)	V71X3401X	IMU 2 PRESSURE/COMMUNICATION GOOD	IMU 2		BD		93017G	*
PRESS/COMM_GOOD(3)	V71X4401X	IMU 3 PRESSURE/COMMUNICATION GOOD	IMU 3		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(1)	V71X2025B	IMU 1 PWR CNTRLR/DGITAL SBSY FAIL	IMU 1		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(2)	V71X3025B	IMU 2 PWR CNTRLR/DGITAL SBSY FAIL	IMU 2		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(3)	V71X4025B	IMU 3 PWR CNTRLR/DGITAL SBSY FAIL	IMU 3		BD		93017G	*
RX_CUR/RX_FAIL(1)	V71X2028B	IMU 1 RESLVR CURRENT/RESLVR FAIL	IMU 1		BD		93017G	*
RX_CUR/RX_FAIL(2)	V71X3028B	IMU 2 RESLVR CURRENT/RESLVR FAIL	IMU 2		BD		93017G	*
RX_CUR/RX_FAIL(3)	V71X4028B	IMU 3 RESLVR CURRENT/RESLVR FAIL	IMU 3		BD		93017G	*
THETARL(1)	V71H2060B	IMU-1 THETA R 8X	WD3 IMU 1	DEG	BSU		93017G	*
THETARL(2)	V71H3060B	IMU-2 THETA R 8X	WD3 IMU 2	DEG	BSU		93017G	*
THETARL(3)	V71H4060B	IMU-3 THETA R 8X	WD3 IMU 3	DEG	BSU		93017G	*
THETAXL(1)	V71H2100B	IMU-1 THETA X 8X	WD5 IMU 1	DEG	BSU		93017G	*
THETAXL(2)	V71H3100B	IMU-2 THETA X 8X	WD5 IMU 2	DEG	BSU		93017G	*
THETAXL(3)	V71H4100B	IMU-3 THETA X 8X	WD5 IMU 3	DEG	BSU		93017G	*
THETAXM(1)	V71H2080B	IMU-1 THETA X 1X	WD4 IMU 1	DEG	BSU		93017G	*
THETAXM(2)	V71H3080B	IMU-2 THETA X 1X	WD4 IMU 2	DEG	BSU		93017G	*
THETAXM(3)	V71H4080B	IMU-3 THETA X 1X	WD4 IMU 3	DEG	BSU		93017G	*
THETAYL(1)	V71H2140B	IMU-1 THETA Y 8X	WD7 IMU 1	DEG	BSU		93017G	*
THETAYL(2)	V71H3140B	IMU-2 THETA Y 8X	WD7 IMU 2	DEG	BSU		93017G	*
THETAYL(3)	V71H4140B	IMU-3 THETA Y 8X	WD7 IMU 3	DEG	BSU		93017G	*

TABLE 4.5.4.3.4-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS  
(V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
THETAYM(1)	V71H2120B	IMU-1 THETA Y 1X	WD6 IMU 1	DEG	BSU		93017G	*
THETAYM(2)	V71H3120B	IMU-2 THETA Y 1X	WD6 IMU 2	DEG	BSU		93017G	*
THETAYM(3)	V71H4120B	IMU-3 THETA Y 1X	WD6 IMU 3	DEG	BSU		93017G	*
THETAZL(1)	V71H2180B	IMU-1 THETA Z 8X	WD9 IMU 1	DEG	BSU		93017G	*
THETAZL(2)	V71H3180B	IMU-2 THETA Z 8X	WD9 IMU 2	DEG	BSU		93017G	*
THETAZL(3)	V71H4180B	IMU-3 THETA Z 8X	WD9 IMU 3	DEG	BSU		93017G	*
THETAZM(1)	V71H2160B	IMU-1 THETA Z 1X	WD8 IMU 1	DEG	BSU		93017G	*
THETAZM(2)	V71H3160B	IMU-2 THETA Z 1X	WD8 IMU 2	DEG	BSU		93017G	*
THETAZM(3)	V71H4160B	IMU-3 THETA Z 1X	WD8 IMU 3	DEG	BSU		93017G	*
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL	WD1B9 IMU 1		BD		93017G	*
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL	WD1B9 IMU 2		BD		93017G	*
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL	WD1B9 IMU 3		BD		93017G	*
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL	WD1B10 IMU 1		BD		93017G	*
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL	WD1B10 IMU 2		BD		93017G	*
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL	WD1B10 IMU 3		BD		93017G	*
	V93X6026X	IMU 1 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6027X	IMU 2 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6028X	IMU 3 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6055X	TERM/IDLE COMMAND	GROUND IMU DISP	EVENT	BD			

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

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TNB_PC_1,1	V99U3405CA	XFMTN NAV BASE-PRES CL (1) ELEM1,1	DL FMT 53/1				93017G	*
1TNB_PC_1,2	V99U3408CA	XFMTN NAV BASE-PRES CL (1) ELEM1,2	DL FMT 53/1				93017G	*
1TNB_PC_1,3	V99U3411CA	XFMTN NAV BASE-PRES CL (1) ELEM1,3	DL FMT 53/1				93017G	*
1TNB_PC_2,1	V99U3414CA	XFMTN NAV BASE-PRES CL (1) ELEM2,1	DL FMT 53/1				93017G	*
1TNB_PC_2,2	V99U3417CA	XFMTN NAV BASE-PRES CL (1) ELEM2,2	DL FMT 53/1				93017G	*
1TNB_PC_2,3	V99U3420CA	XFMTN NAV BASE-PRES CL (1) ELEM2,3	DL FMT 53/1				93017G	*
1TNB_PC_3,1	V99U3423CA	XFMTN NAV BASE-PRES CL (1) ELEM3,1	DL FMT 53/1				93017G	*
1TNB_PC_3,2	V99U3426CA	XFMTN NAV BASE-PRES CL (1) ELEM3,2	DL FMT 53/1				93017G	*
1TNB_PC_3,3	V99U3429CA	XFMTN NAV BASE-PRES CL (1) ELEM3,3	DL FMT 53/1				93017G	*
2TNB_PC_1,1	V99U3406CA	XFMTN NAV BASE-PRES CL (2) ELEM1,1	DL FMT 53/1				93017G	*
2TNB_PC_1,2	V99U3409CA	XFMTN NAV BASE-PRES CL (2) ELEM1,2	DL FMT 53/1				93017G	*
2TNB_PC_1,3	V99U3412CA	XFMTN NAV BASE-PRES CL (2) ELEM1,3	DL FMT 53/1				93017G	*
2TNB_PC_2,1	V99U3415CA	XFMTN NAV BASE-PRES CL (2) ELEM2,1	DL FMT 53/1				93017G	*
2TNB_PC_2,2	V99U3418CA	XFMTN NAV BASE-PRES CL (2) ELEM2,2	DL FMT 53/1				93017G	*
2TNB_PC_2,3	V99U3421CA	XFMTN NAV BASE-PRES CL (2) ELEM2,3	DL FMT 53/1				93017G	*
2TNB_PC_3,1	V99U3424CA	XFMTN NAV BASE-PRES CL (2) ELEM3,1	DL FMT 53/1				93017G	*
2TNB_PC_3,2	V99U3427CA	XFMTN NAV BASE-PRES CL (2) ELEM3,2	DL FMT 53/1				93017G	*
2TNB_PC_3,3	V99U3430CA	XFMTN NAV BASE-PRES CL (2) ELEM3,3	DL FMT 53/1				93017G	*
3TNB_PC_1,1	V99U3407CA	XFMTN NAV BASE-PRES CL (3) ELEM1,1	DL FMT 53/1				93017G	*
3TNB_PC_1,2	V99U3410CA	XFMTN NAV BASE-PRES CL (3) ELEM1,2	DL FMT 53/1				93017G	*
3TNB_PC_1,3	V99U3413CA	XFMTN NAV BASE-PRES CL (3) ELEM1,3	DL FMT 53/1				93017G	*
3TNB_PC_2,1	V99U3416CA	XFMTN NAV BASE-PRES CL (3) ELEM2,1	DL FMT 53/1				93017G	*
3TNB_PC_2,2	V99U3419CA	XFMTN NAV BASE-PRES CL (3) ELEM2,2	DL FMT 53/1				93017G	*
3TNB_PC_2,3	V99U3422CA	XFMTN NAV BASE-PRES CL (3) ELEM2,3	DL FMT 53/1				93017G	*
3TNB_PC_3,1	V99U3425CA	XFMTN NAV BASE-PRES CL (3) ELEM3,1	DL FMT 53/1				93017G	*
3TNB_PC_3,2	V99U3428CA	XFMTN NAV BASE-PRES CL (3) ELEM3,2	DL FMT 53/1				93017G	*
3TNB_PC_3,3	V99U3431CA	XFMTN NAV BASE-PRES CL (3) ELEM3,3	DL FMT 53/1				93017G	*
ACCEL_SF(1)	V71K2541BC	IMU 1 CAPRI SC FAC CMD	WD2 B0	IMU 1 TLM				
ACCEL_SF(2)	V71K3541BC	IMU 2 CAPRI SC FAC CMD	WD2 B0	IMU 2 TLM				
ACCEL_SF(3)	V71K4541BC	IMU 3 CAPRI SC FAC CMD	WD2 B0	IMU 3 TLM				
AZANG(1)	V95H0051CB	IMU 1 COMP AZIMUTH RES ANGLE		DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG		93017G	*
AZANG(2)	V95H1051CB	IMU 2 COMP AZIMUTH RES ANGLE		DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG		93017G	*
AZANG(3)	V95H2051CB	IMU 3 COMP AZIMUTH RES ANGLE		DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AZO(1)	V99H2610CA	AZIMUTH RESOLVER OFFSET(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*
AZO(2)	V99H2611CA	AZIMUTH RESOLVER OFFSET(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*
AZO(3)	V99H2612CA	AZIMUTH RESOLVER OFFSET(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*
AZOE(1)	V99U3001C	IMU 1 AZ RESOLVER OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
AZOE(2)	V99U3002C	IMU 2 AZ RESOLVER OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
AZOE(3)	V99U3003C	IMU 3 AZ RESOLVER OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
BXY(1)	V99H2590CA	X-GYRO MISALIGNMENT TO Y-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BXY(2)	V99H2591CA	X-GYRO MISALIGNMENT TO Y-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BXY(3)	V99H2592CA	X-GYRO MISALIGNMENT TO Y-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BXYE(1)	V99U3090C	IMU 1 X-GYRO MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
BXYE(2)	V99U3091C	IMU 2 X-GYRO MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
BXYE(3)	V99U3092C	IMU 3 X-GYRO MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
BXZ(1)	V99H2593CA	X-GYRO MISALIGNMENT TO Z-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BXZ(2)	V99H2594CA	X-GYRO MISALIGNMENT TO Z-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BXZ(3)	V99H2595CA	X-GYRO MISALIGNMENT TO Z-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BXZE(1)	V99U3093C	IMU 1 X-GYRO MISAL ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
BXZE(2)	V99U3094C	IMU 2 X-GYRO MISAL ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
BXZE(3)	V99U3095C	IMU 3 X-GYRO MISAL ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
BYX(1)	V99H2596CA	Y-GYRO MISALIGNMENT TO X-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BYX(2)	V99H2597CA	Y-GYRO MISALIGNMENT TO X-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BYX(3)	V99H2598CA	Y-GYRO MISALIGNMENT TO X-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BYXE(1)	V99U3096C	IMU 1 Y-GYRO MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
BYXE(2)	V99U3097C	IMU 2 Y-GYRO MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
BYXE(3)	V99U3098C	IMU 3 Y-GYRO MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
BYZ(1)	V99H2599CA	Y-GYRO MISALIGNMENT TO Z-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BYZ(2)	V99H2600CA	Y-GYRO MISALIGNMENT TO Z-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BYZ(3)	V99H2601CA	Y-GYRO MISALIGNMENT TO Z-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BYZE(1)	V99U3099C	IMU 1 Y-GYRO MISAL ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
BYZE(2)	V99U3100C	IMU 2 Y-GYRO MISAL ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
BYZE(3)	V99U3101C	IMU 3 Y-GYRO MISAL ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BZX(1)	V99H2602CA	Z-GYRO MISALIGNMENT TO X-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BZX(2)	V99H2603CA	Z-GYRO MISALIGNMENT TO X-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BZX(3)	V99H2604CA	Z-GYRO MISALIGNMENT TO X-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BZXE(1)	V99U3102C	IMU 1 Z-GYRO MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
BZXE(2)	V99U3103C	IMU 2 Z-GYRO MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
BZXE(3)	V99U3104C	IMU 3 Z-GYRO MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
BZY(1)	V99H2605CA	Z-GYRO MISALIGNMENT TO Y-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BZY(2)	V99H2606CA	Z-GYRO MISALIGNMENT TO Y-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*
BZY(3)	V99H2607CA	Z-GYRO MISALIGNMENT TO Y-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	RAD			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BZYE(1)	V99U3105C	IMU 1 Z-GYRO MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
BZYE(2)	V99U3106C	IMU 2 Z-GYRO MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
BZYE(3)	V99U3107C	IMU 3 Z-GYRO MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
CMD_WD1(1)	V71M2520PC	IMU 1 COMMAND WORD 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 1				93017G	*
CMD_WD1(2)	V71M3520PC	IMU 2 COMMAND WORD 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2				93017G	*
CMD_WD1(3)	V71M4520PC	IMU 3 COMMAND WORD 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3				93017G	*
CMD_WD2(1)	V71M2540PC	IMU 1 COMMAND WORD 2	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1				93017G	*
CMD_WD2(2)	V71M3540PC	IMU 2 COMMAND WORD 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2				93017G	*
CMD_WD2(3)	V71M4540PC	IMU 3 COMMAND WORD 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3				93017G	*
DELTXZ(1)	V99H2552CA	X-ACCEL MISALIGNMENT TO Z-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTXZ(2)	V99H2553CA	X-ACCEL MISALIGNMENT TO Z-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*



TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTZX(3)	V99H2554CA	X-ACCEL MISALIGNMENT TO Z-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTXY(1)	V99H2540CA	Y-ACCEL MISALIGNMENT TO X-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTXY(2)	V99H2541CA	Y-ACCEL MISALIGNMENT TO X-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTXY(3)	V99H2542CA	Y-ACCEL MISALIGNMENT TO X-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTXYE(1)	V99U3203C	IMU 1 Y-ACC MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
DELTXYE(2)	V99U3204C	IMU 2 Y-ACC MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
DELTXYE(3)	V99U3205C	IMU 3 Y-ACC MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
DELTYZ(1)	V99H2549CA	Y-ACCEL MISALIGNMENT TO Z-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTYZ(2)	V99H2550CA	Y-ACCEL MISALIGNMENT TO Z-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTYZ(3)	V99H2551CA	Y-ACCEL MISALIGNMENT TO Z-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTZX(1)	V99H2543CA	Z-ACCEL MISALIGNMENT TO X-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTZX(2)	V99H2544CA	Z-ACCEL MISALIGNMENT TO X-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTZX(3)	V99H2545CA	Z-ACCEL MISALIGNMENT TO X-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTZXE(1)	V99U3209C	IMU 1 Z-ACC MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
DELTZXE(2)	V99U3210C	IMU 2 Z-ACC MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*
DELTZXE(3)	V99U3211C	IMU 3 Z-ACC MISAL ERR TO X-REF	DL FMT 53/1	RAD	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTZY(1)	V99H2546CA	Z-ACCEL MISALIGNMENT TO Y-REF(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTZY(2)	V99H2547CA	Z-ACCEL MISALIGNMENT TO Y-REF(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTZY(3)	V99H2548CA	Z-ACCEL MISALIGNMENT TO Y-REF(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	RAD			93017G	*
DELTZY(1)	V99U3212C	IMU 1 Z-ACC MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
DELTZY(2)	V99U3213C	IMU 2 Z-ACC MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
DELTZY(3)	V99U3214C	IMU 3 Z-ACC MISAL ERR TO Y-REF	DL FMT 53/1	RAD	SPL		93017G	*
DFR(1)	V99U5952CA	IMU 1 REDUNDANT GYRO RESTRAINT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR			93017G	*
DFR(2)	V99U5953CA	IMU 2 REDUNDANT GYRO RESTRAINT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DFR(3)	V99U5954CA	IMU 3 REDUNDANT GYRO RESTRAINT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR			93017G	*
DFRE(1)	V99U3600C	IMU 1 RED GYRO RESTRAINT ERROR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFRE(2)	V99U3601C	IMU 2 RED GYRO RESTRAINT ERROR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFRE(3)	V99U3602C	IMU 3 RED GYRO RESTRAINT ERROR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFX(1)	V99R2560CB	X-GYRO RESTRAINT(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*
DFX(2)	V99R2561CB	X-GYRO RESTRAINT(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*
DFX(3)	V99R2562CB	X-GYRO RESTRAINT(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*
DFXE(1)	V99U3020C	IMU 1 X-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFXE(2)	V99U3021C	IMU 2 X-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFXE(3)	V99U3022C	IMU 3 X-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DFY(1)	V99R2563CB	Y-GYRO RESTRAINT(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*
DFY(2)	V99R2564CB	Y-GYRO RESTRAINT(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*
DFY(3)	V99R2565CB	Y-GYRO RESTRAINT(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*
DFYE(1)	V99U3023C	IMU 1 Y-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFYE(2)	V99U3024C	IMU 2 Y-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFYE(3)	V99U3025C	IMU 3 Y-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFZ(1)	V99R2566CB	Z-GYRO RESTRAINT(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DFZ(2)	V99R2567CB	Z-GYRO RESTRAINT(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*
DFZ(3)	V99R2568CB	Z-GYRO RESTRAINT(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR			93017G	*
DFZE(1)	V99U3026C	IMU 1 Z-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFZE(2)	V99U3027C	IMU 2 Z-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DFZE(3)	V99U3028C	IMU 3 Z-GYRO RESTRAINT ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
DIR(1)	V99U5955CA	IMU 1 RED GYRO INPUT AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*
DIR(2)	V99U5956CA	IMU 2 RED GYRO INPUT AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*
DIR(3)	V99U5957CA	IMU 3 RED GYRO INPUT AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DIRE(1)	V99U3603C	IMU 1 RED GYRO IN AX MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DIRE(2)	V99U3604C	IMU 2 RED GYRO IN AX MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DIRE(3)	V99U3605C	IMU 3 RED GYRO IN AX MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DIX(1)	V99U2570CA	X-GYRO IN AXIS MASS UNBALANCE(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DIX(2)	V99U2571CA	X-GYRO IN AXIS MASS UNBALANCE(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DIX(3)	V99U2572CA	X-GYRO IN AXIS MASS UNBALANCE(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DIXE(1)	V99U3050C	IMU 1 X-GYRO INPUT AXIS MASS UNBAL	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DIXE(2)	V99U3051C	IMU 2 X-GYRO INPUT AXIS MASS UNBAL	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DIXE(3)	V99U3052C	IMU 3 X-GYRO INPUT AXIS MASS UNBAL	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DIZ(1)	V99U2573CA	Z-GYRO IN AXIS MASS UNBALANCE(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DIZ(2)	V99U2574CA	Z-GYRO IN AXIS MASS UNBALANCE(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DIZ(3)	V99U2575CA	Z-GYRO IN AXIS MASS UNBALANCE(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DIZE(1)	V99U3057C	IMU 1 Z-GYRO INPUT AXIS MASS UNBAL	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DIZE(2)	V99U3058C	IMU 2 Z-GYRO INPUT AXIS MASS UNBAL	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DIZE(3)	V99U3059C	IMU 3 Z-GYRO INPUT AXIS MASS UNBAL	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DOR(1)	V99U5958CA	IMU 1 RED GYRO OUT AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*
DOR(2)	V99U5959CA	IMU 2 RED GYRO OUT AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*
DOR(3)	V99U5960CA	IMU 3 RED GYRO OUT AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*
DORE(1)	V99U3606C	IMU 1 RED GYRO OUT AX MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DORE(2)	V99U3607C	IMU 2 RED GYRO OUT AX MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DORE(3)	V99U3608C	IMU 3 RED GYRO OUT AX MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*



TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DOZ(1)	V99U2582CA	Z-GYRO OUT AXIS MASS UNBALANCE(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DOZ(2)	V99U2583CA	Z-GYRO OUT AXIS MASS UNBALANCE(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DOZ(3)	V99U2584CA	Z-GYRO OUT AXIS MASS UNBALANCE(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DOZE(1)	V99U3070C	IMU 1 Z-GYO OTPT AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DOZE(2)	V99U3071C	IMU 2 Z-GYO OTPT AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DOZE(3)	V99U3072C	IMU 3 Z-GYO OTPT AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DP(1)	V99H2660CA	IMU-1 ROLL/PITCH NONORTHOGONALITY	A/E ATT PROC DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU ORB A/CAL IMU PLAT POS MASS MEM STAR TRCK SOP	RAD			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DP(2)	V99H2661CA	IMU-2 ROLL/PITCH NONORTHOGONALITY	A/E ATT PROC DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU ORB A/CAL IMU PLAT POS MASS MEM STAR TRCK SOP	RAD			93017G	*
DP(3)	V99H2662CA	IMU-3 ROLL/PITCH NONORTHOGONALITY	A/E ATT PROC DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU ORB A/CAL IMU PLAT POS MASS MEM STAR TRCK SOP	RAD			93017G	*
DPE(1)	V99U3013C	IMU 1 ROLL/PITCH NONORTHOG ERR	DL FMT 53/1	RAD	SPL		93017G	*
DPE(2)	V99U3014C	IMU 2 ROLL/PITCH NONORTHOG ERR	DL FMT 53/1	RAD	SPL		93017G	*
DPE(3)	V99U3015C	IMU 3 ROLL/PITCH NONORTHOG ERR	DL FMT 53/1	RAD	SPL		93017G	*
DSR(1)	V99U5961CA	IMU 1 RED GYRO SPIN AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*
DSR(2)	V99U5962CA	IMU 2 RED GYRO SPIN AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*
DSR(3)	V99U5963CA	IMU 3 RED GYRO SPIN AXIS MASS UNB	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	DEG/HR/G			93017G	*
DSRE(1)	V99U3609C	IMU 1 RED GYRO SPIN MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DSRE(2)	V99U3610C	IMU 2 RED GYRO SPIN MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DSRE(3)	V99U3611C	IMU 3 RED GYRO SPIN MASS UNB ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DSX(1)	V99U2576CA	X-GYRO SPIN AXIS MASS UNBALANCE(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DSX(2)	V99U2577CA	X-GYRO SPIN AXIS MASS UNBALANCE(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DSX(3)	V99U2578CA	X-GYRO SPIN AXIS MASS UNBALANCE(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DSXE(1)	V99U3075C	IMU 1 X-GYO SPIN AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DSXE(2)	V99U3076C	IMU 2 X-GYO SPIN AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DSXE(3)	V99U3077C	IMU 3 X-GYO SPIN AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DSZ(1)	V99U2579CA	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DSZ(2)	V99U2580CA	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DSZ(3)	V99U2581CA	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/G			93017G	*
DSZE(1)	V99U3083C	IMU 1 Z-GYO SPIN AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DSZE(2)	V99U3084C	IMU 2 Z-GYO SPIN AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DSZE(3)	V99U3085C	IMU 3 Z-GYO SPIN AX MASS UNBAL ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
DVX(1)	V99U2860CB	IMU-1 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX(2)	V99U2861CB	IMU-2 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX(3)	V99U2862CB	IMU-3 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX_1SEC(1)	V95L0056CB	IMU 1 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(2)	V95L1056CB	IMU 2 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(3)	V95L2056CB	IMU 3 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY(1)	V99U2863CB	IMU-1 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(2)	V99U2864CB	IMU-2 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(3)	V99U2865CB	IMU-3 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DVY_1SEC(1)	V95L0057CB	IMU 1 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVY_1SEC(2)	V95L1057CB	IMU 2 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVY_1SEC(3)	V95L2057CB	IMU 3 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVZ(1)	V99U2866CB	IMU-1 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(2)	V99U2867CB	IMU-2 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(3)	V99U2868CB	IMU-3 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ_1SEC(1)	V95L0058CB	IMU 1 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVZ_1SEC(2)	V95L1058CB	IMU 2 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVZ_1SEC(3)	V95L2058CB	IMU 3 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
ETD1(1)	V99U2845CA	ETD1(1) IMU-1 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD1(2)	V99U2848CA	ETD1(2) IMU-1 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD1(3)	V99U2851CA	ETD1(3) IMU-1 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD2(1)	V99U2846CA	ETD2(1) IMU-2 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD2(2)	V99U2849CA	ETD2(2) IMU-2 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD2(3)	V99U2852CA	ETD2(3) IMU-2 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD3(1)	V99U2847CA	ETD3(1) IMU-3 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD3(2)	V99U2850CA	ETD3(2) IMU-3 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
ETD3(3)	V99U2853CA	ETD3(3) IMU-3 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
FAIL_ACCEL_SF(1)	V95X0081XB	IMU 1 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ACCEL_SF(2)	V95X1081XB	IMU 2 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ACCEL_SF(3)	V95X2081XB	IMU 3 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(1)	V95X0030XB	IMU 1 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(2)	V95X1030XB	IMU 2 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(3)	V95X2030XB	IMU 3 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(1)	V95X0031XB	IMU 1 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(2)	V95X1031XB	IMU 2 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(3)	V95X2031XB	IMU 3 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(1)	V95X0034XB	IMU 1 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(2)	V95X1034XB	IMU 2 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(3)	V95X2034XB	IMU 3 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(1)	V95X0037XB	IMU 1 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(2)	V95X1037XB	IMU 2 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_RES_LIM(3)	V95X2037XB	IMU 3 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(1)	V95X0035XB	IMU 1 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(2)	V95X1035XB	IMU 2 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(3)	V95X2035XB	IMU 3 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HCALBP	V99U2722C	HANG CAL B PRES POSN NO	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		HXS		93017G	*
HCB_IMU	V99U2723C	HANG CAL B IMU BEING CALIBRATED	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		HXS		93017G	*
HDW_BITE1(1)	V95Q0076CB	IMU 1 HEX DISCRETE WORD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(2)	V95Q1076CB	IMU 2 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(3)	V95Q2076CB	IMU 3 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE2(1)	V95Q0077CB	IMU 1 HEX MODE/BITE STATUS WORD	GROUND IMU DISP GROUND IMU DISP TLM					
HDW_BITE2(2)	V95Q1077CB	IMU 2 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
HDW_BITE2(3)	V95Q2077CB	IMU 3 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
HNGR_CAL_A	V99X2710X	HANGER CAL A IN PROGRESS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
HNGR_CAL_B	V99X2711X	HANGER CAL B IN PROGRESS	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP		BD		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
HNGR_CAL_C	V99X2712X	HANGER CAL C IN PROGRESS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
IMU_1_SEL_STATUS	V95X0021XB	IMU 1 SELECT STATUS	GROUND IMU DISP GROUND IMU DISP TLM					
IMU_2_SEL_STATUS	V95X1021XB	IMU 2 SELECT STATUS	GROUND IMU DISP TLM					
IMU_3_SEL_STATUS	V95X2021XB	IMU 3 SELECT STATUS	GROUND IMU DISP TLM					
IMU_FAIL_IND(1)	V95X0023XB	IMU 1 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IMU_FAIL_IND(2)	V95X1023XB	IMU 2 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IMU_FAIL_IND(3)	V95X2023XB	IMU 3 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IRANG(1)	V95H0053CB	IMU 1 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
IRANG(2)	V95H1053CB	IMU 2 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
IRANG(3)	V95H2053CB	IMU 3 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
IRO(1)	V99H2615CA	INNER ROLL RESOLVER OFFSET(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*



TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
IRO(2)	V99H2616CA	INNER ROLL RESOLVER OFFSET(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*
IRO(3)	V99H2617CA	INNER ROLL RESOLVER OFFSET(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*
IROE(1)	V99U3004C	IMU 1 INNER ROLL RES OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
IROE(2)	V99U3005C	IMU 2 INNER ROLL RES OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
IROE(3)	V99U3006C	IMU 3 INNER ROLL RES OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
KIX(1)	V99A2520CA	LOW GAIN X-ACCEL SCALE FACTOR(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KIX(2)	V99A2521CA	LOW GAIN X-ACCEL SCALE FACTOR(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KIX(3)	V99A2522CA	LOW GAIN X-ACCEL SCALE FACTOR(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KIXE(1)	V99U3159C	IMU 1 LO GAIN X-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIXE(2)	V99U3160C	IMU-2 LO GAIN X ACCEL SF ERROR	DL FMT 53/1	UG/G	SPL		93017G	*
KIXE(3)	V99U3161C	IMU-3 LO GAIN X ACCEL SF ERROR	DL FMT 53/1	UG/G	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KIXH(1)	V99A2681CA	IMU-1 HI GAIN X ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIXH(2)	V99A2682CA	IMU-2 HI GAIN X ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIXH(3)	V99A2683CA	IMU-3 HI GAIN X ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIXHE(1)	V99U3150C	IMU 1 HI GAIN X-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIXHE(2)	V99U3151C	IMU 2 HI GAIN X-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIXHE(3)	V99U3152C	IMU 3 HI GAIN X-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIY(1)	V99A2523CA	LOW GAIN Y-ACCEL SCALE FACTOR(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KIY(2)	V99A2524CA	LOW GAIN Y-ACCEL SCALE FACTOR(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KIY(3)	V99A2525CA	LOW GAIN Y-ACCEL SCALE FACTOR(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KIYE(1)	V99U3171C	IMU 1 LO GAIN Y-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIYE(2)	V99U3172C	IMU 2 LO GAIN Y-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIYE(3)	V99U3173C	IMU 3 LO GAIN Y-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIYH(1)	V99A2684CA	IMU-1 HI GAIN Y ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIYH(2)	V99A2685CA	IMU-2 HI GAIN Y ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIYH(3)	V99A2686CA	IMU-3 HI GAIN Y ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIYHE(1)	V99U3153C	IMU 1 HI GAIN Y-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIYHE(2)	V99U3154C	IMU 2 HI GAIN Y-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIYHE(3)	V99U3155C	IMU 3 HI GAIN Y-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIZ(1)	V99A2526CA	LOW GAIN Z-ACCEL SCALE FACTOR(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KIZ(2)	V99A2527CA	LOW GAIN Z-ACCEL SCALE FACTOR(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KIZ(3)	V99A2528CA	LOW GAIN Z-ACCEL SCALE FACTOR(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G	SPL		93017G	*
KIZE(1)	V99U3174C	IMU 1 LO GAIN Z-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIZE(2)	V99U3175C	IMU 2 LO GAIN Z-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIZE(3)	V99U3176C	IMU 3 LO GAIN Z-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIZH(1)	V99A2687CA	IMU-1 HI GAIN Z ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIZH(2)	V99A2688CA	IMU-2 HI GAIN Z ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIZH(3)	V99A2689CA	IMU-3 HI GAIN Z ACCEL SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG/G			93017G	*
KIZHE(1)	V99U3156C	IMU 1 HI GAIN Z-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIZHE(2)	V99U3157C	IMU 2 HI GAIN Z-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KIZHE(3)	V99U3158C	IMU 3 HI GAIN Z-ACC SCALE FAC ERR	DL FMT 53/1	UG/G	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOX(1)	V99G2530CB	LOW GAIN X ACCELEROMETER BIAS(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOX(2)	V99G2531CB	LOW GAIN X ACCELEROMETER BIAS(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOX(3)	V99G2532CB	LOW GAIN X ACCELEROMETER BIAS(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOXE(1)	V99U3134C	IMU 1 LOW GAIN X-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOXE(2)	V99U3135C	IMU 2 LOW GAIN X-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOXE(3)	V99U3136C	IMU 3 LOW GAIN X-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOXH(1)	V99G2670CA	IMU-1 HI GAIN X ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*
KOXH(2)	V99G2671CA	IMU-2 HI GAIN X ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOXH(3)	V99G2672CA	IMU-3 HI GAIN X ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*
KOXHE(1)	V99U3125C	IMU 1 HIGH GAIN X-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOXHE(2)	V99U3126C	IMU 2 HIGH GAIN X-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOXHE(3)	V99U3127C	IMU 3 HIGH GAIN X-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOY(1)	V99G2533CB	LOW GAIN Y ACCELEROMETER BIAS(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOY(2)	V99G2534CB	LOW GAIN Y ACCELEROMETER BIAS(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOY(3)	V99G2535CB	LOW GAIN Y ACCELEROMETER BIAS(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOYE(1)	V99U3137C	IMU 1 LOW GAIN Y-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOYE(2)	V99U3138C	IMU 2 LOW GAIN Y-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOYE(3)	V99U3139C	IMU 3 LOW GAIN Y-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOYH(1)	V99G2673CA	IMU-1 HI GAIN Y ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOYH(2)	V99G2674CA	IMU-2 HI GAIN Y ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*
KOYH(3)	V99G2675CA	IMU-3 HI GAIN Y ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*
KOYHE(1)	V99U3128C	IMU 1 HIGH GAIN Y-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOYHE(2)	V99U3129C	IMU 2 HIGH GAIN Y-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOYHE(3)	V99U3130C	IMU 3 HIGH GAIN Y-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOZ(1)	V99G2536CB	LOW GAIN Z ACCELEROMETER BIAS(1)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOZ(2)	V99G2537CB	LOW GAIN Z ACCELEROMETER BIAS(2)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOZ(3)	V99G2538CB	LOW GAIN Z ACCELEROMETER BIAS(3)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG			93017G	*
KOZE(1)	V99U3140C	IMU 1 LOW GAIN Z-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOZE(2)	V99U3141C	IMU 2 LOW GAIN Z-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOZE(3)	V99U3142C	IMU 3 LOW GAIN Z-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOZH(1)	V99G2676CA	IMU-1 HI GAIN Z ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*
KOZH(2)	V99G2677CA	IMU-2 HI GAIN Z ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*
KOZH(3)	V99G2678CA	IMU-3 HI GAIN Z ACCEL BIAS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN IMU PLAT POS IMU TERM/IDLE MASS MEM	UG			93017G	*
KOZHE(1)	V99U3131C	IMU 1 HIGH GAIN Z-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOZHE(2)	V99U3132C	IMU 2 HIGH GAIN Z-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KOZHE(3)	V99U3133C	IMU 3 HIGH GAIN Z-ACCEL BIAS ERR	DL FMT 53/1	UG	SPL		93017G	*
KSX(1)	V99A2510CA	X-ACCELEROMETER SYMMETRY FACTOR(1)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSX(2)	V99A2511CA	X-ACCELEROMETER SYMMETRY FACTOR(2)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSX(3)	V99A2512CA	X-ACCELEROMETER SYMMETRY FACTOR(3)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSX(1)	V99U3180C	IMU 1 X-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KSX(2)	V99U3181C	IMU 2 X-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KSX(3)	V99U3182C	IMU 3 X-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*



TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KSY(1)	V99A2513CA	Y-ACCELEROMETER SYMMETRY FACTOR(1)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSY(2)	V99A2514CA	Y-ACCELEROMETER SYMMETRY FACTOR(2)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSY(3)	V99A2515CA	Y-ACCELEROMETER SYMMETRY FACTOR(3)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSYE(1)	V99U3183C	IMU 1 Y-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KSYE(2)	V99U3184C	IMU 2 Y-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KSYE(3)	V99U3185C	IMU 3 Y-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KSZ(1)	V99A2516CA	Z-ACCELEROMETER SYMMETRY FACTOR(1)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSZ(2)	V99A2517CA	Z-ACCELEROMETER SYMMETRY FACTOR(2)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSZ(3)	V99A2518CA	Z-ACCELEROMETER SYMMETRY FACTOR(3)	DL FMT 53/1 IMU GC ALIGN IMU INT PROC IMU ORB A/CAL MASS MEM	UG/G			93017G	*
KSZE(1)	V99U3186C	IMU 1 Z-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KSZE(2)	V99U3187C	IMU 2 Z-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KSZE(3)	V99U3188C	IMU 3 Z-ACCEL SYMMETRY FACTOR ERR	DL FMT 53/1	UG/G	SPL		93017G	*
KTX(1)	V99G2500CA	X-GYRO TORQUER SCALE FACTOR (1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KTX(2)	V99G2501CA	X-GYRO TORQUER SCALE FACTOR (2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*
KTX(3)	V99G2502CA	X-GYRO TORQUER SCALE FACTOR (3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*
KTXE(1)	V99U3029C	IMU 1 X-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
KTXE(2)	V99U3030C	IMU 2 X-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
KTXE(3)	V99U3031C	IMU 3 X-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
KTY(1)	V99G2503CA	Y-GYRO TORQUER SCALE FACTOR (1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*
KTY(2)	V99G2504CA	Y-GYRO TORQUER SCALE FACTOR (2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*
KTY(3)	V99G2505CA	Y-GYRO TORQUER SCALE FACTOR (3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*
KTYE(1)	V99U3032C	IMU 1 Y-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
KTYE(2)	V99U3033C	IMU 2 Y-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
KTYE(3)	V99U3034C	IMU 3 Y-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KTZ(1)	V99G2506CA	Z-GYRO TORQUER SCALE FACTOR (1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*
KTZ(2)	V99G2507CA	Z-GYRO TORQUER SCALE FACTOR (2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*
KTZ(3)	V99G2508CA	Z-GYRO TORQUER SCALE FACTOR (3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS MASS MEM	DEG/HR/DEG/HR			93017G	*
KTZE(1)	V99U3035C	IMU 1 Z-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
KTZE(2)	V99U3036C	IMU 2 Z-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
KTZE(3)	V99U3037C	IMU 3 Z-GYRO TORQ SCALE FACTOR ERR	DL FMT 53/1	DEG/HR	SPL		93017G	*
KXR(1)	V99U5964CA	IMU 1 RED GYRO X SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KXR(2)	V99U5965CA	IMU 2 RED GYRO X SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KXR(3)	V99U5966CA	IMU 3 RED GYRO X SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KXRE(1)	V99U3612C	IMU 1 RED GYRO X SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
KXRE(2)	V99U3613C	IMU 2 RED GYRO X SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
KXRE(3)	V99U3614C	IMU 3 RED GYRO X SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KYR(1)	V99U5967CA	IMU 1 RED GYRO Y SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KYR(2)	V99U5968CA	IMU 2 RED GYRO Y SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KYR(3)	V99U5969CA	IMU 3 RED GYRO Y SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KYRE(1)	V99U3615C	IMU 1 RED GYRO Y SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
KYRE(2)	V99U3616C	IMU 2 RED GYRO Y SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
KYRE(3)	V99U3617C	IMU 3 RED GYRO Y SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
KZR(1)	V99U5970CA	IMU 1 RED GYRO Z SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KZR(2)	V99U5971CA	IMU 2 RED GYRO Z SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KZR(3)	V99U5972CA	IMU 3 RED GYRO Z SCALE FACTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU ATT DET IMU GC ALIGN MASS MEM	DEG/HR/G			93017G	*
KZRE(1)	V99U3618C	IMU 1 RED GYRO Z SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
KZRE(2)	V99U3619C	IMU 2 RED GYRO Z SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
KZRE(3)	V99U3620C	IMU 3 RED GYRO Z SCALE FACTOR ERR	DL FMT 53/1	DEG/HR/G	SPL		93017G	*
LATCOMP(1)	V95X0085XB	IMU 1 LARGE ANGLE TORQ COMPLETE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
LATCOMP(2)	V95X1085XB	IMU 2 LARGE ANGLE TORQ COMPLETE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
LATCOMP(3)	V95X2085XB	IMU 3 LARGE ANGLE TORQ COMPLETE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
M12B(1)/M12B_X	V99U3551C	IMU 1-2 REL ATT ERROR,COMPONENT 1	TLM	RAD	SPL		79965E	
M12B(2)/M12B_Y	V99U3552C	IMU 1-2 REL ATT ERROR,COMPONENT 2	TLM	RAD	SPL		79965E	
M12B(3)/M12B_Z	V99U3553C	IMU 1-2 REL ATT ERROR,COMPONENT 3	TLM	RAD	SPL		79965E	
M13B(1)/M13B_X	V99U3554C	IMU 1-3 REL ATT ERROR,COMPONENT 1	TLM	RAD	SPL		79965E	
M13B(2)/M13B_Y	V99U3555C	IMU 1-3 REL ATT ERROR,COMPONENT 2	TLM	RAD	SPL		79965E	
M13B(3)/M13B_Z	V99U3556C	IMU 1-3 REL ATT ERROR,COMPONENT 3	TLM	RAD	SPL		79965E	
M23B(1)/M23B_X	V99U3557C	IMU 2-3 REL ATT ERROR,COMPONENT 1	TLM	RAD	SPL		79965E	
M23B(2)/M23B_Y	V99U3558C	IMU 2-3 REL ATT ERROR,COMPONENT 2	TLM	RAD	SPL		79965E	
M23B(3)/M23B_Z	V99U3559C	IMU 2-3 REL ATT ERROR,COMPONENT 3	TLM	RAD	SPL		79965E	
MXZE(1)	V99U3114C	IMU 1 X-GY IN AX OFST ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
MXZE(2)	V99U3115C	IMU 2 X-GY IN AX OFST ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
MXZE(3)	V99U3116C	IMU 3 X-GY IN AX OFST ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
MYZE(1)	V99U3117C	IMU 1 Y-GY IN AX OFST ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
MYZE(2)	V99U3118C	IMU 2 Y-GY IN AX OFST ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
MYZE(3)	V99U3119C	IMU 3 Y-GY IN AX OFST ERR TO Z-REF	DL FMT 53/1	RAD	SPL		93017G	*
NPFA	V99U2721C	HANG/PFLT CAL A PRES POSITION NO	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ND	HXS		93017G	*
OPER_CMD(1)	V71K2576XC	IMU-1 OPERATE MODE CMD	GROUND IMU DISP IMU 1 TLM				93017G	*
OPER_CMD(2)	V71K3576XC	IMU-2 OPERATE MODE CMD	GROUND IMU DISP IMU 2 TLM				93017G	*
OPER_CMD(3)	V71K4576XC	IMU-3 OPERATE MODE CMD	GROUND IMU DISP IMU 3 TLM				93017G	*
ORANG(1)	V95H0054CB	IMU 1 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
ORANG(2)	V95H1054CB	IMU 2 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
ORANG(3)	V95H2054CB	IMU 3 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PANG(1)	V95H0050CB	IMU 1 COMP PITCH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(2)	V95H1050CB	IMU 2 COMP PITCH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(3)	V95H2050CB	IMU 3 COMP PITCH RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PFLT_CAL	V99X2715X	PREFLIGHT CAL IN PROGRESS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP		BD		93017G	*
PHIDIJ(1)	V99R3581CA	REL RATE VECTOR IMU 1 TO 2,COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*
PHIDIJ(1)	V99R3584CA	REL RATE VECTOR IMU 1 TO 3,COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*
PHIDIJ(1)	V99R3587CA	REL RATE VECTOR IMU 2 TO 3,COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*
PHIDIJ(2)	V99R3582CA	REL RATE VECTOR IMU 1 TO 2,COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*
PHIDIJ(2)	V99R3585CA	REL RATE VECTOR IMU 1 TO 3,COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*
PHIDIJ(2)	V99R3588CA	REL RATE VECTOR IMU 2 TO 3,COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*
PHIDIJ(3)	V99R3583CA	REL RATE VECTOR IMU 1 TO 2,COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*
PHIDIJ(3)	V99R3586CA	REL RATE VECTOR IMU 1 TO 3,COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*
PHIDIJ(3)	V99R3589CA	REL RATE VECTOR IMU 2 TO 3,COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	RAD/SEC			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PHIIJ(1)	V99U3571CA	MISALIGN VECTOR IMU 1 TO 2 COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PHIIJ(1)	V99U3574CA	MISALIGN VECTOR IMU 1 TO 3 COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PHIIJ(1)	V99U3577CA	MISALIGN VECTOR IMU 2 TO 3 COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PHIIJ(2)	V99U3572CA	MISALIGN VECTOR IMU 1 TO 2 COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PHIIJ(2)	V99U3575CA	MISALIGN VECTOR IMU 1 TO 3 COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PHIIJ(2)	V99U3578CA	MISALIGN VECTOR IMU 2 TO 3 COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PHIIJ(3)	V99U3573CA	MISALIGN VECTOR IMU 1 TO 2 COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PHIIJ(3)	V99U3576CA	MISALIGN VECTOR IMU 1 TO 3 COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PHIIJ(3)	V99U3579CA	MISALIGN VECTOR IMU 2 TO 3 COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PN(1)	V99U2830CA	IMU 1 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PN(2)	V99U2831CA	IMU 2 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PN(3)	V99U2832CA	IMU 3 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PO(1)	V99H2620CA	PITCH RESOLVER OFFSET(1)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PO(2)	V99H2621CA	PITCH RESOLVER OFFSET(2)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*
PO(3)	V99H2622CA	PITCH RESOLVER OFFSET(3)	DL FMT 53/1 IMU ATT DET IMU GC ALIGN IMU INT PROC IMU ORB A/CAL IMU PLAT POS IMU TERM/IDLE MASS MEM	DEG			93017G	*
POE(1)	V99U3010C	IMU 1 PITCH RES OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
POE(2)	V99U3011C	IMU 2 PITCH RES OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
POE(3)	V99U3012C	IMU 3 PITCH RES OFFSET ERR	DL FMT 53/1	DEG	SPL		93017G	*
PUP(1)	V99U2836CA	IMU 1 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PUP(2)	V99U2837CA	IMU 2 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PUP(3)	V99U2838CA	IMU 3 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(1)	V99U2833CA	IMU 1 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(2)	V99U2834CA	IMU 2 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(3)	V99U2835CA	IMU 3 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PWR_ON(1)	V95X0020XB	IMU 1 POWER ON	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP				93017G	*
PWR_ON(2)	V95X1020XB	IMU 2 POWER ON	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP				93017G	*



TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PWR_ON(3)	V95X2020XB	IMU 3 POWER ON					93017G	*
					DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP			
PX(1)	V71K2521BC	IMU-1 TORQUE X CMD	WD1B0-4		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 1			
PX(2)	V71K3521BC	IMU-2 TORQUE X CMD	WD1B0-4		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 2			
PX(3)	V71K4521BC	IMU-3 TORQUE X CMD	WD1B0-4		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 3			
PY(1)	V71K2526BC	IMU-1 TORQUE Y CMD	WD1B5-9		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 1			
PY(2)	V71K3526BC	IMU-2 TORQUE Y CMD	WD1B5-9		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 2			
PY(3)	V71K4526BC	IMU-3 TORQUE Y CMD	WD1B5-9		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 3			
PZ(1)	V71K2531BC	IMU-1 TORQUE Z CMD	WD1B10-14		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 1			
PZ(2)	V71K3531BC	IMU-2 TORQUE Z CMD	WD1B10-14		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 2			
PZ(3)	V71K4531BC	IMU-3 TORQUE Z CMD	WD1B10-14		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		93017G	*
					IMU 3			
S/W_BITE(1)	V95X0046XB	IMU 1 SW BITE STATUS			GROUND IMU DISP		92297B	
S/W_BITE(2)	V95X1046XB	IMU 2 SW BITE STATUS			GROUND IMU DISP		92297B	
S/W_BITE(3)	V95X2046XB	IMU 3 SW BITE STATUS			GROUND IMU DISP		92297B	

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_X_NEG(1)	V71K2543BC	IMU-1 SLEW X NEG	WD2B2	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1		93017G	*
SLEW_X_NEG(2)	V71K3543BC	IMU-2 SLEW X NEG	WD2B2	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2		93017G	*
SLEW_X_NEG(3)	V71K4543BC	IMU-3 SLEW X NEG	WD2B2	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3		93017G	*
SLEW_X_POS(1)	V71K2542BC	IMU-1 SLEW X POS	WD2B1	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1		93017G	*
SLEW_X_POS(2)	V71K3542BC	IMU-2 SLEW X POS	WD2B1	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2		93017G	*
SLEW_X_POS(3)	V71K4542BC	IMU-3 SLEW X POS	WD2B1	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3		93017G	*
SLEW_Y_NEG(1)	V71K2545BC	IMU-1 SLEW Y NEG	WD2B4	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1		93017G	*
SLEW_Y_NEG(2)	V71K3545BC	IMU-2 SLEW Y NEG	WD2B4	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2		93017G	*
SLEW_Y_NEG(3)	V71K4545BC	IMU-3 SLEW Y NEG	WD2B4	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3		93017G	*
SLEW_Y_POS(1)	V71K2544BC	IMU-1 SLEW Y POS	WD2B3	DEG/S	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Y_POS(2)	V71K3544BC	IMU-2 SLEW Y POS	WD2B3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Y_POS(3)	V71K4544BC	IMU-3 SLEW Y POS	WD2B3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Z_NEG(1)	V71K2547BC	IMU-1 SLEW Z NEG	WD2B6	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Z_NEG(2)	V71K3547BC	IMU-2 SLEW Z NEG	WD2B6	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Z_NEG(3)	V71K4547BC	IMU-3 SLEW Z NEG	WD2B6	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Z_POS(1)	V71K2546BC	IMU-1 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Z_POS(2)	V71K3546BC	IMU-2 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Z_POS(3)	V71K4546BC	IMU-3 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
THETA1(1)	V99U3220CA	IMU-1 NORTH COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA1(2)	V99U3223CA	IMU-1 WEST COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
THETA1(3)	V99U3226CA	IMU-1 UP COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
THETA2(1)	V99U3221CA	IMU-2 NORTH COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
THETA2(2)	V99U3224CA	IMU-2 WEST COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
THETA2(3)	V99U3227CA	IMU-2 UP COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
THETA3(1)	V99U3222CA	IMU-3 NORTH COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
THETA3(2)	V99U3225CA	IMU-3 WEST COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
THETA3(3)	V99U3228CA	IMU-3 UP COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
VRSS(1)	V95L0060CB	IMU 1 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S2			93017G	*
VRSS(2)	V95L1060CB	IMU 2 SENSED CHANGE IN VEL(1 SEC)	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S2			93017G	*
VRSS(3)	V95L2060CB	IMU 3 SENSED CHANGE IN VEL(1 SEC)	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S2			93017G	*
WRCF(1)	V95R0660CC	IMU 1 COMP AND FLTRD RED AXIS RATE	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR			93017G	*

TABLE 4.5.4.3.4-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
WRCF(2)	V95R0661CC	IMU 2 COMP AND FLTRD RED AXIS RATE	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR			93017G	*
WRCF(3)	V95R0662CC	IMU 3 COMP AND FLTRD RED AXIS RATE	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR			93017G	*
	V95M2842PB	CGMB_IMU_FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
	V95M2843PB	CGMB_PWR_ON_DFG	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2845PB	CGMB_SUBM_ACT_IP7	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2846PB	CGMB_POS_COMP	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2850PB	CGMB_SW_BITE\$(1:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2851PB	CGMB_SW_BITE\$(2:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2852PB	CGMB_SW_BITE\$(3:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V99U3621C	RGM DELTA RESTRAINT ERROR IMU 1	DL FMT 53/1				93017G	*
	V99U3622C	RGM DELTA RESTRAINT ERROR IMU 2	DL FMT 53/1				93017G	*
	V99U3623C	RGM DELTA RESTRAINT ERROR IMU 3	DL FMT 53/1				93017G	*

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

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

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
AZLIM	V99U9804C	ARC-SEC	F	S	D	P	V4.9A	00	ZFA	89986H	
AZO(1)	V99H2610CC	DEG	F	S	L	P	V4.9A	00	IH1	DC0599	
AZO(2)	V99H2611CC	DEG	F	S	L	P	V4.9A	00	IH2	DC0599	
AZO(3)	V99H2612CC	DEG	F	S	L	P	V4.9A	00	IH3	DC0738	
BXY(1)	V99H2590CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
BXY(2)	V99H2591CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
BXY(3)	V99H2592CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
BXZ(1)	V99H2593CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
BXZ(2)	V99H2594CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
BXZ(3)	V99H2595CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
BYX(1)	V99H2596CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
BYX(2)	V99H2597CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
BYX(3)	V99H2598CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
BYZ(1)	V99H2599CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
BYZ(2)	V99H2600CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
BYZ(3)	V99H2601CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
BZX(1)	V99H2602CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
BZX(2)	V99H2603CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
BZX(3)	V99H2604CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
BZY(1)	V99H2605CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
BZY(2)	V99H2606CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
BZY(3)	V99H2607CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
DDFR(1)	V99U5870C	DEG/HR	F	S	D	P	V4.9A	00	IH1	DC0599	
DDFR(2)	V99U5871C	DEG/HR	F	S	D	P	V4.9A	00	IH2	DC0599	
DDFR(3)	V99U5872C	DEG/HR	F	S	D	P	V4.9A	00	IH3	DC0738	
DELTXZ(1)	V99H2552CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
DELTXZ(2)	V99H2553CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
DELTXZ(3)	V99H2554CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
DELTYX(1)	V99H2540CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
DELTYX(2)	V99H2541CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
DELTYX(3)	V99H2542CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
DELTYZ(1)	V99H2549CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
DELTYZ(2)	V99H2550CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
DELTYZ(3)	V99H2551CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
DELTZX(1)	V99H2543CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
DELTZX(2)	V99H2544CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
DELTZX(3)	V99H2545CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
DELTZY(1)	V99H2546CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
DELTZY(2)	V99H2547CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
DELTZY(3)	V99H2548CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
DFR(1)	V99U5952C	DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
DFR(2)	V99U5953C	DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
DFR(3)	V99U5954C	DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
DFX(1)	V99R2560CD	DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
DFX(2)	V99R2561CD	DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
DFX(3)	V99R2562CD	DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
DFY(1)	V99R2563CD	DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
DFY (2)	V99R2564CD	DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
DFY (3)	V99R2565CD	DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
DFZ (1)	V99R2566CD	DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
DFZ (2)	V99R2567CD	DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
DFZ (3)	V99R2568CD	DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
DIR (1)	V99U5955C	DEG/HR/G	F	S	L	P	V4.9A	00	IH1	DC0599	
DIR (2)	V99U5956C	DEG/HR/G	F	S	L	P	V4.9A	00	IH2	DC0599	
DIR (3)	V99U5957C	DEG/HR/G	F	S	L	P	V4.9A	00	IH3	DC0738	
DIX (1)	V99U2570CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH1	DC0599	
DIX (2)	V99U2571CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH2	DC0599	
DIX (3)	V99U2572CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH3	DC0738	
DIZ (1)	V99U2573CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH1	DC0599	
DIZ (2)	V99U2574CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH2	DC0599	
DIZ (3)	V99U2575CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH3	DC0738	
DOR (1)	V99U5958C	DEG/HR/G	F	S	L	P	V4.9A	00	IH1	DC0599	
DOR (2)	V99U5959C	DEG/HR/G	F	S	L	P	V4.9A	00	IH2	DC0599	
DOR (3)	V99U5960C	DEG/HR/G	F	S	L	P	V4.9A	00	IH3	DC0738	
DOZ (1)	V99U2582CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH1	DC0599	
DOZ (2)	V99U2583CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH2	DC0599	
DOZ (3)	V99U2584CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH3	DC0738	
DP (1)	V99H2660CC	RAD	F	S	L	P	V4.9A	00	IH1	DC0599	
DP (2)	V99H2661CC	RAD	F	S	L	P	V4.9A	00	IH2	DC0599	
DP (3)	V99H2662CC	RAD	F	S	L	P	V4.9A	00	IH3	DC0738	
DSR (1)	V99U5961C	DEG/HR/G	F	S	L	P	V4.9A	00	IH1	DC0599	
DSR (2)	V99U5962C	DEG/HR/G	F	S	L	P	V4.9A	00	IH2	DC0599	
DSR (3)	V99U5963C	DEG/HR/G	F	S	L	P	V4.9A	00	IH3	DC0738	
DSX (1)	V99U2576CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH1	DC0599	
DSX (2)	V99U2577CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH2	DC0599	
DSX (3)	V99U2578CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH3	DC0738	
DSZ (1)	V99U2579CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH1	DC0599	
DSZ (2)	V99U2580CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH2	DC0599	
DSZ (3)	V99U2581CC	DEG/HR/G	F	S	L	P	V4.9A	00	IH3	DC0738	
DTTIM	V96W7001C	SEC	F	S	D	P	V4.9A	02	ZFA	89986H	
								03	ZFA		
								09	ZFA		
DU (1)	V99U7545C	DEG/HR	F	S	L	P	V4.9A	00	IM1	79965E	
DU (2)	V99U7546C	DEG/HR	F	S	L	P	V4.9A	00	IM2	79965E	
DU (3)	V99U7547C	DEG/HR	F	S	L	P	V4.9A	00	IM3	79655E	
G_SITE_1	V96A7002CA	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	
G_SITE_2	V96A7002CB	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	
G_SITE_3	V96A7002CC	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	
G_SITE_4	V96A7002CD	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	
G_SITE_5	V96A7002CE	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	
G_SITE_6	V96A7002CF	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	
G_SITE_7	V96A7002CG	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	
G_SITE_8	V96A7002CH	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	
G_SITE_9	V96A7002CI	FT/SEC**2	F	S	M	P	V4.9A	00	ISP	79965E	

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
HCA_HI_POS	V99U9976C	ND	BI		D	P	V4.9A	00	ZFA	89986H	
HCA_LO_POS	V99U9975C	ND	BI		D	P	V4.9A	00	ZFA	89986H	
HS1Y	V96U7072C	DEG/HR	F	S	L	P	V4.9A	00	IM1	79965E	
HS1Z	V96U7069C	DEG/HR	F	S	L	P	V4.9A	00	IM1	79956E	
HS2Y	V96U7073C	DEG/HR	F	S	L	P	V4.9A	00	IM2	79965E	
HS2Z	V96U7070C	DEG/HR	F	S	L	P	V4.9A	00	IM2	79965E	
HS3Y	V96U7074C	DEG/HR	F	S	L	P	V4.9A	00	IM3	79965E	
HS3Z	V96U7071C	DEG/HR	F	S	L	P	V4.9A	00	IM3	79965E	
IRO(1)	V99H2615CC	DEG	F	S	L	P	V4.9A	00	IH1	DC0599	
IRO(2)	V99H2616CC	DEG	F	S	L	P	V4.9A	00	IH2	DC0599	
IRO(3)	V99H2617CC	DEG	F	S	L	P	V4.9A	00	IH3	DC0738	
KAX(1)	V99U5978C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KAX(2)	V99U5979C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KAX(3)	V99U5980C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KAXH(1)	V98U7927C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KAXH(2)	V98U7928C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KAXH(3)	V98U7929C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KAY(1)	V99U5981C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KAY(2)	V99U5982C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KAY(3)	V99U5983C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KAYH(1)	V98U7930C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KAYH(2)	V98U7931C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KAYH(3)	V98U7932C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KAZ(1)	V99U5984C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KAZ(2)	V99U5985C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KAZ(3)	V99U5986C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KAZH(1)	V98U7933C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KAZH(2)	V98U7934C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KAZH(3)	V98U7935C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KBX(1)	V99U5987C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KBX(2)	V99U5988C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KBX(3)	V99U5989C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KBXH(1)	V98U7936C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KBXH(2)	V98U7937C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KBXH(3)	V98U7938C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KBY(1)	V99U5990C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KBY(2)	V99U5991C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KBY(3)	V99U5992C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KBYH(1)	V98U7939C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KBYH(2)	V98U7940C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KBYH(3)	V98U7941C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KBZ(1)	V99U5993C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KBZ(2)	V99U5994C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KBZ(3)	V99U5995C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KBZH(1)	V98U7942C	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KBZH(2)	V98U7943C	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KBZH(3)	V98U7944C	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	



TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
KIX(1)	V99A2520CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KIX(2)	V99A2521CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KIX(3)	V99A2522CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KIXH(1)	V99A2681CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KIXH(2)	V99A2682CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KIXH(3)	V99A2683CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KIY(1)	V99A2523CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KIY(2)	V99A2524CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KIY(3)	V99A2525CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KIYH(1)	V99A2684CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KIYH(2)	V99A2685CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KIYH(3)	V99A2686CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KIZ(1)	V99A2526CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KIZ(2)	V99A2527CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KIZ(3)	V99A2528CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KIZH(1)	V99A2687CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KIZH(2)	V99A2688CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KIZH(3)	V99A2689CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KOX(1)	V99G2530CD	UG	F	S	L	P	V4.9A	00	IH1	DC0599	
KOX(2)	V99G2531CD	UG	F	S	L	P	V4.9A	00	IH2	DC0599	
KOX(3)	V99G2532CD	UG	F	S	L	P	V4.9A	00	IH3	DC0738	
KOXH(1)	V99G2670CC	UG	F	S	L	P	V4.9A	00	IH1	DC0599	
KOXH(2)	V99G2671CC	UG	F	S	L	P	V4.9A	00	IH2	DC0599	
KOXH(3)	V99G2672CC	UG	F	S	L	P	V4.9A	00	IH3	DC0738	
KOY(1)	V99G2533CD	UG	F	S	L	P	V4.9A	00	IH1	DC0599	
KOY(2)	V99G2534CD	UG	F	S	L	P	V4.9A	00	IH2	DC0599	
KOY(3)	V99G2535CD	UG	F	S	L	P	V4.9A	00	IH3	DC0738	
KOYH(1)	V99G2673CC	UG	F	S	L	P	V4.9A	00	IH1	DC0599	
KOYH(2)	V99G2674CC	UG	F	S	L	P	V4.9A	00	IH2	DC0599	
KOYH(3)	V99G2675CC	UG	F	S	L	P	V4.9A	00	IH3	DC0738	
KOZ(1)	V99G2536CD	UG	F	S	L	P	V4.9A	00	IH1	DC0599	
KOZ(2)	V99G2537CD	UG	F	S	L	P	V4.9A	00	IH2	DC0599	
KOZ(3)	V99G2538CD	UG	F	S	L	P	V4.9A	00	IH3	DC0738	
KOZH(1)	V99G2676CC	UG	F	S	L	P	V4.9A	00	IH1	DC0599	
KOZH(2)	V99G2677CC	UG	F	S	L	P	V4.9A	00	IH2	DC0599	
KOZH(3)	V99G2678CC	UG	F	S	L	P	V4.9A	00	IH3	DC0738	
KSX(1)	V99A2510CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KSX(2)	V99A2511CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KSX(3)	V99A2512CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KSX(1)	V99A2513CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KSX(2)	V99A2514CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KSX(3)	V99A2515CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KSZ(1)	V99A2516CC	UG/G	F	S	L	P	V4.9A	00	IH1	DC0599	
KSZ(2)	V99A2517CC	UG/G	F	S	L	P	V4.9A	00	IH2	DC0599	
KSZ(3)	V99A2518CC	UG/G	F	S	L	P	V4.9A	00	IH3	DC0738	
KTX(1)	V99G2500CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
KTX(2)	V99G2501CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
KTX(3)	V99G2502CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
KTY(1)	V99G2503CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
KTY(2)	V99G2504CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
KTY(3)	V99G2505CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
KTZ(1)	V99G2506CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
KTZ(2)	V99G2507CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
KTZ(3)	V99G2508CC	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
KXR(1)	V99U5964C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
KXR(2)	V99U5965C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
KXR(3)	V99U5966C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
KYR(1)	V99U5967C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
KYR(2)	V99U5968C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
KYR(3)	V99U5969C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
KZR(1)	V99U5970C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH1	DC0599	
KZR(2)	V99U5971C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH2	DC0599	
KZR(3)	V99U5972C	DEG/HR/DEG/HR	F	S	L	P	V4.9A	00	IH3	DC0738	
LAT_SITE_1	V96H7079CA	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LAT_SITE_2	V96H7079CB	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LAT_SITE_3	V96H7079CC	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LAT_SITE_4	V96H7079CD	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LAT_SITE_5	V96H7079CE	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LAT_SITE_6	V96H7079CF	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LAT_SITE_7	V96H7079CG	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LAT_SITE_8	V96H7079CH	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LAT_SITE_9	V96H7079CI	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_1	V96U7076CA	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_2	V96U7076CB	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_3	V96U7076CC	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_4	V96U7076CD	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_5	V96U7076CE	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_6	V96U7076CF	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_7	V96U7076CG	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_8	V96U7076CH	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITXB_SITE_9	V96U7076CI	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_1	V96U7077CA	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_2	V96U7077CB	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_3	V96U7077CC	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_4	V96U7077CD	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_5	V96U7077CE	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_6	V96U7077CF	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_7	V96U7077CG	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_8	V96U7077CH	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITYB_SITE_9	V96U7077CI	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITZB_SITE_1	V96U7078CA	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITZB_SITE_2	V96U7078CB	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITZB_SITE_3	V96U7078CC	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITZB_SITE_4	V96U7078CD	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
LIMITZB_SITE_5	V96U7078CE	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITZB_SITE_6	V96U7078CF	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITZB_SITE_7	V96U7078CG	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITZB_SITE_8	V96U7078CH	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LIMITZB_SITE_9	V96U7078CI	ARC-SEC	F	S	D	P	V4.9A	00	ISP	79965E	
LONG_SITE_1	V96H7080CA	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LONG_SITE_2	V96H7080CB	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LONG_SITE_3	V96H7080CC	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LONG_SITE_4	V96H7080CD	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LONG_SITE_5	V96H7080CE	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LONG_SITE_6	V96H7080CF	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LONG_SITE_7	V96H7080CG	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LONG_SITE_8	V96H7080CH	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
LONG_SITE_9	V96H7080CI	RAD	F	S	M	P	V4.9A	00	ISP	79965E	
MAX_TORQ	V96U7005C	DEG/HR	F	S	D	P	V4.9A	02	ZFA	89986H	
								03	ZFA		
								09	ZFA		
PO(1)	V99H2620CC	DEG	F	S	L	P	V4.9A	00	IH1	DC0599	
PO(2)	V99H2621CC	DEG	F	S	L	P	V4.9A	00	IH2	DC0599	
PO(3)	V99H2622CC	DEG	F	S	L	P	V4.9A	00	IH3	DC0738	
RGAO(1)	V99U9559C	RAD	F	S	L	P	G4.226	00	IH1	DC0599	
							G4.97				
							V4.9A				
RGAO(2)	V99U9560C	RAD	F	S	L	P	G4.226	00	IH2	DC0599	
							G4.97				
							V4.9A				
RGAO(3)	V99U9561C	RAD	F	S	L	P	G4.226	00	IH3	DC0738	
							G4.97				
							V4.9A				
RGPO(1)	V99U9562C	RAD	F	S	L	P	G4.226	00	IH1	DC0599	
							G4.97				
							V4.9A				
RGPO(2)	V99U9563C	RAD	F	S	L	P	G4.226	00	IH2	DC0599	
							G4.97				
							V4.9A				
RGPO(3)	V99U9564C	RAD	F	S	L	P	G4.226	00	IH3	DC0738	
							G4.97				
							V4.9A				
RO(1)	V90H7650C	DEG	F	S	L	P	V4.9A	00	IH1	DC0599	
RO(2)	V90H7651C	DEG	F	S	L	P	V4.9A	00	IH2	DC0599	
RO(3)	V90H7652C	DEG	F	S	L	P	V4.9A	00	IH3	DC0738	
RRTOL	V90R7635C	DEG/HR	F	S	D	P	V4.9A	00	ZFA	89986H	
SI	V96U7181C	ND	I	S	M	P	V4.9A	00	INV	DC0599	
TC1	V99U9807C	SEC	F	S	D	P	V4.9A	00	ZFA	89986H	
TEST_SITE_7	V96U8510C	ND	CH		M	P	V4.9A	00	ISP	79965E	
TEST_SITE_8	V96U8511C	ND	CH		M	P	V4.9A	00	ISP	79965E	
TEST_SITE_9	V96U8512C	ND	CH		M	P	V4.9A	00	ISP	79965E	

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
TGYR01	V99U9806C	SEC	F	S	D	P	V4.9A	00	ZFA	89986H	
TILTLIM	V99U9805C	ARC-SEC	F	S	D	P	V4.9A	00	ZFA	89986H	
TNBBODY(1,1)	V96U7096C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNBBODY(1,2)	V96U7097C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNBBODY(1,3)	V96U7098C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNBBODY(2,1)	V96U7099C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNBBODY(2,2)	V96U7100C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNBBODY(2,3)	V96U7101C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNBBODY(3,1)	V96U7102C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNBBODY(3,2)	V96U7103C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNBBODY(3,3)	V96U7104C	ND	F	S	L	P	G4.226 G4.66 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE1(1,1)	V96U7132C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE1(1,2)	V96U7135C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE1(1,3)	V96U7138C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
TNB_CASE1(2,1)	V96U7141C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE1(2,2)	V96U7144C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE1(2,3)	V96U7147C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE1(3,1)	V96U7150C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE1(3,2)	V96U7153C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE1(3,3)	V96U7156C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(1,1)	V96U7133C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(1,2)	V96U7136C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(1,3)	V96U7139C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(2,1)	V96U7142C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(2,2)	V96U7145C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(2,3)	V96U7148C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(3,1)	V96U7151C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(3,2)	V96U7154C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE2(3,3)	V96U7157C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
TNB_CASE3(1,1)	V96U7134C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE3(1,2)	V96U7137C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE3(1,3)	V96U7140C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE3(2,1)	V96U7143C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE3(2,2)	V96U7146C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE3(2,3)	V96U7149C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE3(3,1)	V96U7152C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE3(3,2)	V96U7155C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_CASE3(3,3)	V96U7158C	ND	F	S	L	P	G4.226 G4.97 V4.9A	00	IPR	DC0599	
TNB_GCD1(1,1)	V96U7092C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD1(1,2)	V96U7093C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD1(1,3)	V96U7094C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD1(2,1)	V96U7086C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD1(2,2)	V96U7087C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD1(2,3)	V96U7088C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD1(3,1)	V96U7089C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD1(3,2)	V96U7090C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD1(3,3)	V96U7091C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(1,1)	V96U7159C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(1,2)	V96U7161C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(1,3)	V96U7163C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(2,1)	V96U7165C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(2,2)	V96U7167C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(2,3)	V96U7169C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(3,1)	V96U7171C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(3,2)	V96U7173C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD2(3,3)	V96U7175C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD3(1,1)	V96U7160C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD3(1,2)	V96U7162C	ND	F	S	M	P	V4.9A	00	INV	DC0599	

TABLE 4.5.4.3.4-3. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
TNB_GCD3(1,3)	V96U7164C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD3(2,1)	V96U7166C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD3(2,2)	V96U7168C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD3(2,3)	V96U7170C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD3(3,1)	V96U7172C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD3(3,2)	V96U7174C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TNB_GCD3(3,3)	V96U7176C	ND	F	S	M	P	V4.9A	00	INV	DC0599	
TRGM(1)	V99U5973C	ND	F	S	D	P	V4.9A	00	ZFA	89986H	
TRGM(2)	V99U5974C	ND	F	S	D	P	V4.9A	00	ZFA	89986H	
TS	V96W7085C	SEC	F	S	D	P	V4.9A	00	ZFA	89986H	
UPGAIN	V99U9808C	ND	F	S	D	P	V4.9A	00	ZFA	89986H	
VERT_HORZ_SITE_1	V99U9850CA	ND	I	S	D	P	V4.9A	00	ISP	79965E	
VERT_HORZ_SITE_2	V99U9850CB	ND	I	S	D	P	V4.9A	00	ISP	79965E	
VERT_HORZ_SITE_3	V99U9850CC	ND	I	S	D	P	V4.9A	00	ISP	79965E	
VERT_HORZ_SITE_4	V99U9850CD	ND	I	S	D	P	V4.9A	00	ISP	79965E	
VERT_HORZ_SITE_5	V99U9850CE	ND	I	S	D	P	V4.9A	00	ISP	79965E	
VERT_HORZ_SITE_6	V99U9850CF	ND	I	S	D	P	V4.9A	00	ISP	79965E	
VERT_HORZ_SITE_7	V99U9850CG	ND	I	S	D	P	V4.9A	00	ISP	79965E	
VERT_HORZ_SITE_8	V99U9850CH	ND	I	S	D	P	V4.9A	00	ISP	79965E	
VERT_HORZ_SITE_9	V99U9850CI	ND	I	S	D	P	V4.9A	00	ISP	79965E	
WN_SITE_1	V96R7026CA	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WN_SITE_2	V96R7026CB	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WN_SITE_3	V96R7026CC	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WN_SITE_4	V96R7026CD	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WN_SITE_5	V96R7026CE	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WN_SITE_6	V96R7026CF	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WN_SITE_7	V96R7026CG	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WN_SITE_8	V96R7026CH	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WN_SITE_9	V96R7026CI	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_1	V96R7027CA	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_2	V96R7027CB	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_3	V96R7027CC	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_4	V96R7027CD	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_5	V96R7027CE	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_6	V96R7027CF	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_7	V96R7027CG	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_8	V96R7027CH	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WU_SITE_9	V96R7027CI	DEG/HR	F	S	M	P	V4.9A	00	ISP	79965E	
WZ4	V99U5176C	DEG/HR	F	S	D	P	V4.9A	00	ZFA	89986H	

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

TABLE 4.5.4.3.4-4. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
AMP	V96U7035C	00	+1.5	E+01	DEG/HR	F	S	P V4.9A	29687	
AZO_G	V98U7050C	00	+0.0	E+00	DEG	F	S	P V4.9A	92068A	
BXY_G	V98U7051C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
BXZ_G	V98U7052C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
BYX_G	V98U7053C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
BYZ_G	V98U7054C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
BZX_G	V98U7055C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
BZY_G	V98U7056C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
DDFR_G	V98U7057C	00	-6.9000006	E-02	DEG/HR	F	S	P V4.9A	92068A	
DELTXZ_G	V98U7058C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
DELTXX_G	V98U7059C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
DELTYZ_G	V98U7060C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
DELTZX_G	V98U7061C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
DELTZY_G	V98U7062C	00	+0.0	E+00	RAD	F	S	P V4.9A	92068A	
DFR_G	V98U7063C	00	+0.0	E+00	DEG/HR	F	S	P V4.9A	92068A	
DFX_G	V98U7064C	00	+0.0	E+00	DEG/HR	F	S	P V4.9A	92068A	
DFY_G	V98U7065C	00	+0.0	E+00	DEG/HR	F	S	P V4.9A	92068A	
DFZ_G	V98U7066C	00	+0.0	E+00	DEG/HR	F	S	P V4.9A	92068A	
DIR_G	V98U7067C	00	+0.0	E+00	DEG/HR/G	F	S	P V4.9A	92068A	
DIX_G	V98U7068C	00	+0.0	E+00	DEG/HR/G	F	S	P V4.9A	92068A	
DIZ_G	V98U7069C	00	+0.0	E+00	DEG/HR/G	F	S	P V4.9A	92068A	
DOR_G	V98U7070C	00	+0.0	E+00	DEG/HR/G	F	S	P V4.9A	92068A	
DOZ_G	V98U7071C	00	+0.0	E+00	DEG/HR/G	F	S	P V4.9A	92068A	



TABLE 4.5.4.3.4-4. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
DP_G	V98U7072C	00	+0.0	E+00 RAD	F	S	P	V4.9A	92068A	
DSR_G	V98U7073C	00	+0.0	E+00 DEG/HR/G	F	S	P	V4.9A	92068A	
DSX_G	V98U7074C	00	+0.0	E+00 DEG/HR/G	F	S	P	V4.9A	92068A	
DSZ_G	V98U7075C	00	+0.0	E+00 DEG/HR/G	F	S	P	V4.9A	92068A	
DU_G	V98U7076C	00	+0.0	E+00 DEG/HR	F	S	P	V4.9A	92068A	
HSY_G	V98U7077C	00	+0.0	E+00 DEG/HR	F	S	P	V4.9A	92068A	
HSZ_G	V98U7078C	00	+0.0	E+00 DEG/HR	F	S	P	V4.9A	92068A	
IRO_G	V98U7079C	00	+0.0	E+00 DEG	F	S	P	V4.9A	92068A	
KASF1	V99U5976C	00	+9.952115	E-01 ND	F	S	C	V4.9A	79912	
ACC SF ATTITUDE FILTER CONST-1										
KASF2	V99U5977C	00	+4.7885	E-03 ND	F	S	C	V4.9A	59952	
ACC SF ATTITUDE FILTER CONST-2										
KAXH_G	V98U7081C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KAX_G	V98U7080C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KAYH_G	V98U7083C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KAY_G	V98U7082C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KAZH_G	V98U7085C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KAZ_G	V98U7084C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KBXH_G	V98U7087C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KBX_G	V98U7086C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KBYH_G	V98U7089C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KBY_G	V98U7088C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KBZH_G	V98U7091C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KBZ_G	V98U7090C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KIXH_G	V98U7093C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	

TABLE 4.5.4.3.4-4. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
KIX_G	V98U7092C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KIYH_G	V98U7095C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KIY_G	V98U7094C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KIZH_G	V98U7097C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KIZ_G	V98U7096C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KOXH_G	V98U7099C	00	-1.0000000	E+03 UG	F	S	P	V4.9A	92068A	
KOX_G	V98U7098C	00	-1.0000000	E+03 UG	F	S	P	V4.9A	92068A	
KOYH_G	V98U7101C	00	-1.0000000	E+03 UG	F	S	P	V4.9A	92068A	
KOY_G	V98U7100C	00	-1.0000000	E+03 UG	F	S	P	V4.9A	92068A	
KOZH_G	V98U7103C	00	-1.0000000	E+03 UG	F	S	P	V4.9A	92068A	
KOZ_G	V98U7102C	00	-1.0000000	E+03 UG	F	S	P	V4.9A	92068A	
KSX_G	V98U7104C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KSY_G	V98U7105C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KSZ_G	V98U7106C	00	+0.0	E+00 UG/G	F	S	P	V4.9A	92068A	
KTX_G	V98U7107C	00	+1.0000000	E+00 DEG/HR/DEG/HR	F	S	P	V4.9A	92068A	
KTY_G	V98U7108C	00	+1.0000000	E+00 DEG/HR/DEG/HR	F	S	P	V4.9A	92068A	
KTZ_G	V98U7109C	00	+1.0000000	E+00 DEG/HR/DEG/HR	F	S	P	V4.9A	92068A	
KVELLIM1	V96L7003C	00	+480	PULSES	I	S	P	V4.9A	29687	
KVELLIM2	V96L7075C	00	+48	PULSES	I	S	P	V4.9A	29687	
KVELLIM3	V90U7624C	00	+720	PULSES	I	S	P	V4.9A	39291A	
KVELLIM4	V98U7964C	00	+4300	PULSES	I	S	P	V4.9A	39369	
KXR_G	V98U7110C	00	+8.9100003	E-01 DEG/HR/DEG/HR	F	S	P	V4.9A	92068A	
KYR_G	V98U7111C	00	+4.5400000	E-01 DEG/HR/DEG/HR	F	S	P	V4.9A	92068A	

TABLE 4.5.4.3.4-4. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
KZR_G	V98U7112C	00	+0.0	E+00 DEG/HR/DEG/HR	F	S	P	V4.9A	92068A	
LAT_C1	V96U7008C	00	+3.2	E-04 ND	F	S	P	V4.9A	29687	
LAT_C2	V96U7009C	00	+3.0	E-01 ND	F	S	P	V4.9A	29687	
LAT_C3	V96U7010C	00	+3.0	E-02 ND	F	S	P	V4.9A	29687	
LAT_C4	V96U7011C	00	+1.3	E-03 ND	F	S	P	V4.9A	29687	
MAX_D_RATE	V96U7036C	00	+6.5	E+01 DEG/HR	F	S	P	V4.9A	29687	
NAZ	V96R7037C	00	+11	ND	I	S	P	V4.9A	89786C	
PO_G	V98U7113C	00	+0.0	E+00 DEG	F	S	P	V4.9A	92068A	
RGAO_G	V98U7114C	00	+0.0	E+00 RAD	F	S	P	V4.9A	92068A	
RGPO_G	V98U7115C	00	+0.0	E+00 RAD	F	S	P	V4.9A	92068A	
RO_G	V98U7116C	00	+0.0	E+00 DEG	F	S	P	V4.9A	92068A	
TC	V96L7083C	00	+3.008	E+01 SEC	F	S	P	V4.9A	29687	
TCA	V96W7179C	00	+1.7984	E+02 SEC	F	S	P	V4.9A	29687	
TCAL1	V96W7057C	00	+2.976	E+01 SEC	F	S	P	V4.9A	29687	
TCAL2	V96W7058C	00	+2.976	E+01 SEC	F	S	P	V4.9A	29687	
TCAL3	V96W7059C	00	+1.20	E+02 SEC	F	S	P	V4.9A	29687	
TCAL4	V96W7060C	00	+9.92	E+00 SEC	F	S	P	V4.9A	29687	
TCAL5	V96W7061C	00	+6.00	E+02 SEC	F	S	P	V4.9A	39891B	
TCAL6	V96W7062C	00	+1.20	E+02 SEC	F	S	P	V4.9A	29687	
TCAL7	V96W7063C	00	+3.60	E+02 SEC	F	S	P	V4.9A	29687	
TCAL8	V96W7064C	00	+1.7984	E+02 SEC	F	S	P	V4.9A	29687	
TCALC	V96U7177C	00	+6.0000000	E+01 SEC	F	S	P	V4.9A	59952	
CAL C MEAS PERIOD TCASE_DC12(1,1)	V96U7038C	00	+9.962389	E-01 ND	F	S	P	V4.9A	29687	

TABLE 4.5.4.3.4-4. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
TCASE_DC12(1,2)	V96U7039C	00	-5.745788	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC12(1,3)	V96U7040C	00	+6.485765	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC12(2,1)	V96U7041C	00	+6.121183	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC12(2,2)	V96U7042C	00	+9.964696	E-01 ND	F	S	P	V4.9A	29687	
TCASE_DC12(2,3)	V96U7043C	00	-5.745788	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC12(3,1)	V96U7044C	00	-6.132727	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC12(3,2)	V96U7045C	00	+6.121183	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC12(3,3)	V96U7046C	00	+9.962389	E-01 ND	F	S	P	V4.9A	29687	
TCASE_DC34(1,1)	V96U7047C	00	-9.962389	E-01 ND	F	S	P	V4.9A	29687	
TCASE_DC34(1,2)	V96U7048C	00	+5.745788	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC34(1,3)	V96U7049C	00	-6.485765	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC34(2,1)	V96U7050C	00	-6.121183	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC34(2,2)	V96U7051C	00	-9.964696	E-01 ND	F	S	P	V4.9A	29687	
TCASE_DC34(2,3)	V96U7052C	00	+5.745788	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC34(3,1)	V96U7053C	00	-6.132727	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC34(3,2)	V96U7054C	00	+6.121183	E-02 ND	F	S	P	V4.9A	29687	
TCASE_DC34(3,3)	V96U7055C	00	+9.962383	E-01 ND	F	S	P	V4.9A	29687	
TD1	V96W7067C	00	+1.20	E+02 SEC	F	S	P	V4.9A	29687	
TD2	V96W7068C	00	+1.20	E+02 SEC	F	S	P	V4.9A	29687	
TE	V96W7056C	00	+8.992	E+01 SEC	F	S	P	V4.9A	29687	
TGYRO	V96U7081C	00	+6.00	E+02 SEC	F	S	P	V4.9A	29687	
THCB1 HANGER CAL B,TIME CONSTANT 1	V96W7065C	00	+6.016	E+01 SEC	F	S	P	V4.9A	59952	
THCB2 HANGER CAL B,TIME CONSTANT 2	V96W7066C	00	+3.60	E+02 SEC	F	S	P	V4.9A	59952	

TABLE 4.5.4.3.4-4. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
TLIT(1,1)	V96U7012C	00	+9.997	E-01 ND	F	S	P	V4.9A	29687	
TLIT(1,2)	V96U7013C	00	-1.714	E-02 ND	F	S	P	V4.9A	29687	
TLIT(1,3)	V96U7014C	00	+1.775	E-02 ND	F	S	P	V4.9A	29687	
TLIT(2,1)	V96U7015C	00	+1.748	E-02 ND	F	S	P	V4.9A	29687	
TLIT(2,2)	V96U7016C	00	+9.997	E-01 ND	F	S	P	V4.9A	29687	
TLIT(2,3)	V96U7017C	00	-1.714	E-02 ND	F	S	P	V4.9A	29687	
TLIT(3,1)	V96U7018C	00	-1.745	E-02 ND	F	S	P	V4.9A	29687	
TLIT(3,2)	V96U7019C	00	+1.775	E-02 ND	F	S	P	V4.9A	29687	
TLIT(3,3)	V96U7020C	00	+9.9969997	E-01 ND	F	S	P	V4.9A	29687	
TMAJ_AL MAJOR CYCLE RATE FOR ON-ORBIT ALIGNMENT TO	V96U7212C	00	+1.60	E-01 SEC	F	S	P	V4.9A	29687	
TSC	V96W7178C	00	+3.0000000	E+01 SEC	F	S	P	V4.9A	59952	
THERMAL STABILIZATION TIME-CAL C TSLEW1	V96W7022C	00	+1.984	E+01 SEC	F	S	P	V4.9A	29687	
TSLEW2	V96W7023C	00	+5.12	E+00 SEC	F	S	P	V4.9A	29687	
TSLEW3	V96W7024C	00	+6.4	E-01 SEC	F	S	P	V4.9A	29687	
TSLEW4	V96W7025C	00	+3.2	E-01 SEC	F	S	P	V4.9A	29687	
TSLEW5	V96W7095C	00	+1.984	E+01 SEC	F	S	P	V4.9A	29687	
WR	V96U7180C	00	+5.235987	E-01 RAD/SEC	F	S	P	V4.9A	29687	
WX1	V96U7028C	00	+5.977434	E+01 DEG/HR	F	S	P	V4.9A	29687	
WX2	V96U7029C	00	-3.679636	E+00 DEG/HR	F	S	P	V4.9A	29687	
WX3	V99U5172C	00	+5.977434	E+01 DEG/HR	F	S	P	V4.9A	29687	
WX4	V99U5173C	00	-3.679636	E+00 DEG/HR	F	S	P	V4.9A	29687	
WY1	V96U7030C	00	+3.672709	E+00 DEG/HR	F	S	P	V4.9A	29687	

TABLE 4.5.4.3.4-4. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) K-LOADS

FSSR NAME DESCRIPTION	MSID	MC	KLOAD VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
WY2	V96U7031C	00	+5.988706	E+01	DEG/HR	F	S	P V4.9A	29687	
WY3	V99U5174C	00	+3.672709	E+00	DEG/HR	F	S	P V4.9A	29687	
WY4	V99U5175C	00	+5.988706	E+01	DEG/HR	F	S	P V4.9A	29687	
WZ1	V96U7032C	00	-3.679636	E+00	DEG/HR	F	S	P V4.9A	29687	
WZ2	V96U7033C	00	+0.0	E+00	DEG/HR	F	S	P V4.9A	29687	
WZ3	V96U7034C	00	+3.679636	E+00	DEG/HR	F	S	P V4.9A	29687	

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

TABLE 4.5.4.3.4-5. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
DEG_PER_RAD RADIAN TO DEGREE CONVERSION FACTOR	V97U0112C	00	+5.72957795131E+01	DEG/RAD	F		S	C A6.9 G4.10 G4.126 G4.127 G4.128 G4.175 G4.20 G4.201 G4.204 G4.208 G4.21 G4.213 G4.220 G4.226 G4.227 G4.23 G4.234 G4.237 G4.24 G4.25 G4.35 G4.36 G4.5 G4.6 G4.66 G4.8 G4.9 G4.97 G5.26 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	

TABLE 4.5.4.3.4-5. INERTIAL MEASUREMENT UNIT(IMU) GROUND CALIBRATIONS (V4.9A) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
GO EARTH GRAV ACCEL CONSTANT	V90A7622C	00	+3.2174049	E+01 FT/SEC**2	F		S P	A6.9 G4.10 G4.105 G4.126 G4.204 G4.208 G4.22 G4.220 G4.227 G4.234 G4.237 G4.36 G4.8 G4.9 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
RAD RADIAN TO ARC-SEC CONVERSION	V97U6133C	00	+2.0626481	E+05 ARC-SEC/RAD	F		S P	A6.9 G4.208 G4.38 V4.10 V4.11 V4.9A	90374C	

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



#### 4.5.4.4 IMU Preflight Calibration Modules.

The purpose of the modules defined in this section is to define the processing required to perform a short term calibration of certain gyro and accelerometer parameters during preflight operations. The processing requirements are currently defined in one module, Preflight Calibration A (PFLT\_CALA). Table 4.5.4.4-1 identifies the parameters calibrated during Preflight Calibration A. The preflight calibration parameters identified in Table 4.5.4.1-1 may be written to or read from mass memory via a Preflight IMU Control Monitor item entry.

Table 4.5.4.4-1. Preflight Calibration A Parameters		
Parameters	Description	Units
KIX,Y,Z	Low-gain accelerometer scale factors	μg/g
KOX,Y,Z	Low-gain accelerometer biases	μg
KIXH,YH,ZH	High-gain accelerometer scale factors	μg/g
KOXH,YH,ZH	High-gain accelerometer biases	μg
DFX,Y,Z	Gyro restraints	deg/hr
DSX,Z	Gyro mass unbalance (spin axis)	deg/hr/g
DOZ	Gyro mass unbalance (output axis)	deg/hr/g
DFR	Redundant gyro restraint	deg/hr
DDFR*	Delta redundant gyro restraint	deg/hr
DIR	Redundant gyro mass unbalance (input axis)	deg/hr/g
DOR	Redundant gyro mass unbalance (output axis)	deg/hr/g
DSR	Redundant gyro mass unbalance (spin axis)	deg/hr/g
KXR,YR,ZR	Redundant gyro scale factors	deg/hr/ deg/hr
*Not stored in mass memory		

#### 4.5.4.4.1 Preflight Calibration A (PFLT\_CALA).

The purpose of Preflight Calibration A is to collect acceleration and drift data in seven cardinal positions (positions 1 through 7 of Table 4.5.4.4.1-1) to enable the calibration of accelerometer biases, accelerometer scale factors, gyro restraints, and the gyro mass unbalance terms identified in Table 4.5.4.4-1.

PFLT\_CALA will calibrate all selected IMU's in operate mode. For each IMU, the cluster will be torqued to the seven cardinal positions utilizing the cluster repositioning sequence. Once at the desired cluster position, the ground sequence will be utilized to obtain estimates of drift and vertical acceleration. PFLT\_CALA collects the gyro calibration data and the high-gain accelerometer calibration data with the accelerometer/CAPRI gain set to high gain in the first pass through the seven cluster positions. The low-gain accelerometer calibration data are collected in the second pass through the same cluster positions with the accelerometer/CAPRI gain set to low gain. Position 7 is skipped in the second pass. After the final position in the second pass, the error terms (deltas) associated with each calibration parameter are computed. All parameters are automatically updated at the end of calibration.

A. Functional Requirements. The PFLT\_CALA module performs the following functions:

1. Perform the collection of acceleration and drift data in each of the specified cluster orientations.
2. Compute the error terms associated with the accelerometer bias and scale factor, gyro restraint, and gyro mass unbalance parameters, and redundant gyro scale factor, restraint, and mass unbalance parameters.
3. Update the accelerometer bias and scale factor gyro restraint and mass unbalance calibration parameters.

B. Interface Requirements. The input/output interfaces associated with PFLT\_CALA are listed in Tables 4.5.4.4.1-2 and 4.5.4.4.1-3. Where two range values are listed for one parameter, the first value is for the KT-70 IMU and the second value is for the HAINS IMU.

C. Detailed Requirements. PFLT\_CALA will sequence through the seven predefined positions.

When PFLT\_CALA is requested by the user, it is required that all memory locations utilized for the stored data terms (AL, AH, ETDX, ETDY, ETDZ, etc.) initially be set equal to zero for all IMU's.

During each calibration position, the calibration position index NPFA shall indicate the current calibration position. Between positions, (prior to or after the calibration, or during thermal stabilization periods) the index may assume a value not corresponding to an expected calibration position.

The following equations and sequence of computations are required for each of the seven predefined cluster positions in Table 4.5.4.4.1-1. The positions are defined in terms of Euler angle rotations (ALPHA, GAMMA, DELTA) corresponding to successive rotations about the Z, Y, and X axis with the cluster coordinate system initially aligned with the NWU coordinate system.

1. a. Set the accelerometer/CAPRI gain equal to high gain for each applicable IMU(K).
- b. Perform ground sequence 8 (refer to Section 4.1.4) for TD1 seconds for thermal delay after the accelerometer gain change to high gain with the following inputs:

$$ERN(K) = ERW(K) = ERU(K) = 0,$$

$$\left[ T_R^{PCK} \right] = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \text{ for each applicable IMU(K)}$$

2. a. Based on the values of ALPHA, DELTA, and GAMMA (refer to Table 4.5.4.4.1-1) for specified orientation, compute the transformation from NWU-to-desired cluster as follows:

$$\left[ T_R^{DC} \right] = \begin{bmatrix} (D)(E) & (E)(A) & -B \\ (D)(B)(C) - (A)(F) & (A)(B)(C) + (D)(F) & (C)(E) \\ (D)(B)(F) + (C)(A) & (A)(B)(F) - (C)(D) & (E)(F) \end{bmatrix}$$

where A = SIN(ALPHA), B = SIN(GAMMA), C = SIN(DELTA), D = COS(ALPHA), E = COS(GAMMA), F = COS(DELTA)

- b. Using the transformation from NWU-to-desired cluster and the transformation from Nav base-to-reference NWU, compute the transformation from Nav base-to-desired cluster for each applicable IMU(K) as follows:

$$\left[ T_{NB}^{DCK} \right] = \left[ T_R^{DC} \right] \left[ T_{NB}^{NWUK} \right]$$

Note that for PFLT\_CALA, K refers to applicable IMU's (K = 1, 2, or 3).

3. Perform the cluster repositioning sequence to orient the clusters to the required position, until the large angle torquing complete flag, LATCOMP, is set by the LAT\_FUNC module for all applicable IMU's.
4. After completion of the required rotation for all IMU's to be calibrated, set the transformations from NWU-to-present cluster as follows:

$$\left[ T_R^{PCK} \right] = \left[ T_R^{DC} \right] \text{ for each applicable IMU(K).}$$

5. Estimate tilts with the following initial inputs:

$$ERN(K) = ERW(K) = ERU(K) = 0,$$

$$\left[ T_R^{PCK} \right] \text{ for each applicable IMU(K).}$$

- a. If in high gain, perform ground sequence 3 for TCAL1 seconds for position 1 and for TE seconds for positions 2 through 7.

- b. If in low gain, perform ground sequence 3 for TCAL2 seconds for all positions.
6. Compute the excess rates required to torque out cluster tilts for each applicable IMU(K) as follows:

$$ERN(K) = - \left( \frac{[THETA_K(2)] (RAD)}{G (TC)} \right)$$

$$ERW(K) = \frac{[THETA_K(1)] (RAD)}{G (TC)}$$

where RAD is a conversion factor to convert radians to arc-seconds, THETA<sub>K</sub>(1) and THETA<sub>K</sub>(2) are the west and north tilts in ft/sec<sup>2</sup> for IMU(K), G is the local gravity constant in ft/sec<sup>2</sup>, and TC seconds is the time to torque out the estimated tilts.

7. Perform ground sequence 2 for TC seconds to torque out the estimated tilts with the following initial inputs:

$$ERN(K) = ERN(K), ERW(K) = ERW(K), ERU(K) = 0,$$

$$[T_R^{PCK}] \text{ for each applicable IMU(K).}$$

8. a. Set  $[T_R^{PCK}] = [T_R^{DC}]$  for each applicable IMU(K).

- b. If in high gain, proceed to step 9; otherwise, proceed to step 13.

9. Perform ground sequence 3 for TGM = TCAL6 seconds for position 1 and for TGM = TCAL7 seconds for positions 2 through 7 for all IMU's to be calibrated to estimate north and west channel drift and the vertical component of acceleration with the following inputs:

$$ERN(K) = 0, ERU(K) = 0, ERW(K) = 0$$

$$[T_R^{PCK}] \text{ for each applicable IMU(K).}$$

10. a. Store the estimates from the LSF\_FILR as follows for each applicable IMU(K):

$$ETDN(K) = ETD_K(2) + \left[ \frac{THETA_K(1)}{G} + \left[ \frac{ETD_K(1)}{2 (RAD)} \right] (TGM) \right] (WU)$$

$$AH(K, NPFA) = THETA_K(3)$$

where  $\overline{ETD}_K$  and  $\overline{THETA}_K$  are the LSF\_FILR estimates, and NPFA = present position number.

- b. Transform these rates into cluster coordinates as follows:

$$\begin{bmatrix} \text{ETDX}(K, \text{NPFA}) \\ \text{ETDY}(K, \text{NPFA}) \\ \text{ETDZ}(K, \text{NPFA}) \end{bmatrix} = \begin{bmatrix} T_R^{\text{PCK}} \end{bmatrix} \begin{bmatrix} \text{ETDN}(K) \\ 0 \\ 0 \end{bmatrix}$$

- c. Store the redundant axis rate from RGM\_COMP as follows for each applicable IMU(K):

$$\text{ETDR}(K, \text{NPFA}) = \text{WRCF}(K)$$

11. If high-gain data have been collected for all specified cluster positions, proceed to step 12 for low-gain data collection; otherwise, return to step 2 for the next specified cluster position.

12. a. Set the accelerometer/CAPRI gain equal to low gain for each applicable IMU(K).

- b. Perform ground sequence 8 (refer to Section 4.1.4) for TD2 seconds for thermal delay after the accelerometer gain change to low gain with the following inputs:

$$\text{ERN}(K) = \text{ERW}(K) = \text{ERU}(K) = 0,$$

$$\begin{bmatrix} T_R^{\text{PCK}} \end{bmatrix} \text{ for each applicable IMU}(K).$$

- c. Return to step 2 to start collecting low-gain data for all specified cluster positions except for position 7. No low-gain data are required for position 7.

13. a. Perform ground sequence 3 for TCAL8 seconds to estimate the vertical component of acceleration for each applicable IMU(K) with the following inputs:

$$\text{ERW}(K) = \text{ERU}(K) = \text{ERN}(K) = 0,$$

$$\begin{bmatrix} T_R^{\text{PCK}} \end{bmatrix} \text{ for each applicable IMU}(K).$$

- b. Store the vertical component of acceleration from the LSF\_FILR for each applicable IMU(K) as follows:

$$\text{AL}(K, \text{NPFA}) = \text{THETA}_K(3)$$

where NPFA is the present position number.

14. If low-gain data have been collected for all specified cluster positions except for position 7, proceed to step 15; otherwise, return to step 2.

15. Compute the error terms associated with each of the PFLT\_CALA parameters for each IMU(K) in accordance with the equations specified in Figure 4.5.4.4.1-1.

16. After all error terms have been computed, perform the calibration update computations for each requested IMU in accordance with the equations in Figure 4.5.4.4.1-2. After the update has been completed, Preflight Calibration A should proceed automatically to the TERM/IDLE submode.

Preflight Calibration A stored data terms and parameter error terms utilized in the equations in Figure 4.5.4.4.1–1 (all variables except G and G<sub>o</sub>) need to be saved while in operational sequence 9 in order that they can be dumped (not downlisted) by the user to the ACE station for later observation.

In addition to the foregoing requirements, whenever the Preflight Cal A submode is in progress, a PREFLIGHT CAL A IN PROGRESS flag shall be set equal to 1 and made available to DISPLAYS.

A suggested design flow for PFLT\_CALA is shown in Figure 4.5.4.4.1–3. Refer to Special Considerations (Item D) for additional discussion regarding the operational use of Preflight Calibration A and the associated user interface requirements.

D. Special Considerations. This section identifies user interface requirements associated with Preflight Calibration A, and also discusses the recommended utilization of Preflight Calibration A.

1. Preflight Calibration A User Interface. The following CRT format is required to control and monitor the Preflight Calibration A mechanization defined in previous paragraphs.

PREFLT\_CAL 23X TERM/IDLE 27X

Item 23X is used for request of Preflight Calibration A. The X position displays an asterisk when Preflight Calibration A is active.

Item 27X may be used to terminate Preflight Calibration A prior to normal completion. The X position displays an asterisk when the program is in the TERM/IDLE submode.

Note that the specific correct item numbers are defined in the D&C FSSR.

2. Preflight Calibration A Operations. The following guidelines are recommended for effective utilization of Preflight Calibration A capabilities:
  - a. Preflight Calibration A should normally consist of a calibration of all three IMU's. However, under special circumstances (particularly a laboratory environment), a calibration of one or two IMU's can be performed.
  - b. A repeat calibration should normally be performed if particular error terms are determined to be unreasonable or if calibration parameter stability tests are desired.
  - c. It is mandatory that a three IMU calibration be performed in support of all flight operations.
  - d. The time required for this submode is approximately 2 hours.
  - e. No power down or return to STANDBY should be allowed to occur between PFLT\_CALA and GC\_ALIGN.

Position No. (NPFA)	Repositioning Angles About Z, Y, X (ALPHA, GAMMA, DELTA)
1	( -90, -90, 0 )
2	( 0, 0, 0 )
3	( 90, 0, 90 )
4	( 180, 90, 0 )
5	( 180, 0, -90 )
6	( 90, 180, 0 )
7	( -90, 0, -90 )

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
TE	V96W7056C	TILT ESTIMATION TIME	K-LOAD	SCALAR	89.92	SEC	OD
TC	V96L7083C	TILT CORRECTION TIME	K-LOAD	SCALAR	30.08	SEC	OD
TD1	V96W7067C	HIGH-GAIN THERMAL DELAY	K-LOAD	SCALAR	120	SEC	OD
TD2	V96W7068C	LOW-GAIN THERMAL DELAY	K-LOAD	SCALAR	120	SEC	OD
DFX	V99R2560C V99R2561C V99R2562C	X-GYRO RESTRAINT; 1 PER IMU	HANG_CALA	SCALAR	+/-9.999	DEG/HR	OD
DFY	V99R2563C V99R2564C V99R2565C	Y-GYRO RESTRAINT; 1 PER IMU	HANG_CALA	SCALAR	+/-9.999	DEG/HR	OD
DFZ	V99R2566C V99R2567C V99R2568C	Z-GYRO RESTRAINT; 1 PER IMU	HANG_CALA	SCALAR	+/-9.999	DEG/HR	OD
DSX	V99U2576C V99U2577C V99U2578C	X-GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	HANG_CALA	SCALAR	+/-6	DEG/HR/G	OD
DSZ	V99U2579C V99U2580C V99U2581C	Z-GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	HANG_CALA	SCALAR	+/-6	DEG/HR/G	OD
DOZ	V99U2582C V99U2583C V99U2584C	Z-GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	HANG_CALA	SCALAR	+/-6	DEG/HR/G	OD
KIXH	V99A2681C V99A2682C V99A2683C	HIGH-GAIN X-ACCELEROMETER SCALE FACTOR; 1 PER IMU	HANG_CALA	SCALAR	+/- 300,000	UG/G	OD
KIYH	V99A2684C V99A2685C V99A2686C	HIGH-GAIN Y-ACCELEROMETER SCALE FACTOR; 1 PER IMU	HANG_CALA	SCALAR	+/- 300,000	UG/G	OD
KIZH	V99A2687C V99A2688C V99A2789C	HIGH-GAIN Z-ACCELEROMETER SCALE FACTOR; 1 PER IMU	HANG_CALA	SCALAR	+/- 300,000	UG/G	OD
KIX	V99A2520C V99A2521C V99A2522C	LOW-GAIN X-ACCELEROMETER SCALE FACTOR; 1 PER IMU	HANG_CALA	SCALAR	+/- 300,000	UG/G	OD

Table 4.5.4.4.1-2. PFLT\_CALA Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
KIY	V99A2523C V99A2524C V99A2525C	LOW-GAIN Y-ACCELEROMETER SCALE FACTOR; 1 PER IMU	HANG_CALA	SCALAR	+/- 300,000	UG/G	OD
KIZ	V99A2526C V99A2527C V99A2528C	LOW-GAIN Z-ACCELEROMETER SCALE FACTOR; 1 PER IMU	HANG_CALA	SCALAR	+/- 300,000	UG/G	OD
KOX	V99G2530C V99G2531C V99G2532C	LOW-GAIN X-ACCELEROMETER BIAS; 1 PER IMU	HANG_CALA	SCALAR	+/-10**5	UG	OD
KOY	V99G2533C V99G2534C V99G2535C	LOW-GAIN Y-ACCELEROMETER BIAS; 1 PER IMU	HANG_CALA	SCALAR	+/-10**5	UG	OD
KOZ	V99G2536C V99G2537C V99G2538C	LOW-GAIN Z-ACCELEROMETER BIAS; 1 PER IMU	HANG_CALA	SCALAR	+/-10**5	UG	OD
KOXH	V99G2670C V99G2671C V99G2672C	HIGH-GAIN X-ACCELEROMETER BIAS; 1 PER IMU	HANG_CALA	SCALAR	+/-10**5	UG	OD
KOYH	V99G2673C V99G2674C V99G2675C	HIGH-GAIN Y-ACCELEROMETER BIAS; 1 PER IMU	HANG_CALA	SCALAR	+/-10**5	UG	OD
KOZH	V99G2676C V99G2677C V99G2678C	HIGH-GAIN Z-ACCELEROMETER BIAS; 1 PER IMU	HANG_CALA	SCALAR	+/-10**5	UG	OD
T <sub>NWU</sub> NB	V99U2790C THRU V99U2816C	TRANSFORMATION: NAVIGATION BASE TO NWU; 1 PER IMU	IMU_ATT	MATRIX	+/-1	NA	OD
LATCOMP	V95X0085X V95X1085X V95X2085X	LARGE ANGLE TORQUING COMPLETE FLAG; 1 PER IMU	LAT_FUNC	LOGICAL	0, 1	NA	OD
THETA	V99U3220C THRU V99U3228C	ESTIMATED ACCELERATION VECTOR (NWU ORDER); 1 PER IMU	LSF_FILR	VECTOR	+/-70	FT/SEC **2	OD
ETD	V99U2845C THRU V99U2853C	LSF ESTIMATED DRIFT VECTOR (NWU ORDER); 1 PER IMU	LSF_FILR	VECTOR	+/-100	DEG/HR	OD
G_SITE_N (N = 1-9)	V96A7002C	LOCAL GRAVITY VALUE	I-LOAD	SCALAR	32.08 - 32.21	FT/SEC **2	OD
GO	V90A7622C	STANDARD ACCELERATION DUE TO GRAVITY	CONSTANT	SCALAR	32.174048	FT/SEC /SEC/G	OD
RAD	V96U7006C	CONVERSION FACTOR TO CONVERT RADIANS TO ARC- SECONDS	CONSTANT	SCALAR	206264.8	ARC-SEC /RAD	OD
TCAL1	V96W7057C	CALIBRATION TIME CONSTANT 1	K-LOAD	SCALAR	29.76	SEC	OD
TCAL2	V96W7058C	CALIBRATION TIME CONSTANT 2	K-LOAD	SCALAR	29.76	SEC	OD
TCAL6	V96W7062C	CALIBRATION TIME CONSTANT 6	K-LOAD	SCALAR	120	SEC	OD
TCAL7	V96W7063C	CALIBRATION TIME CONSTANT 7	K-LOAD	SCALAR	360	SEC	OD
TCAL8	V96W7064C	CALIBRATION TIME CONSTANT 8	K-LOAD	SCALAR	179.84	SEC	OD



Table 4.5.4.4.1-2. PFLT\_CALA Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
DIR	V99U5955C V99U5956C V99U5957C	REDUNDANT GYRO INPUT AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL HANG_CALA	SCALAR	±6	DEG/ HR/G	OD
DOR	V99U5958C V99U5959C V99U5960C	REDUNDANT GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL HANG_CALA	SCALAR	±6	DEG/ HR/G	OD
DSR	V99U5961C V99U5962C V99U5963C	REDUNDANT GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	COMPOOL HANG_CALA	SCALAR	±6	DEG/ HR/G	OD
DFR	V99U5952C V99U5953C V99U5954C	REDUNDANT GYRO RESTRAINT; 1 PER IMU	COMPOOL HANG_CALA	SCALAR	±10	DEG/HR	OD
KXR	V99U5964C V99U5965C V99U5966C	REDUNDANT GYRO X SCALE FACTOR; 1 PER IMU	COMPOOL HANG_CALA	SCALAR	±1	DEG/HR/ DEG/HR	OD
KYR	V99U5967C V99U5968C V99U5969C	REDUNDANT GYRO Y SCALE FACTOR; 1 PER IMU	COMPOOL HANG_CALA	SCALAR	±1	DEG/HR/ DEG/HR	OD
KZR	V99U5970C V99U5971C V99U5972C	REDUNDANT GYRO Z SCALE FACTOR; 1 PER IMU	COMPOOL HANG_CALA	SCALAR	±1	DEG/HR/ DEG/HR	OD
WRCF(1)	V95R0660C	IMU-1 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	RGM_COMP	SCALAR	±120	DEG/HR	OD
WRCF(2)	V95R0661C	IMU-2 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	RGM_COMP	SCALAR	±120	DEG/HR	OD
WRCF(3)	V95R0662C	IMU-3 COMPENSATED AND FILTERED REDUNDANT AXIS RATE	RGM_COMP	SCALAR	±120	DEG/HR	OD
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	IMU_BITE DISPLAY	LOGICAL	0,1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	IMU_BITE DISPLAY	LOGICAL	0,1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	IMU_BITE DISPLAY	LOGICAL	0,1	NA	OD
DDFR	V99U5870C V99U5871C V99U5872C	RGM DELTA RESTRAINT; 1 PER IMU	COMPOOL	SCALAR	±10	DEG/HR	OD

Table 4.5.4.4.1-3. PFLT\_CALA Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
PFLT_CAL	V99X2715X	PREFLIGHT CAL IN PROGRESS	DISPLAY TLM	LOGICAL	0,1	NA	OD
KOX	V99G2530C V99G2531C V99G2532C	LOW-GAIN X-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-10**5	UG	OD
KOY	V99G2533C V99G2534C V99G2535C	LOW-GAIN Y-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-10**5	UG	OD
KOZ	V99G2536C V99G2537C V99G2538C	LOW-GAIN Z-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-10**5	UG	OD
KOXH	V99G2670C V99G2671C V99G2672C	HIGH-GAIN X-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-10**5	UG	OD
KOYH	V99G2673C V99G2674C V99G2675C	HIGH-GAIN Y-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-10**5	UG	OD
KOZH	V99G2676C V99G2677C V99G2678C	HIGH-GAIN Z-ACCELEROMETER BIAS; 1 PER IMU	ACP_COMP TLM	SCALAR	+/-10**5	UG	OD
KIX	V99A2520C V99A2521C V99A2522C	LOW-GAIN X-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/- 300,000	UG/G	OD
KIY	V99A2523C V99A2524C V99A2525C	LOW-GAIN Y-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/- 300,000	UG/G	OD
KIZ	V99A2526C V99A2527C V99A2528C	LOW-GAIN Z-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/- 300,000	UG/G	OD
KIXH	V99A2681C V99A2682C V99A2683C	HIGH-GAIN X-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/- 300,000	UG/G	OD
KIYH	V99A2684C V99A2685C V99A2686C	HIGH-GAIN Y-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/- 300,000	UG/G	OD
KIZH	V99A2687C V99A2688C V99A2689C	HIGH-GAIN Z-ACCELEROMETER SCALE FACTOR; 1 PER IMU	ACP_COMP TLM	SCALAR	+/- 300,000	UG/G	OD
DFX	V99R2560C V99R2561C V99R2562C	X-GYRO RESTRAINT; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-10	DEG/HR	OD
DFY	V99R2563C V99R2564C V99R2565C	Y-GYRO RESTRAINT; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-10	DEG/HR	OD
DFZ	V99R2566C V99R2567C V99R2568C	Z-GYRO RESTRAINT; 1 PER IMU	GYO_COMP TLM	SCALAR	+/-10	DEG/HR	OD
NPFA	V99U2721C	HANG/PFLT CAL A PRES POSITION NO.	TLM	INTEGER	1-14	ND	OD
ACCEL_SF(1)	V71K2541B	IMU-1 CAPRI SF WD2 BO CMD	IMU-1 TLM	LOGICAL	0,1	NA	OD
ACCEL_SF(2)	V71K3541B	IMU-2 CAPRI SF WD2 BO CMD	IMU-2 TLM	LOGICAL	0,1	NA	OD
ACCEL_SF(3)	V71K4541B	IMU-3 CAPRI SF WD2 BO CMD	IMU-3 TLM	LOGICAL	0,1	NA	OD

Table 4.5.4.4.1-3. PFLT\_CALA Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
$T_R^{PC}$		TRANSFORMATION: REFERENCE NWU TO PRESENT CLUSTER; 1 PER IMU	T_UPDATE ACP_TRSF TOR_TRSF	MATRIX	+/-1	NA	OD
$T_{NB}^{DC}$	V99U3350C THRU V99U3376C	TRANSFORMATION: NAVIGATION BASE TO DESIREDCLUSTER; 1 PER IMU	LAT_FUNC	MATRIX	+/-1	NA	OD
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
KIXE	V99U3159C V99U3160C V99U3161C	LOW-GAIN X-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	UG/G	OD
KIYE	V99U3171C V99U3172C V99U3173C	LOW-GAIN Y-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	UG/G	OD
KIZE	V99U3174C V99U3175C V99U3176C	LOW-GAIN Z-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	UG/G	OD
KIXHE	V99U3150C V99U3151C V99U3152C	HIGH-GAIN X-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	UG/G	OD
KIYHE	V99U3153C V99U3154C V99U3155C	HIGH-GAIN Y-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	UG/G	OD
KIZHE	V99U3156C V99U3157C V99U3158C	HIGH-GAIN Z-ACCELEROMETER SCALE FACTOR ERROR; 1 PER IMU	TLM	SCALAR	+/- 300,000	UG/G	OD
KOXE	V99U3134C V99U3135C V99U3136C	LOW-GAIN X-ACCELEROMETER BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	UG	OD
KOYE	V99U3137C V99U3138C V99U3139C	LOW-GAIN Y-ACCELEROMETER BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	UG	OD
KOZE	V99U3140C V99U3141C V99U3142C	LOW-GAIN Z-ACCELEROMETER BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	UG	OD
KOXHE	V99U3125C V99U3126C V99U3127C	HIGH-GAIN X-ACCELEROMETER BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	UG	OD
KOYHE	V99U3128C V99U3129C V99U3130C	HIGH-GAIN Y-ACCELEROMETER BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	UG	OD
KOZHE	V99U3131C V99U3132C V99U3133C	HIGH-GAIN Z-ACCELEROMETER BIAS ERROR; 1 PER IMU	TLM	SCALAR	+/-10**5	UG	OD
DFXE	V99U3020C V99U3021C V99U3022C	X-GYRO RESTRAINT ERROR; 1 PER IMU	TLM	SCALAR	+/-10	DEG/HR	OD
DFYE	V99U3023C V99U3024C V99U3025C	Y-GYRO RESTRAINT ERROR; 1 PER IMU	TLM	SCALAR	+/-10	DEG/HR	OD

Table 4.5.4.4.1-3. PFLT\_CALA Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
DFZE	V99U3026C V99U3027C V99U3028C	Z-GYRO RESTRAINT ERROR; 1 PER IMU	TLM	SCALAR	+/-10	DEG/HR	OD
DSXE	V99U3075C V99U3076C V99U3077C	X-GYRO SPIN AXIS MASS UNBALANCE ERROR; 1 PER IMU	TLM	SCALAR	+/-6	DEG/HR/ G	OD
DSZE	V99U3083C V99U3084C V99U3085C	Z-GYRO SPIN AXIS MASS UNBALANCE ERROR; 1 PER IMU	TLM	SCALAR	+/-6	DEG/HR/ G	OD
DOZE	V99U3070C V99U3071C V99U3072C	Z-GYRO OUTPUT AXIS MASS UNBALANCE ERROR; 1 PER IMU	TLM	SCALAR	+/-6	DEG/HR/ G	OD
DSX	V99U2576C V99U2577C V99U2578C	X-GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	GYO_COMP	SCALAR	+/-6	DEG/HR/ G	OD
DSZ	V99U2579C V99U2580C V99U2581C	Z-GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	GYO_COMP	SCALAR	+/-6	DEG/HR/ G	OD
DOZ	V99U2582C V99U2583C V99U2584C	Z-GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	GYO_COMP	SCALAR	+/-6	DEG/HR/ G	OD
DIR	V99U5955C V99U5956C V99U5957C	REDUNDANT GYRO INPUT AXIS MASS UNBALANCE; 1 PER IMU	RGM_COMP	SCALAR	±6	DEG/HR/ G	OD
DOR	V99U5958C V99U5959C V99U5960C	REDUNDANT GYRO OUTPUT AXIS MASS UNBALANCE; 1 PER IMU	RGM_COMP	SCALAR	±6	DEG/HR/ G	OD
DSR	V99U5961C V99U5962C V99U5963C	REDUNDANT GYRO SPIN AXIS MASS UNBALANCE; 1 PER IMU	RGM_COMP	SCALAR	±6	DEG/HR/ G	OD
DFR	V99U5952C V99U5953C V99U5954C	REDUNDANT GYRO RESTRAINT; 1 PER IMU	RGM_COMP	SCALAR	±10	DEG/HR	OD
DDFR	V99U5870C V99U5871C V99U5872C	RGM DELTA RESTRAINT; 1 PER IMU	RGM_COMP HANG_CALA TLM	SCALAR	±10	DEG/HR	OD
KXR	V99U5964C V99U5965C V99U5966C	REDUNDANT GYRO X SCALE FACTOR; 1 PER IMU	RGM_COMP	SCALAR	±1	DEG/HR/ DEG/HR	OD
KYR	V99U5967C V99U5968C V99U5969C	REDUNDANT GYRO Y SCALE FACTOR; 1 PER IMU	RGM_COMP	SCALAR	±1	DEG/HR/ DEG/HR	OD
KZR	V99U5970C V99U5971C V99U5972C	REDUNDANT GYRO Z SCALE FACTOR; 1 PER IMU	RGM_COMP	SCALAR	±1	DEG/HR/ DEG/HR	OD
DIRE	V99U3603C V99U3604C V99U3605C	REDUNDANT GYRO INPUT AXIS MASS UNB ERROR; 1 PER IMU	COMPOOL	SCALAR	±6	DEG/HR/ G	OD
DORE	V99U3606C V99U3607C V99U3608C	REDUNDANT GYRO OUTPUT AXIS MASS UNB ERROR; 1 PER IMU	COMPOOL	SCALAR	±6	DEG/HR/ G	OD
DSRE	V99U3609C V99U3610C V99U3611C	REDUNDANT GYRO SPIN AXIS MASS UNB ERROR; 1 PER IMU	COMPOOL	SCALAR	±6	DEG/HR/ G	OD
DFRE	V99U3600C V99U3601C V99U3602C	REDUNDANT GYRO RESTRAINT ERROR; 1 PER IMU	COMPOOL	SCALAR	±10	DEG/HR	OD

Table 4.5.4.4.1-3. PFLT\_CALA Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
KXRE	V99U3612C V99U3613C V99U3614C	REDUNDANT GYRO X SCALE FACTOR ERROR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD
KYRE	V99U3615C V99U3616C V99U3617C	REDUNDANT GYRO Y SCALE FACTOR ERROR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD
KZRE	V99U3618C V99U3619C V99U3620C	REDUNDANT GYRO Z SCALE FACTOR ERROR; 1 PER IMU	COMPOOL	SCALAR	±1	DEG/HR/ DEG/HR	OD
DDFRE	V99U3621C V99U3622C V99U3623C	RGM DELTA RESTRAINT ERROR; 1 PER IMU	COMPOOL TLM	SCALAR	±10	DEG/HR	OD

Error Parameters and Equations	Units
$KIXE(K) = - \left( \frac{AL(K,1) + AL(K,4)}{2 (G) (10^{-6})} \right)$	$\mu g/g$
$KIXHE(K) = - \left( \frac{AH(K,1) + AH(K,4)}{2 (G) (10^{-6})} \right)$	$\mu g/g$
$KIYE(K) = - \left( \frac{AL(K,3) + AL(K,5)}{2 (G) (10^{-6})} \right)$	$\mu g/g$
$KIYHE(K) = - \left( \frac{AH(K,3) + AH(K,5)}{2 (G) (10^{-6})} \right)$	$\mu g/g$
$KIZE(K) = - \left( \frac{AL(K,2) + AL(K,6)}{2 (G) (10^{-6})} \right)$	$\mu g/g$
$KIZHE(K) = - \left( \frac{AH(K,2) + AH(K,6)}{2 (G) (10^{-6})} \right)$	$\mu g/g$
$KOXE(K) = \left( \frac{AL(K,1) + AL(K,4)}{2 (G_0) (10^{-6})} \right)$	$\mu g$
$KOXHE(K) = \left( \frac{AH(K,1) + AH(K,4)}{2 (G_0) (10^{-6})} \right)$	$\mu g$
$KOYE(K) = \left( \frac{AL(K,3) + AL(K,5)}{2 (G_0) (10^{-6})} \right)$	$\mu g$

FIGURE 4.5.4.4.1-1.(1) PFLT\_CALA Calibration Error Parameter Computations (Sheet 1 of 3)

Error Parameters and Equations	Units
$KOYHE(K) = \frac{AH(K,3) - AH(K,5)}{2 (G_0) (10^{-6})}$	μg
$KOZE(K) = \frac{AL(K,2) - AL(K,6)}{2 (G_0) (10^{-6})}$	μg
$KOZHE(K) = \frac{AH(K,2) - AH(K,6)}{2 (G_0) (10^{-6})}$	μg
$DFXE(K) = ETDX(K,2) - \frac{KOXHE(K)(WU)}{10^6} \left( \frac{G_0}{G} \right)$	deg/hr
$DSXE(K) = \left( -ETDX(K,5) + DFXE(K) + \frac{KOXHE(K)(WU)}{10^6} \left( \frac{G_0}{G} \right) \right) \left( \frac{G_0}{G} \right)$	deg/hr/g
$DFYE(K) = ETDY(K,6) - \frac{KOYHE(K)(WU)}{10^6} \left( \frac{G_0}{G} \right)$	deg/hr
$DFZE(K) = \left( \frac{ETDZ(K,3) + ETDZ(K,7)}{2} \right) - \frac{KOZHE(K)(WU)}{10^6} \left( \frac{G_0}{G} \right)$	deg/hr
$DSZE(K) = - \left( \frac{ETDZ(K,3) + ETDZ(K,7)}{2} \right) \left( \frac{G_0}{G} \right)$	deg/hr/g
$DOZE(K) = \left( ETDZ(K,4) - DFZE(K) - \frac{KOZHE(K)(WU)}{10^6} \left( \frac{G_0}{G} \right) \right) \left( \frac{G_0}{G} \right)$	deg/hr/g

FIGURE 4.5.4.4.1-1.(2) PFLT\_CALA Calibration Error Parameter Computations (Sheet 2 of 3)

Error Parameters and Equations	Units
$KXRE(K) = (ETDR(K,1) + ETDR(K,2) - 2 (ETDR(K,3)) + ETDR(K,4) - 5 (ETDR(K,5)) + ETDR(K,6) + 3 (ETDR(K,7))) / 6 (WN)$	deg/hr/ deg/hr
$KYRE(K) = (ETDR(K,1) - ETDR(K,2) + ETDR(K,4) - ETDR(K,5) - ETDR(K,6) + EDTR(K,7))/(2 WN)$	deg/hr/ deg/hr
$KZRE(K) = ( ETDR(K,1) - ETDR(K,2) + 2 (ETDR(K,3)) - ETDR(K,4) - ETDR(K,5) - ETDR(K,6) + 3 (ETDR(K,7))) / (6 WN)$	deg/hr/ deg/hr
$DFRE(K) = (ETDR(K,1) + ETDR(K,2) + ETDR(K,3) + ETDR(K,4) + ETDR(K,5) + ETDR(K,6) ) / 6.0 - (KXR(K) + KXRE(K)) (DFXE(K)) - (KYR(K) + KYRE(K)) (DFYE(K))$	deg/hr/ deg/hr
$DIRE(K) = \frac{ETDR(K,1) - ETDR(K,4) - (KYRE(K) + KZRE(K)) (WN)}{2.0}$ $- (KXRE(K)) (WU) - (KXR(K) + KXRE(K)) (DIXE (K)) + (KYR(K) + KYRE(K)) (DSXE(K))$	deg/hr/g
$DORE(K) = \frac{ETDR(K,3) - ETDR(K,7)}{2.0} - (KYRE(K)) (WU)$ $- (KXR(K) + (KXRE(K)) (DSXE (K)) - (KYR(K) + KYRE(K)) (DIXE(K))$	deg/hr/g
$DSRE(K) = \frac{ETDR(K,2) - ETDR(K,6) - (KXRE(K) + KYRE(K)) (WN)}{2.0}$ $- (KZRE(K)) (WU)$	deg/hr/g
$DDFRE(K) = \frac{C(DOR(K) + DORE(K)) - (DIR(K) + DIRE(K))}{C - 1}$	deg/hr
<p>where:</p>	
$C = \frac{KXR(K) + KXRE(K)}{KYR(K) + KYRE(K)}$	

FIGURE 4.5.4.4.1-1.(3) PFLT\_CALA Calibration Error Parameter Computations (Sheet 3 of 3)



Calibration Parameters and Equations	Units
$KOX(K) = KOX(K) + KOXE(K)$	$\mu g$
$KOY(K) = KOY(K) + KOYE(K)$	$\mu g$
$KOZ(K) = KOZ(K) + KOZE(K)$	$\mu g$
$KOXH(K) = KOXH(K) + KOXHE(K)$	$\mu g$
$KOYH(K) = KOYH(K) + KOYHE(K)$	$\mu g$
$KOZH(K) = KOZH(K) + KOZHE(K)$	$\mu g$
$KIX(K) = \frac{KIX(K) + KIXE(K)}{1 - KIXE(K) 10^{-6}}$	$\mu g/g$
$KIY(K) = \frac{KIY(K) + KIYE(K)}{1 - KIYE(K) 10^{-6}}$	$\mu g/g$
$KIZ(K) = \frac{KIZ(K) + KIZE(K)}{1 - KIZE(K) 10^{-6}}$	$\mu g/g$
$KIXH(K) = \frac{KIXH(K) + KIXHE(K)}{1 - KIXHE(K) 10^{-6}}$	$\mu g/g$
$KIYH(K) = \frac{KIYH(K) + KIYHE(K)}{1 - KIYHE(K) 10^{-6}}$	$\mu g/g$
$KIZH(K) = \frac{KIZH(K) + KIZHE(K)}{1 - KIZHE(K) 10^{-6}}$	$\mu g/g$
$DFX(K) = DFX(K) + DFXE(K)$	deg/hr
$DFY(K) = DFY(K) + DFYE(K)$	deg/hr
$DFZ(K) = DFZ(K) + DFZE(K)$	deg/hr
$DSX(K) = DSX(K) + DSXE(K)$	deg/hr/g

FIGURE 4.5.4.4.1-2.(1) PFLT\_CALA Calibration Parameter Update Computations  
(Sheet 1 of 2)

Calibration Parameters and Equations	Units
$DSZ(K) = DSZ(K) + DSZE(K)$	deg/hr/g
$DOZ(K) = DOZ(K) + DOZE(K)$	deg/hr/g
$KXR(K) = KXR(K) + KXRE(K)$	deg/hr/deg/hr
$KYR(K) = KYR(K) + KYRE(K)$	deg/hr/deg/hr
$KZR(K) = KZR(K) + KZRE(K)$	deg/hr/deg/hr
$DFR(K) = DFR(K) + DFRE(K)$	deg/hr
$DIR(K) = DIR(K) + DIRE(K) - DDFRE(K)$	deg/hr/g
$DOR(K) = DOR(K) + DORE(K) - DDFRE(K)$	deg/hr/g
$DSR(K) = DSR(K) + DSRE(K) - DDFRE(K)$	deg/hr/g
$DDFR(K) = DDFR(K) + DDFRE(K)$	deg/hr

FIGURE 4.5.4.4.1-2.(2) PFLT\_CALA Calibration Parameter Update Computations  
 (Sheet 2 of 2)

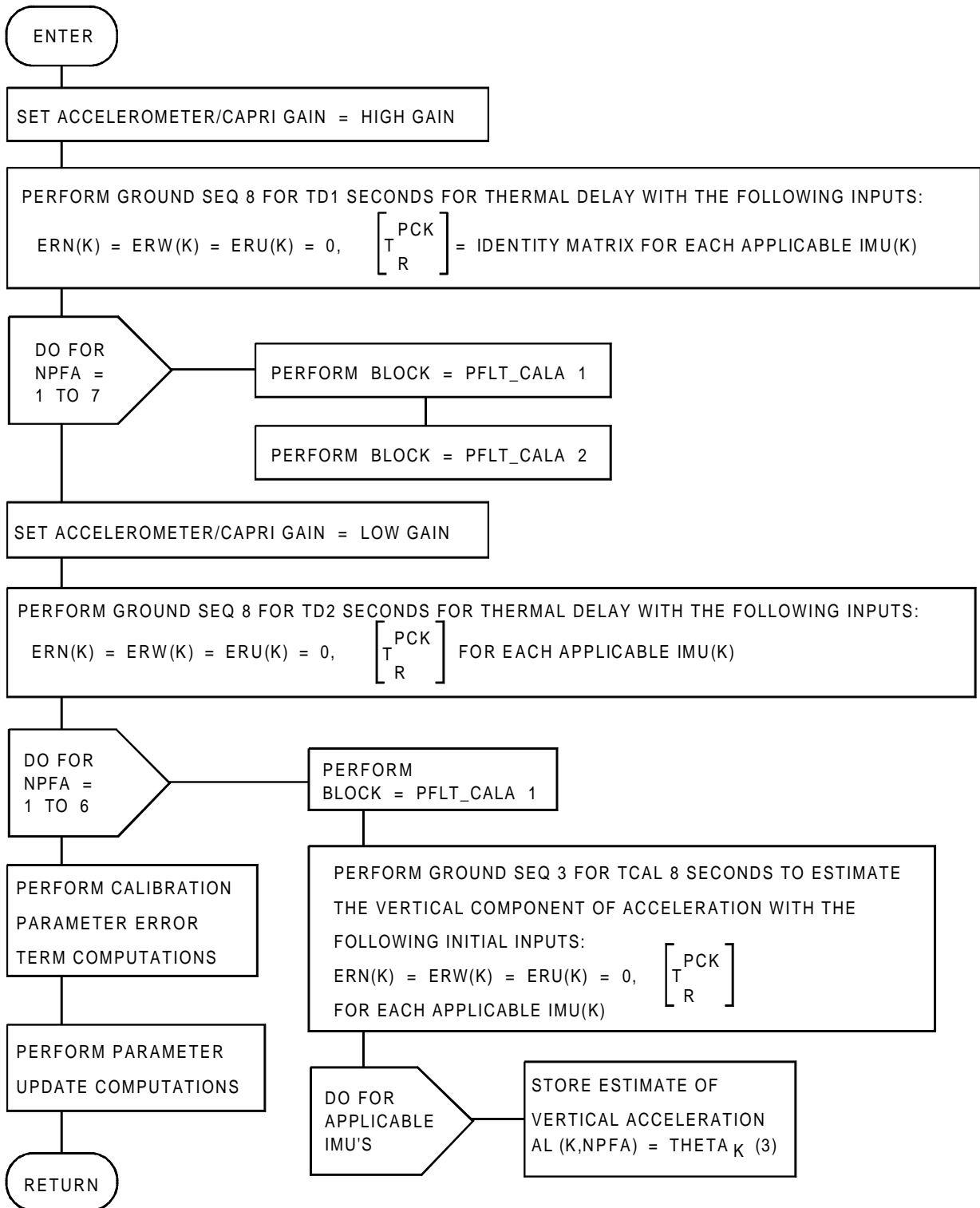


FIGURE 4.5.4.4.1-3.(1) PFLT\_CALA Flow Diagram (Sheet 1 of 4)

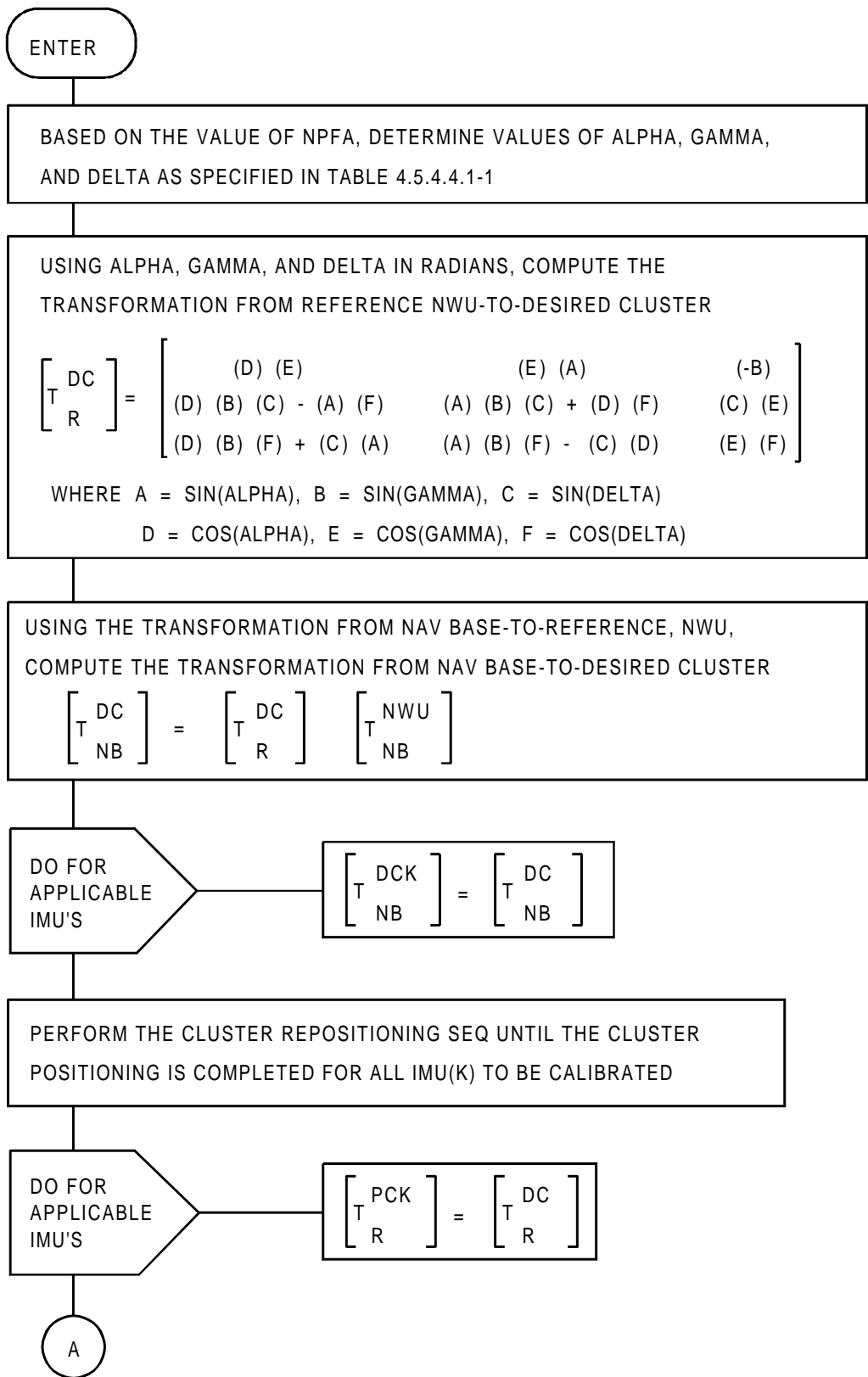


FIGURE 4.5.4.4.1-3.(2) PFLT\_CALA (Block: PFLT\_CALA 1) Flow Diagram (Sheet 2 of 4)

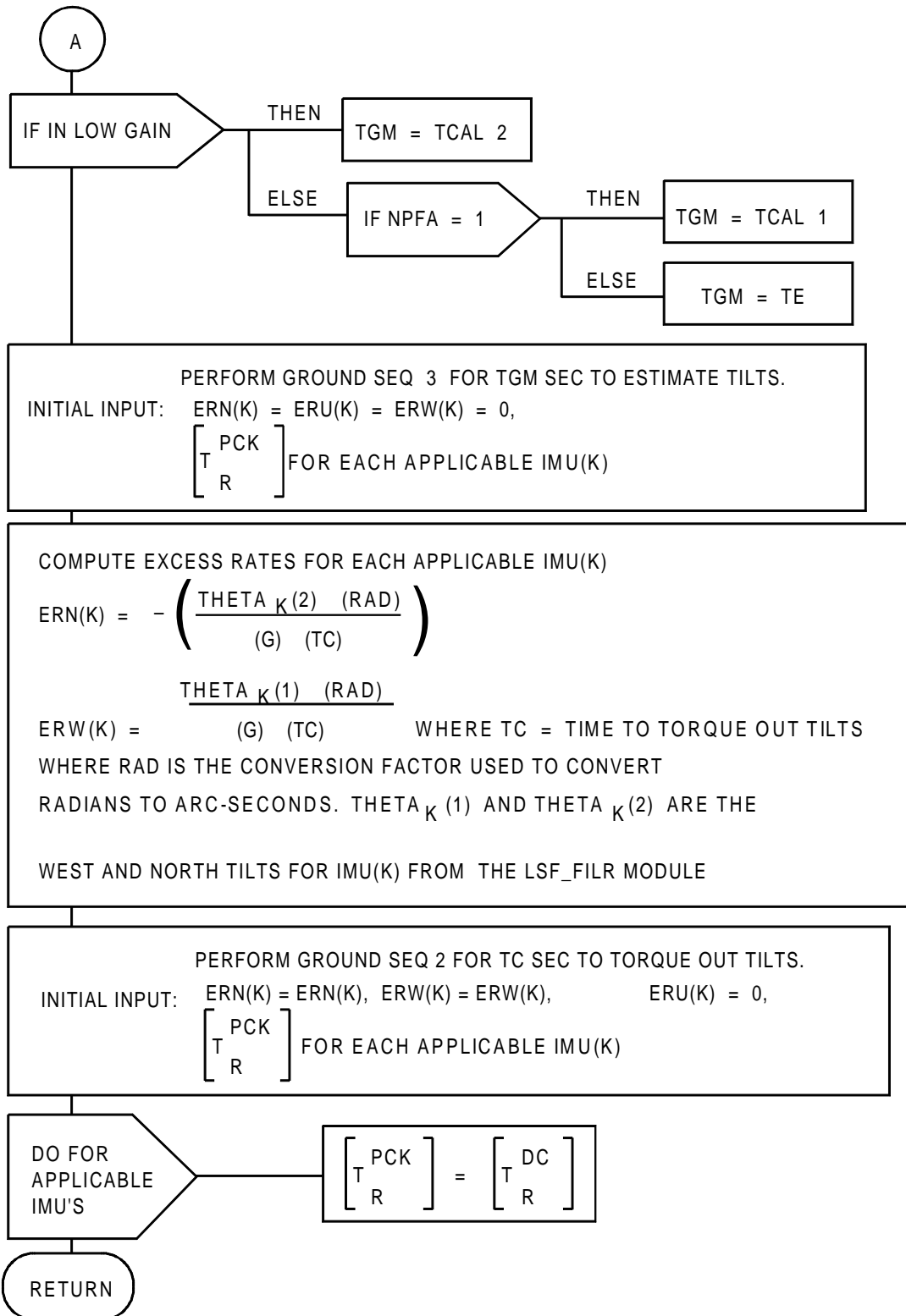


FIGURE 4.5.4.4.1-3.(3) PFLT\_CALA (Block: PFLT\_CALA 1) Flow Diagram (Sheet 3 of 4)

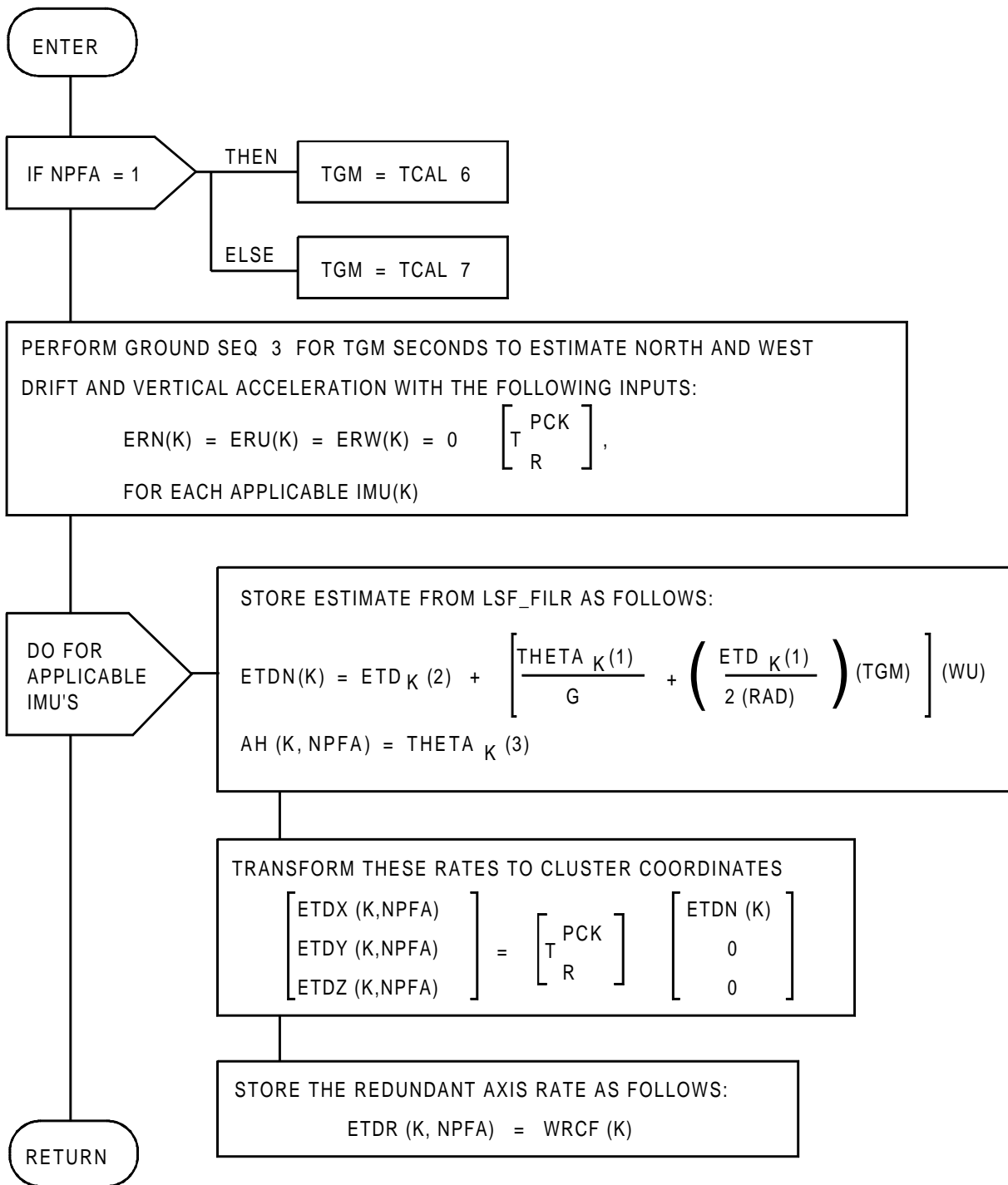


FIGURE 4.5.4.4.1-3.(4) PFLT\_CALA (Block: PFLT\_CALA 2) Flow Diagram (Sheet 4 of 4)

#### 4.5.4.5 IMU Preflight Alignment.

This section specifies the requirements for IMU preflight alignment. Preflight alignment is performed during IMU operations in the hangar, on the launch pad, or in the various development labs. Preflight alignment consists of two modules: a complete two position gyrocompass alignment (GC\_ALIGN) and a single position gyrocompass alignment (GC\_ALIGN1) for maintaining the alignment.

##### 4.5.4.5.1 Gyrocompass Alignment (GC\_ALIGN).

The GC\_ALIGN module provides an accurate definition of IMU cluster orientation with respect to the local NWU reference coordinate system for each IMU.

A. Functional Requirements. The GC\_ALIGN module performs the following functions for each applicable IMU:

1. Accurately determine the orientation of the cluster relative to the NWU reference.
2. Compare the attitudes of the IMU clusters to detect performance anomalies.

B. Interface Requirements. The input/output interfaces associated with the GC\_ALIGN module are listed in Tables 4.5.4.5.1-1 and 4.5.4.5.1-2.

C. Detailed Requirements. The following sequence of operations is required for each selected IMU in OPERATE mode when the ALIGN command is entered via the user interface:

1. Set the accelerometer loops to low gain.
2. Compute a matrix that defines the desired initial gyrocompassing orientation relative to NWU:

$$\begin{bmatrix} T_{NWU}^{GC} \end{bmatrix} = \begin{bmatrix} T_{NB}^{GCD} \end{bmatrix} \begin{bmatrix} T_{NB}^{NWU} \end{bmatrix}^T \begin{bmatrix} 0 & -1(SI) & 0 \\ 1(SI) & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

where the last matrix represents a 90-degree rotation about up.

3. Compute the navigation base-to-(desired) cluster transformation for use in cluster repositioning:

$$\begin{bmatrix} T_{NB}^{DC} \end{bmatrix} = \begin{bmatrix} T_{NWU}^{GC} \end{bmatrix} \begin{bmatrix} T_{NB}^{NWU} \end{bmatrix}$$

4. Perform the cluster repositioning sequence until the above defined cluster orientation is achieved for each applicable IMU.

5. Perform Ground Sequence 8 (refer to Section 4.1.4) for TS seconds for thermal stabilization. The initialization required is:

$$ER_i = 0$$

For  $i = N, W, U$

$$\left[ T_R^{PC} \right] = \left[ T_{NWU}^{GC} \right]$$

6. Perform Ground Sequence 3 for TE seconds to estimate tilts. The initialization required is:

$$ER_i = 0 \text{ for } i = N, W, U$$

$$\left[ T_R^{PC} \right] = \left[ T_{NWU}^{GC} \right] \text{ (from steps 2 or 11a)}$$

The required outputs are

THETA(1) – tilt of north axis about west

THETA(2) – tilt of west axis about north

7. Compute the torquing rates required to remove the tilts over the time allocated:

$$RN = - \left( \frac{(\text{THETA}(2)) (\text{RAD})}{(G) (\text{TC})} \right)$$

$$RW = \frac{(\text{THETA}(1)) (\text{RAD})}{(G) (\text{TC})}$$

where THETA(1) is the tilt of the north axis about west and the first component of the THETA from LSF\_FILR, etc.

8. Perform Ground Sequence 2 for TC seconds to correct tilts. The required initialization is:

$$ER_i = RN, RW, 0 \text{ for } i = N, W, U$$

$$\left[ T_R^{PC} \right] = \left[ T_{NWU}^{GC} \right]$$

9. Perform the first position data collection by performing Ground Sequence 3 for TGYRO seconds. The required initialization is:

$$ER_N = ER_W = ER_U = 0$$

$$\left[ T_R^{PC} \right] = \left[ T_{NWU}^{GC} \right]$$

The required outputs are  $\overline{ETD}(1)$ ,  $\overline{ETD}(2)$ , THETA(1), and THETA(3). These are the components of  $\overline{ETD}$  and THETA from LSF\_FILR.



10. Compute and store the tilt rate about north:

$$ETDN = (SI) \left[ ETD(2) + WU \left[ \frac{THETA(1)}{G} + \frac{1}{2} ETD(1) \frac{TGYRO}{RAD} \right] \right]$$

11. Determine the orientation required for the second gyrocompass position.

a. Compute the second gyrocompassing position relative to the reference NWU:

$$\left[ T_{NWU}^{GC} \right] = \left[ T_{NB}^{GCD} \right] \left[ T_{NB}^{NWU} \right]^T$$

b. Compute the navigation base-to-cluster (desired) transformation for use in cluster repositioning:

$$\left[ T_{NB}^{DC} \right] = \left[ T_{NWU}^{GC} \right] \left[ T_{NB}^{NWU} \right]$$

12. Repeat steps 4 through 8 above.

13. Perform the second position data collection by performing Ground Sequence 9 for TGYRO seconds. The initialization required is:

$$ERN = ERW = ERU = 0$$

$$\left[ T_R^{PC} \right] = \left[ T_{NWU}^{GC} \right]$$

Note that this is the same as step 9 except that the CL\_CLRATE module is ordinarily required and the required outputs are THETA(1), THETA(2), ETD(1), ETD(2), PHIIj, and PHIDIj.

Use of the CL\_CLRATE module varies according to the number of selected IMU's in OPERATE:

- If all three IMU's are selected and in OPERATE, then PHIIj and PHIDIj are required for the following combinations of clusters: ij = 1, 2; 1, 3; and 2, 3.
- If two selected IMU's are in OPERATE, the ij = 1, 2; 1, 3; or 2, 3 according to which is applicable.
- If only one selected IMU is in OPERATE, the CL\_CLRATE module is not required, and Ground Sequence 3 will provide the required outputs and no combinations of clusters are required.

The following sequence of computations involves both operations on each applicable combination of selected operating IMU's and each selected operating IMU individually. When combinations are involved, the possible ij combinations are as defined above. When no combinations are required because only one selected IMU is in operate, the operations involving combinations are not done nor is any failure flag set to indicate the voided reasonableness tests were not passed.

14. Form the relative attitude error (tilts) from resolver data:

$$MR_{ijN} = PHI_{ij}(1) + \frac{TGYRO}{2} (PHID_{ij}(1))$$

$$MR_{ijW} = PHI_{ij}(2) + \frac{TGYRO}{2} (PHID_{ij}(2))$$

where  $PHI_{ij}(1)$ ,  $PHI_{ij}(2)$  are the first and second components of  $\overline{PHI}_{ij}$  from  $CL\_CLRATE$ .  $PHID_{ij}$  terms are similar.

15. Form the relative attitude error from accelerometer data:

$$MA_{ijN} = (THETA_j(2) - THETA_i(2)) / G + \frac{TGYRO}{2(RAD)} (ETD_j(2) - ETD_i(2))$$

$$MA_{ijW} = (THETA_j(1) - THETA_i(1)) / G - \frac{TGYRO}{2(RAD)} (ETD_j(1) - ETD_i(1))$$

16. Compute tilt errors:

$$E_{ijN} = MR_{ijN} - MA_{ijN}$$

$$E_{ijW} = MR_{ijW} - MA_{ijW}$$

17. Compute the azimuth misalignment for each cluster:

a. 
$$\begin{bmatrix} T_{BODY}^{NWU} \end{bmatrix} = \begin{bmatrix} T_{NB}^{NWU} \end{bmatrix} \begin{bmatrix} T_{NB}^{BODY} \end{bmatrix}^T$$

- b. If  $SI = 1$ , compute the “north” heading sensitivity correction:

$$HSC = (a_{12}) (HSiY) - (a_{13}) (HSiZ)$$

where  $a_{12}$ ,  $a_{13}$  are the second and third elements of the first row of  $\begin{bmatrix} T_{BODY}^{NWU} \end{bmatrix}$

- c. If  $SI = -1$ , compute the “west” heading sensitivity correction:

$$HSC = -(a_{22}) (HSiY) + (a_{23}) (HSiZ)$$

- d.

$$EAZ_i = \left[ -ETD_i(1) - ETD_{Ni} + (WU) (THETA_i(2) / G) + 1/2 (WU) (ETD_i(2)) \frac{(TGYRO)}{RAD} - HSC \right] / WN$$

18. Compute the relative azimuth misalignment error:

$$E_{ijU} = PHI_{ij}(3) + \frac{(TGYRO)}{2} (PHID_{ij}(3)) - (EAZ_j - EAZ_i)$$

19. Convert errors to body coordinates:

$$\begin{bmatrix} E_{ij}X_b \\ E_{ij}Y_b \\ E_{ij}Z_b \end{bmatrix} = \left[ T_{BODY}^{NWU(i)} \right]^T \begin{bmatrix} E_{ij}N \\ E_{ij}W \\ E_{ij}U \end{bmatrix}$$

20. Perform reasonableness test as follows: for  $k = X_b, Y_b, Z_b$

If any  $|E_{ijk}| \text{ (RAD)} > \text{LIMIT}_k$

set FAIL\_GC flag and GC\_FAILED\_PAIR(ij) = 1

21. Update the reference to each cluster transformation for GC\_ALIGN1 module:

$$\left[ T_{NWU}^{ACi} \right] = \left[ T_R^{PC} \right] \begin{bmatrix} 1 - 1/2(TW^2 + TU^2) & TU + 1/2(TN)(TW) & -TW + 1/2(TN)(TU) \\ -TU + 1/2(TN)(TW) & 1 - 1/2(TN^2 + TU^2) & TN + 1/2(TW)(TU) \\ TW + 1/2(TN)(TU) & -TN + 1/2(TW)(TU) & 1 - 1/2(TN^2 + TW^2) \end{bmatrix}$$

where

$$\begin{aligned} TN &= \text{THETA}(2)/G + (\text{ETD}(2))(\text{TGYRO})/(\text{RAD}) \\ TW &= -\text{THETA}(1)/G - (\text{ETD}(1))(\text{TGYRO})/(\text{RAD}) \\ TU &= \text{EAZi} \end{aligned}$$

NOTE =The matrix in the right-hand side is identical to that of T\_UPDATE module in its form.

22. Compute and save north and west drift

$$\text{ETDN} = \text{ETD}(2) + (\text{WU}) [\text{THETA}(1)/G + 1/2(\text{TGYRO}) (\text{ETD}(1))/\text{RAD}]$$

$$\begin{aligned} \text{ETDW} &= -\text{ETD}(1) + (\text{WU}) [\text{THETA}(2)/G + 1/2(\text{TGYRO}) (\text{ETD}(2))/\text{RAD}] - \\ &(\text{WN}) (\text{EAZi}) \end{aligned}$$

23. Set the ALIGNCMP flag and the LSF flag, then terminate the module and advance to the GC\_ALIGN1 module.

The GC\_ALIGN submodule program will be executed upon request by the user. The normal termination will consist of entering the GC\_ALIGN1 module. This is the only allowable termination exclusive of a manually requested termination by the user. The transition to GC\_ALIGN1 shall be such that the control of the applicable IMU clusters by the ground sequence is continuous.

In addition to the foregoing requirements, whenever, the gyrocompass alignment submodule (GC\_ALIGN) is in progress, a GYROCOMPASS IN PROGRESS flag shall be set equal to one and made available to DISPLAYS.

A suggested design flow that satisfies the GC\_ALIGN requirements is shown in Figure 4.5.4.5.1-1.

D. Special Considerations. This section identifies user interface requirements associated with GC\_ALIGN (also GC\_ALIGN1 and the INERTIAL submode) and discusses the recommended use of gyrocompass alignment from an operational standpoint.

1. GC\_ALIGN (also GC\_ALIGN1 and INERTIAL) User Interface. The following CRT format is required to command and monitor IMU gyrocompass alignment and INERTIAL operation:

GYROCOMP	24X
CPLT/FAIL	
INERTIAL	25X
TERM/IDLE	27X

Item 24X is used to request the gyrocompass alignment submode for all selected IMU's that are currently in the OPERATE mode. The X position displays an asterisk whenever CG\_ALIGN is active.

Item 25X is used to request the INERTIAL submode for all selected IMU's that are in OPERATE mode and are currently in the GC\_ALIGN1 phase of alignment. Item 25X is executed after the initiation of the CPLT word. The X position will be used to display an asterisk when the INERTIAL submode is active.

Item 27X is used to terminate GC\_ALIGN, GC\_ALIGN1, or the INERTIAL submode (or any other submode). The X position displays an asterisk when TERM/IDLE has been selected.

Note that the specific correct item numbers are defined in the D&C FSSR.

2. Gyrocompass Alignment and INERTIAL Operation. The following guidelines are recommended for effective use of the IMU gyrocompass alignment and INERTIAL capabilities.
  - a. It is required that the IMU\_ATT submode be completed for each IMU after any physical movement of the vehicle, navigation base, or IMU's before gyrocompassing is attempted.
  - b. It is required that currently valid IMU calibration parameters be stored in memory prior to a gyrocompass alignment.
  - c. Gyrocompass alignment should normally be performed with all three IMU's in the OPERATE mode. If necessary, alignment can be performed with only one or two IMU's operating. However, the gyrocompass accuracy test, performed at the conclusion of gyrocompassing, is with IMU pairs (1:2; 1:3; 2:3 nominally) and if only one IMU is in the OPERATE mode this test will be bypassed.

- d. Preloaded data (IMU GC\_ALIGN I-LOAD) defines the desired gyrocompassing position relative to the navigation base and provides certain heading sensitivity compensation terms for each IMU. One of two possible sets of skewed orientations normally is loaded prior to performing Hangar Cal C. The purpose of selecting from two sets is to enable avoiding gimbal flip during boost as a function of the selected trajectory. The heading sensitivity terms are applicable to either set but different internal computations are required for each set. For this reason, the data load data includes the identification of the selected set.
- e. It is assumed that one of the two predefined orientation sets will be utilized and if the I-load data associated with one of these two orientations are loaded, the GC\_ALIGN module will select the proper heading sensitivity compensation. If any other orientations are desired, it is required to override the I-load data. To avoid alignment degradation, it is recommended that the stored heading sensitivity terms also be changed via the general memory read/write user interface capability. Also, it will be necessary to control the direction of rotation determined by step C.2 and the sign of the equations in steps C.10 and C.17, via the general memory read/write capability.

In any case, the credibility of the gyrocompass goodness test is compromised unless I-load data are derived by a Hangar Cal C submode that used the same predefined orientations.

- f. A gyrocompass alignment is requested by executing Item 24X on the applicable CRT page. A two-position gyrocompass will be performed for each selected IMU in the OPERATE mode.
- g. At the end of the two position gyrocompass, the program will issue the gyrocompass complete (ALIGNCMP) flag, terminate the module and proceed to the GC\_ALIGN1 module which will maintain the alignment. This will occur even though a GC\_FAILED PAIR i, j was annunciated in the telemetry data.
- h. If there has been a GC\_FAILED PAIR i, j the intent is that the relative errors will be analyzed and then if deemed necessary, the GC\_ALIGN1 will be terminated by the TERM/IDLE command and the GC\_ALIGN will be reinitiated. It is expected that the prelaunch time line will permit a GC\_ALIGN retest if necessary without impacting the scheduled launch time.
- i. Gyrocompass alignment or INERTIAL operation may be terminated at any time by executing TERM/IDLE.
- j. For flight operations, gyrocompass alignment will normally be accomplished with the orbiter in a predetermined location and orientation.
- k. It is recommended that a three IMU alignment always be performed in support of all flight operations.

Table 4.5.4.5.1-1. GC\_ALIGN Input

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
TC	V96L7083C	TILT CORRECTION TIME	K-LOAD	SCALAR	30.08	SEC	OD
TE	V96W7056C	TILT ESTIMATION TIME	K-LOAD	SCALAR	89.92	SEC	OD
TS	V96W7085C	THERMAL STABILIZATION TIME	I-LOAD	SCALAR	0-1800	SEC	OD
LIMITXB	V96U7076C	RELATIVE MISALIGNMENT LIMIT, FOR X (BODY)	I-LOAD	SCALAR		ARC-SEC	OD
LIMITYB	V96U7077C	RELATIVE MISALIGNMENT LIMIT, FOR Y (BODY)	I-LOAD	SCALAR		ARC-SEC	OD
LIMITZB	V96U7078C	RELATIVE MISALIGNMENT LIMIT, FOR Z (BODY)	I-LOAD	SCALAR		ARC-SEC	OD
PHIJ	V99U3571C THRU V99U3579C	MISALIGNMENT VECTOR ESTIMATE BETWEEN CLUSTERS I AND J; 1 PER IMU PAIR	CL_CLRATE	VECTOR	+/-1	RAD	OD
PHIDIJ	V99U3581C THRU V99U3589C	RELATIVE RATE ERROR VECTOR BETWEEN CLUSTERS I AND J; 1 PER IMU PAIR	CL_CLRATE	VECTOR	+/-1	RAD/SEC	OD
SI	V96U7181C	GYROCOMPASS POS SEL INDEX	I-LOAD	INTEGER	+/-1	NA	OD
T <sub>NB</sub> <sup>BODY</sup>	V96U7096C THRU V96U7104C	TRANSFORMATION: NAVIGATION BASE TO BODY	I-LOAD	MATRIX	+/-1	NA	OD
T <sub>NB</sub> <sup>NWU</sup>	V99U2790C THRU V99U2816C	TRANSFORMATION: NAVIGATION BASE TO NWU; 1 PER IMU	IMU_ATT	MATRIX	+/-1	NA	OD
T <sub>R</sub> <sup>PC</sup>		TRANSFORMATION: REFERENCE (NWU) TO PRESENT CLUSTER; 1 PER IMU	T_UPDATE	MATRIX	-1 to 1	NA	3.125
T <sub>NB</sub> <sup>GCD(1)</sup>	V96U7092C V96U7093C V96U7094C V96U7086C V96U7087C V96U7088C V96U7089C V96U7090C V96U7091C	TRANSFORMATION: NAV BASE TO DESIRED GYROCOMPASS ORIENTATION IMU-1	I-LOAD	MATRIX	+/-1	NA	OD
T <sub>NB</sub> <sup>GCD(2)</sup>	V96U7159C V96U7161C V96U7163C V96U7165C V96U7167C V96U7169C V96U7171C V96U7173C V96U7175C	TRANSFORMATION: NAV BASE TO DESIRED GYROCOMPASS ORIENTATION IMU-2	I-LOAD	MATRIX	+/-1	NA	OD
T <sub>NB</sub> <sup>GCD(3)</sup>	V96U7160C V96U7162C V96U7164C V96U7166C V96U7168C V96U7170C V96U7172C V96U7174C V96U7176C	TRANSFORMATION: NAV BASE TO DESIRED GYROCOMPASS ORIENTATION IMU-3	I-LOAD	MATRIX	+/-1	NA	OD
TGYRO	V96U7081C	GYROCOMPASSING DATA COLLECTION PERIOD	K-LOAD	SCALAR	600	SEC	OD
HS1Z	V96U7069C	HEADING SENSITIVITY-Z BODY AXIS; IMU-1	I-LOAD	SCALAR	+/-0.05	DEG/HR	OD

Table 4.5.4.5.1-1. GC\_ALIGN Input

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
HS2Z	V96U7070C	HEADING SENSITIVITY-Z BODY AXIS; IMU-2	I-LOAD	SCALAR	+/-0.05	DEG/HR	OD
HS3Z	V96U7071C	HEADING SENSITIVITY-Z BODY AXIS; IMU-3	I-LOAD	SCALAR	+/-0.05	DEG/HR	OD
HS1Y	V96U7072C	HEADING SENSITIVITY-Y BODY AXIS; IMU-1	I-LOAD	SCALAR	+/-0.05	DEG/HR	OD
HS2Y	V96U7073C	HEADING SENSITIVITY-Y BODY AXIS; IMU-2	I-LOAD	SCALAR	+/-0.05	DEG/HR	OD
HS3Y	V96U7074C	HEADING SENSITIVITY-Y BODY AXIS; IMU-3	I-LOAD	SCALAR	+/-0.05	DEG/HR	OD
WN	V96R7026C	NORTH COMPONENT OF EARTH'S RATE	I-LOAD	SCALAR	0-15.2	DEG/HR	ONCE
WU	V96R7027C	UP COMPONENT OF EARTH'S RATE	I-LOAD	SCALAR	0-15.2	DEG/HR	ONCE
THETA	V99U3220C V99U3228C	ESTIMATED ACCELERATION VECTOR; NWU ORDER; 1 PER IMU	LSF_FILR	VECTOR	+/-3.2	FT/SEC /SEC	OD
ETD	V99U2845C V99U2853C	LSF ESTIMATED DRIFT VECTOR; NWU ORDER; 1 PER IMU	LSF_FILR	VECTOR	+/-90	DEG/HR	OD
LATCOMP(1)	V95X0085X	IMU-1 LARGE ANGLE TORQ COMPLETE	LAT_FUNC	LOGICAL	0,1	NA	ONCE
LATCOMP(2)	V95X1085X	IMU-2 LARGE ANGLE TORQ COMPLETE	LAT_FUNC	LOGICAL	0,1	NA	ONCE
LATCOMP(3)	V95X2085X	IMU-3 LARGE ANGLE TORQ COMPLETE	LAT_FUNC	LOGICAL	0,1	NA	ONCE
RAD	V96U7006C	CONVERSION FACTOR TO CONVERT RADIANS TO ARC-SECONDS	CONSTANT	SCALAR	206264.8	ARC-SEC /RAD	OD
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	IMU_BITE DISPLAY	LOGICAL	0,1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	IMU_BITE DISPLAY	LOGICAL	0,1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	IMU_BITE DISPLAY	LOGICAL	0,1	NA	OD

Table 4.5.4.5.1-2. GC\_ALIGN Output

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
GYO_COMP	V95X0015X	GC ALIGN IN PROGRESS	DISPLAYS TLM	LOGICAL	0,1	NA	OD
GC_FAILED_PAIR 1,2	V99U3262C	GC FAILED IMU-1,2 PAIR	TLM	LOGICAL	0,1	NA	OD
GC_FAILED_PAIR 1,3	V99U3263C	GC FAILED IMU-1,3 PAIR	TLM	LOGICAL	0,1	NA	OD
GC_FAILED_PAIR 2,3	V99U3264C	GC FAILED IMU-2,3 PAIR	TLM	LOGICAL	0,1	NA	OD
FAIL_GC	V99X3280X	GYROCOMPASS FAIL	DISP_SUP	LOGICAL	0,1	NA	ONCE
GCP	V99H2720C	GYROCOMPASS POSITION INDICATOR	TLM	INTEGER	0,1,2	NA	OD
ACCEL_SF(1)	V71K2541B	IMU-1 CAPRI SF WD2 BO CMD	IMU-1 TLM	LOGICAL	0,1	NA	OD
ACCEL_SF(2)	V71K3541B	IMU-2 CAPRI SF WD2 BO CMD	IMU-2 TLM	LOGICAL	0,1	NA	OD
ACCEL_SF(3)	V71K4541B	IMU-3 CAPRI SF WD2 BO CMD	IMU-3 TLM	LOGICAL	0,1	NA	OD
$T_R^{PC}$		TRANSFORMATION: REFERENCE NWU-TO-PRESENT CLUSTER; 1 PER IMU	T_UPDATE TOR_TRSF	MATRIX	+/-1	NA	OD
$T_{NB}^{DC}$	V99U3350C THRU V99U3376C	TRANSFORMATION: NAVIGATION BASE TO DESIRED CLUSTER; 1 PER IMU	LAT_FUNC	MATRIX	+/-1	NA	OD
$T_{NWU}^{AC}$	V99U2760C THRU V99U2786C	TRANSFORMATION: NWU TO ALIGNED CLUSTER; 1 PER IMU	GC_ALIGN1 TLM	MATRIX	+/-1	NA	ONCE
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	T_UPDATE TOR_TRSF	SCALAR	+/-65	DEG/HR	OD
E12N	V99U3288C	IMU-1 TO 2 RELATIVE N TILT ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE
E12W	V99U3291C	IMU-1 TO 2 RELATIVE W TILT ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE
ALIGNCMP	V95X0010X	ALIGN COMPLETE	DISPLAYS TLM	LOGICAL	0,1	NA	OD
E12U	V99U3285C	IMU-1 TO 2 RELATIVE AZ MISALIGN ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE
E13N	V99U3289C	IMU-1 TO 3 RELATIVE N TILT ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE
E13W	V99U3292C	IMU-1 TO 3 RELATIVE W TILT ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE
E13U	V99U3286C	IMU-1 TO 3 RELATIVE AZ MISALIGN ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE
E23N	V99U3290C	IMU-2 TO 3 RELATIVE N TILT ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE
E23W	V99U3293C	IMU-2 TO 3 RELATIVE W TILT ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE



Table 4.5.4.5.1-2. GC\_ALIGN Output

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
E23U	V99U3287C	IMU-2 TO 3 RELATIVE AZ MISALIGN ERROR	TLM	SCALAR	+/- (5/57.3)	RAD	ONCE
ETDN(1)	V99U3250C	IMU-1 EST NORTH DRIFT	GC_ALIGN1 TLM	SCALAR	+/-1	DEG/HR	ONCE
ETDN(2)	V99U3251C	IMU-2 EST NORTH DRIFT	GC_ALIGN1 TLM	SCALAR	+/-1	DEG/HR	ONCE
ETDN(3)	V99U3252C	IMU-3 EST NORTH DRIFT	GC_ALIGN1 TLM	SCALAR	+/-1	DEG/HR	ONCE
ETDW(1)	V99U3253C	IMU-1 EST WEST DRIFT	GC_ALIGN1 TLM	SCALAR	+/-1	DEG/HR	ONCE
ETDW(2)	V99U3254C	IMU-2 EST WEST DRIFT	GC_ALIGN1 TLM	SCALAR	+/-1	DEG/HR	ONCE
ETDW(3)	V99U3255C	IMU-3 EST WEST DRIFT	GC_ALIGN1 TLM	SCALAR	+/-1	DEG/HR	ONCE
LSF		FLAG FOR LSF TO RUN	GC_ALIGN1	LOGICAL	0,1	NA	ONCE

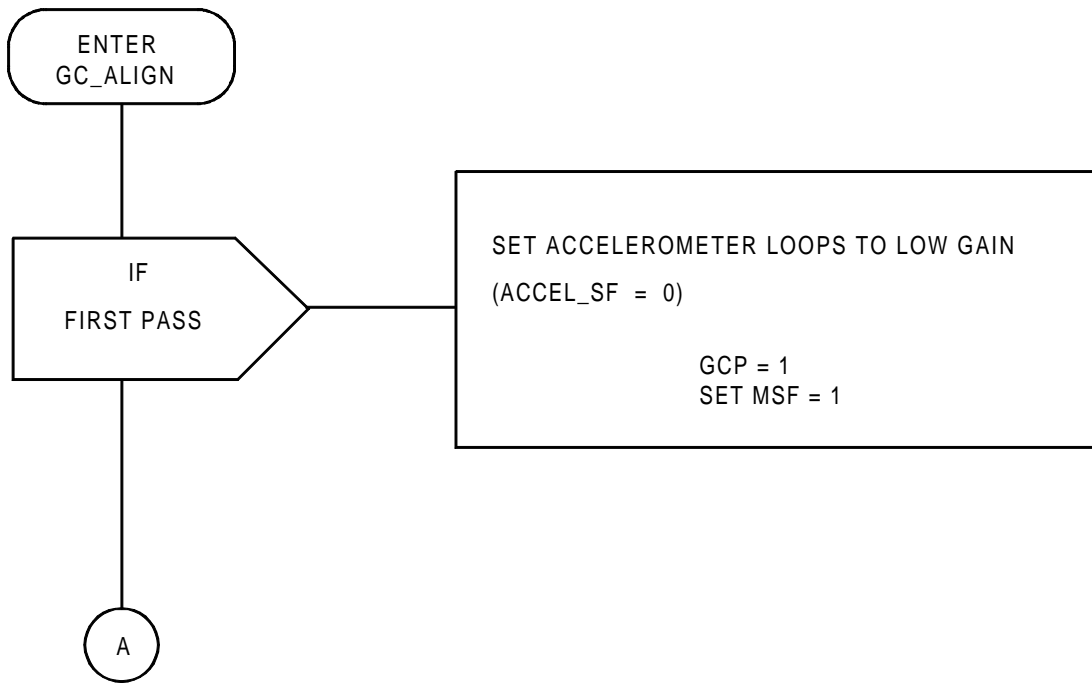


FIGURE 4.5.4.5.1-1.(1) GC\_ALIGN Flow Diagram (Sheet 1 of 7)

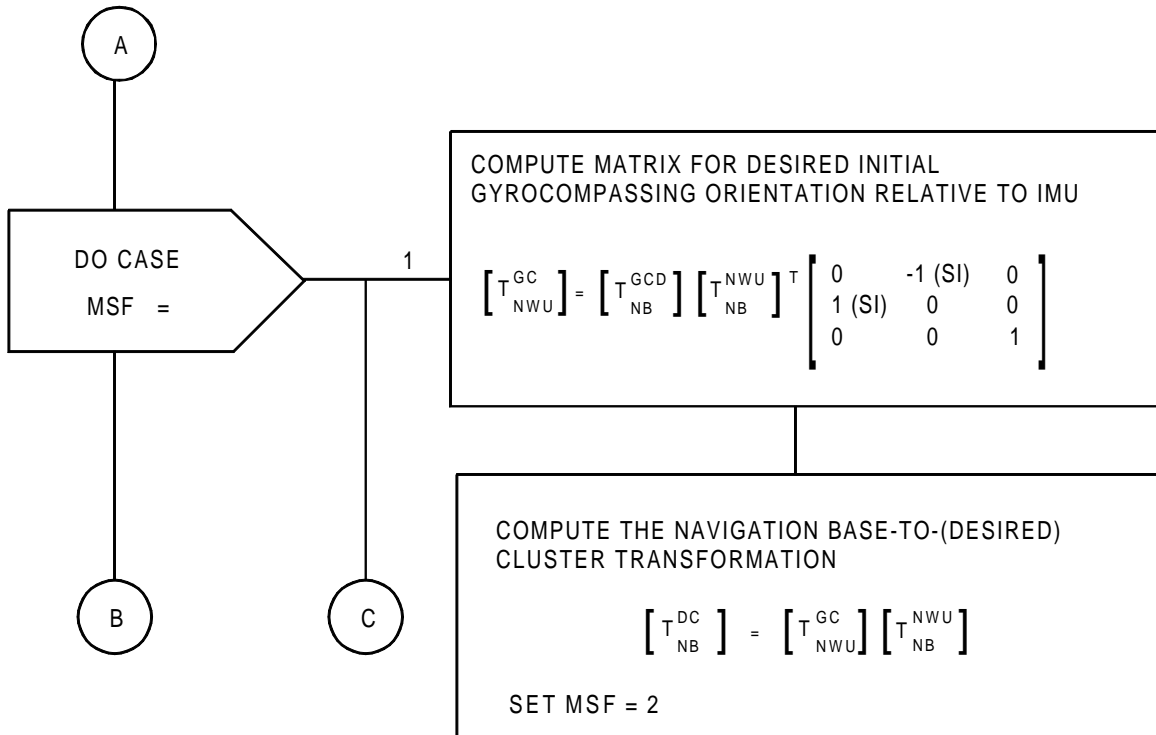


FIGURE 4.5.4.5.1-1.(2) GC\_ALIGN Flow Diagram (Sheet 2 of 7)

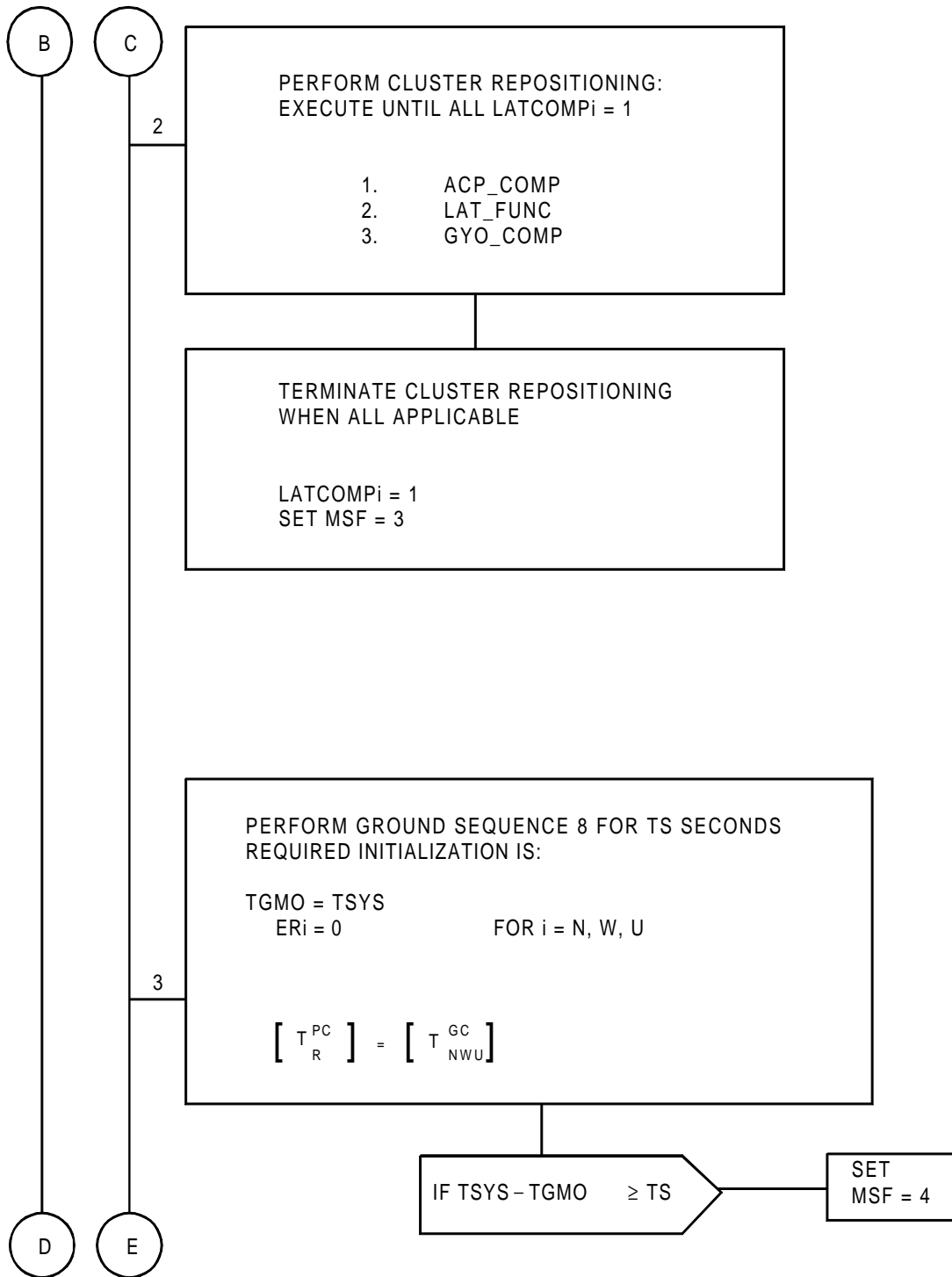


FIGURE 4.5.4.5.1-1.(3) GC\_ALIGN Flow Diagram (Sheet 3 of 7)

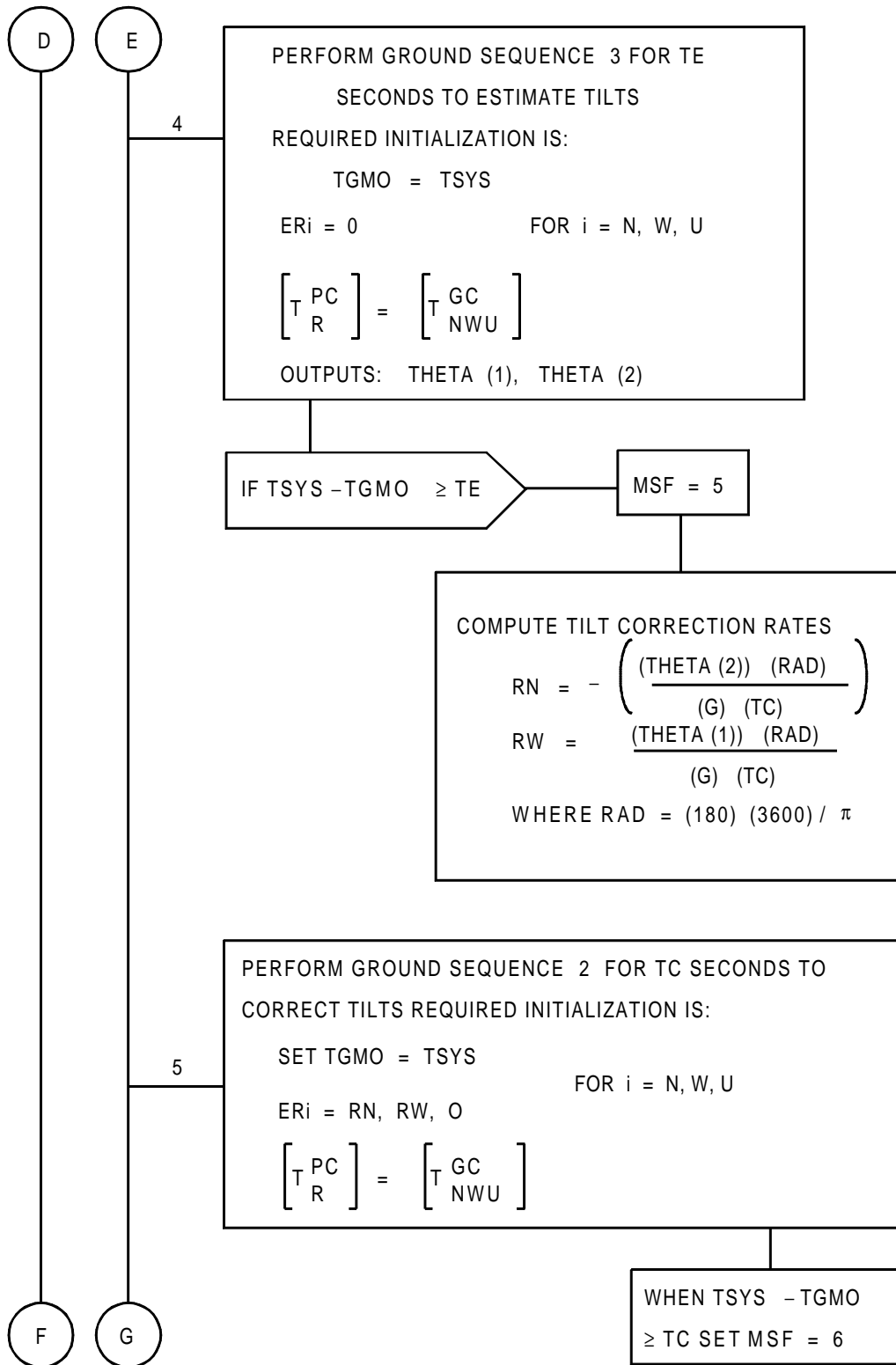


FIGURE 4.5.4.5.1-1.(4) GC\_ALIGN Flow Diagram (Sheet 4 of 7)

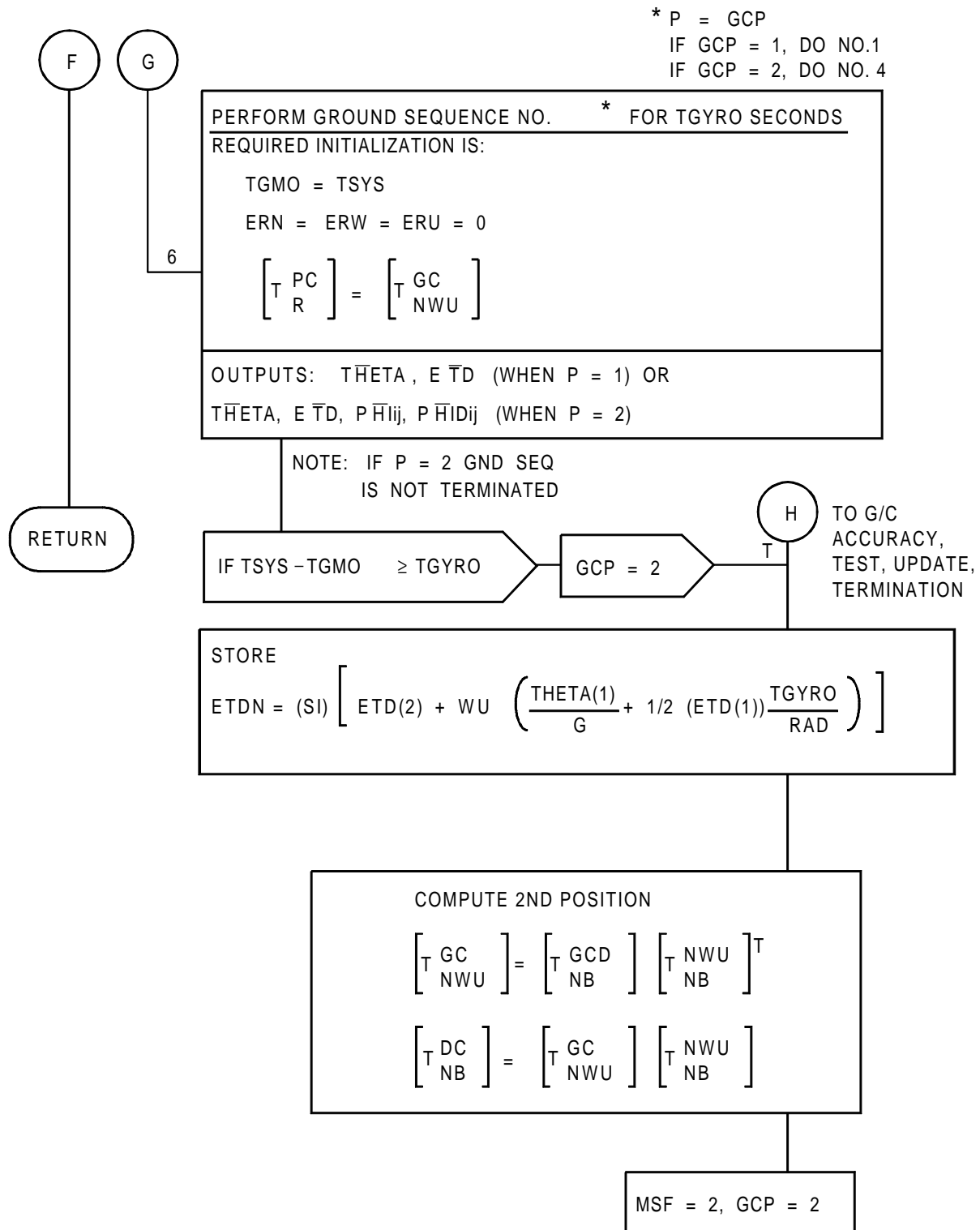
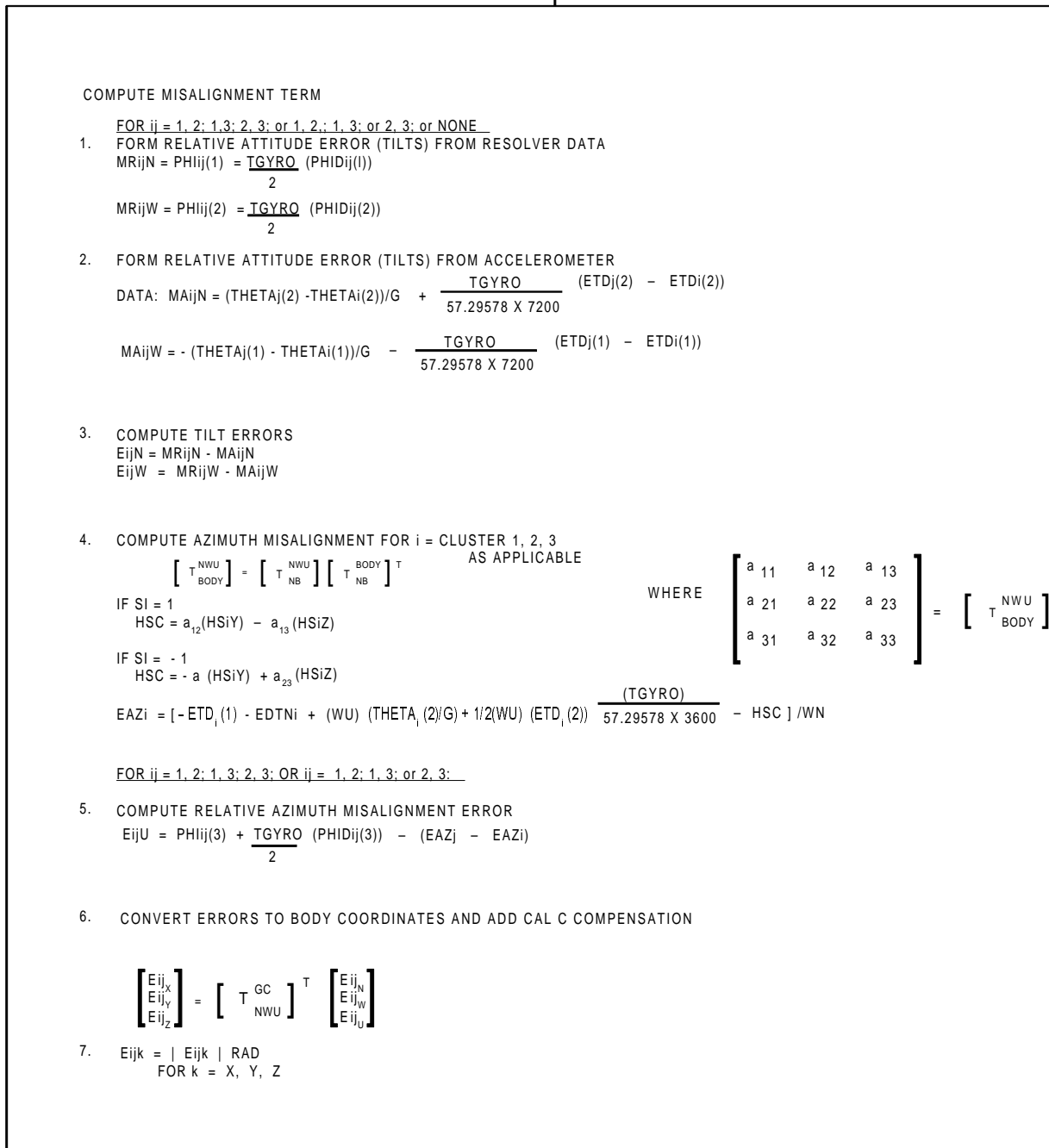


FIGURE 4.5.4.5.1-1.(5) GC\_ALIGN Flow Diagram (Sheet 5 of 7)

H



I

FIGURE 4.5.4.5.1-1.(6) GC\_ALIGN Flow Diagram (Sheet 6 of 7)

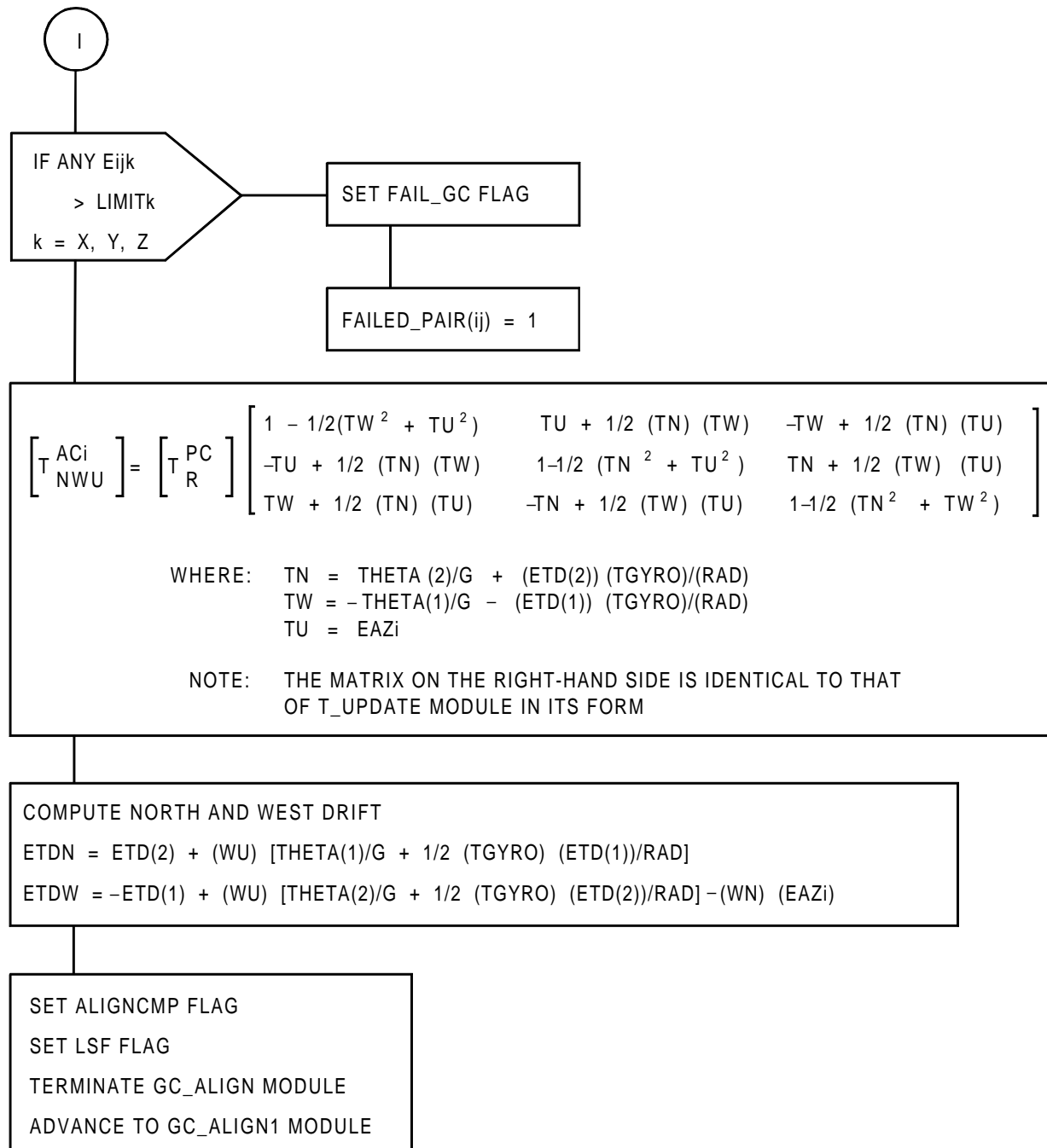


FIGURE 4.5.4.5.1-1.(7) GC\_ALIGN Flow Diagram (Sheet 7 of 7)



#### **4.5.4.5.1.1 Parameter Tables for IMU Gyrocompass Alignment.**

The IDD inputs and outputs are listed in Tables 4.5.4.5.1-1 and 4.5.4.5.1-2. In the table it should be noted that the CAPRI TEMP discretes are set true (=1) when power is applied to the HAINS IMU and some dual discretes have been designated with dual names dependent upon IMU hardware. The first part of the dual name is for the KT-70 IMU while the second part is for the HAINS IMU. Values for the I-loads are contained in the I-load requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.5.4.5.1-3. K-loads are listed in Table 4.5.4.5.1-4. Constants are listed in Table 4.5.4.5.1-5.

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TNB_NWU_1,1	V99U2790C	NAV BASE TO NWU,IMU-1/ELEMENT 1,1	IMU ATT DET		SPL		93017G	*
1TNB_NWU_1,2	V99U2791C	NAV BASE TO NWU,IMU-1/ELEMENT 1,2	IMU ATT DET		SPL		93017G	*
1TNB_NWU_1,3	V99U2792C	NAV BASE TO NWU,IMU-1/ELEMENT 1,3	IMU ATT DET		SPL		93017G	*
1TNB_NWU_2,1	V99U2793C	NAV BASE TO NWU,IMU-1/ELEMENT 2,1	IMU ATT DET		SPL		93017G	*
1TNB_NWU_2,2	V99U2794C	NAV BASE TO NWU,IMU-1/ELEMENT 2,2	IMU ATT DET		SPL		93017G	*
1TNB_NWU_2,3	V99U2795C	NAV BASE TO NWU,IMU-1/ELEMENT 2,3	IMU ATT DET		SPL		93017G	*
1TNB_NWU_3,1	V99U2796C	NAV BASE TO NWU,IMU-1/ELEMENT 3,1	IMU ATT DET		SPL		93017G	*
1TNB_NWU_3,2	V99U2797C	NAV BASE TO NWU,IMU-1/ELEMENT 3,2	IMU ATT DET		SPL		93017G	*
1TNB_NWU_3,3	V99U2798C	NAV BASE TO NWU,IMU-1/ELEMENT 3,3	IMU ATT DET		SPL		93017G	*
2TNB_NWU_1,1	V99U2799C	NAV BASE TO NWU,IMU-2/ELEMENT 1,1	IMU ATT DET		SPL		93017G	*
2TNB_NWU_1,2	V99U2800C	NAV BASE TO NWU,IMU-2/ELEMENT 1,2	IMU ATT DET		SPL		93017G	*
2TNB_NWU_1,3	V99U2801C	NAV BASE TO NWU,IMU-2/ELEMENT 1,3	IMU ATT DET		SPL		93017G	*
2TNB_NWU_2,1	V99U2802C	NAV BASE TO NWU,IMU-2/ELEMENT 2,1	IMU ATT DET		SPL		93017G	*
2TNB_NWU_2,2	V99U2803C	NAV BASE TO NWU,IMU-2/ELEMENT 2,2	IMU ATT DET		SPL		93017G	*
2TNB_NWU_2,3	V99U2804C	NAV BASE TO NWU,IMU-2/ELEMENT 2,3	IMU ATT DET		SPL		93017G	*
2TNB_NWU_3,1	V99U2805C	NAV BASE TO NWU,IMU-2/ELEMENT 3,1	IMU ATT DET		SPL		93017G	*
2TNB_NWU_3,2	V99U2806C	NAV BASE TO NWU,IMU-2/ELEMENT 3,2	IMU ATT DET		SPL		93017G	*
2TNB_NWU_3,3	V99U2807C	NAV BASE TO NWU,IMU-2/ELEMENT 3,3	IMU ATT DET		SPL		93017G	*
3TNB_NWU_1,1	V99U2808C	NAV BASE TO NWU,IMU-3/ELEMENT 1,1	IMU ATT DET		SPL		93017G	*
3TNB_NWU_1,2	V99U2809C	NAV BASE TO NWU,IMU-3/ELEMENT 1,2	IMU ATT DET		SPL		93017G	*
3TNB_NWU_1,3	V99U2810C	NAV BASE TO NWU,IMU-3/ELEMENT 1,3	IMU ATT DET		SPL		93017G	*
3TNB_NWU_2,1	V99U2811C	NAV BASE TO NWU,IMU-3/ELEMENT 2,1	IMU ATT DET		SPL		93017G	*
3TNB_NWU_2,2	V99U2812C	NAV BASE TO NWU,IMU-3/ELEMENT 2,2	IMU ATT DET		SPL		93017G	*
3TNB_NWU_2,3	V99U2813C	NAV BASE TO NWU,IMU-3/ELEMENT 2,3	IMU ATT DET		SPL		93017G	*
3TNB_NWU_3,1	V99U2814C	NAV BASE TO NWU,IMU-3/ELEMENT 3,1	IMU ATT DET		SPL		93017G	*
3TNB_NWU_3,2	V99U2815C	NAV BASE TO NWU,IMU-3/ELEMENT 3,2	IMU ATT DET		SPL		93017G	*
3TNB_NWU_3,3	V99U2816C	NAV BASE TO NWU,IMU-3/ELEMENT 3,3	IMU ATT DET		SPL		93017G	*
AD_FAIL(1)	V71X2023B	IMU-1 A/D FAIL	WD1B2	IMU 1	BD		93017G	*
AD_FAIL(2)	V71X3023B	IMU-2 A/D FAIL	WD1B2	IMU 2	BD		93017G	*
AD_FAIL(3)	V71X4023B	IMU-3 A/D FAIL	WD1B2	IMU 3	BD		93017G	*
AZO(1)	V99H2610CA	AZIMUTH RESOLVER OFFSET(1)		IMU GND CAL	DEG		93017G	*
AZO(1)	V99H2610CB	AZIMUTH RESOLVER OFFSET(1)		MASS MEM	DEG			
AZO(2)	V99H2611CA	AZIMUTH RESOLVER OFFSET(2)		IMU GND CAL	DEG		93017G	*
AZO(2)	V99H2611CB	AZIMUTH RESOLVER OFFSET(2)		MASS MEM	DEG			
AZO(3)	V99H2612CA	AZIMUTH RESOLVER OFFSET(3)		IMU GND CAL	DEG		93017G	*
AZO(3)	V99H2612CB	AZIMUTH RESOLVER OFFSET(3)		MASS MEM	DEG			
BXY(1)	V99H2590CA	X-GYRO MISALIGNMENT TO Y-REF(1)		IMU GND CAL	RAD		93017G	*
BXY(1)	V99H2590CB	X-GYRO MISALIGNMENT TO Y-REF(1)		MASS MEM	RAD		90525D	
BXY(2)	V99H2591CA	X-GYRO MISALIGNMENT TO Y-REF(2)		IMU GND CAL	RAD		93017G	*
BXY(2)	V99H2591CB	X-GYRO MISALIGNMENT TO Y-REF(2)		MASS MEM	RAD		90525D	
BXY(3)	V99H2592CA	X-GYRO MISALIGNMENT TO Y-REF(3)		IMU GND CAL	RAD		93017G	*
BXY(3)	V99H2592CB	X-GYRO MISALIGNMENT TO Y-REF(3)		MASS MEM	RAD		90525D	
BXZ(1)	V99H2593CA	X-GYRO MISALIGNMENT TO Z-REF(1)		IMU GND CAL	RAD		93017G	*
BXZ(1)	V99H2593CB	X-GYRO MISALIGNMENT TO Z-REF(1)		MASS MEM	RAD		90525D	
BXZ(2)	V99H2594CA	X-GYRO MISALIGNMENT TO Z-REF(2)		IMU GND CAL	RAD		93017G	*
BXZ(2)	V99H2594CB	X-GYRO MISALIGNMENT TO Z-REF(2)		MASS MEM	RAD		90525D	

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BXZ (3)	V99H2595CA	X-GYRO MISALIGNMENT TO Z-REF (3)	IMU GND CAL	RAD			93017G	*
BXZ (3)	V99H2595CB	X-GYRO MISALIGNMENT TO Z-REF (3)	MASS MEM	RAD			90525D	
BYX (1)	V99H2596CA	Y-GYRO MISALIGNMENT TO X-REF (1)	IMU GND CAL	RAD			93017G	*
BYX (1)	V99H2596CB	Y-GYRO MISALIGNMENT TO X-REF (1)	MASS MEM	RAD			90525D	
BYX (2)	V99H2597CA	Y-GYRO MISALIGNMENT TO X-REF (2)	IMU GND CAL	RAD			93017G	*
BYX (2)	V99H2597CB	Y-GYRO MISALIGNMENT TO X-REF (2)	MASS MEM	RAD			90525D	
BYX (3)	V99H2598CA	Y-GYRO MISALIGNMENT TO X-REF (3)	IMU GND CAL	RAD			93017G	*
BYX (3)	V99H2598CB	Y-GYRO MISALIGNMENT TO X-REF (3)	MASS MEM	RAD			90525D	
BYZ (1)	V99H2599CA	Y-GYRO MISALIGNMENT TO Z-REF (1)	IMU GND CAL	RAD			93017G	*
BYZ (1)	V99H2599CB	Y-GYRO MISALIGNMENT TO Z-REF (1)	MASS MEM	RAD			90525D	
BYZ (2)	V99H2600CA	Y-GYRO MISALIGNMENT TO Z-REF (2)	IMU GND CAL	RAD			93017G	*
BYZ (2)	V99H2600CB	Y-GYRO MISALIGNMENT TO Z-REF (2)	MASS MEM	RAD			90525D	
BYZ (3)	V99H2601CA	Y-GYRO MISALIGNMENT TO Z-REF (3)	IMU GND CAL	RAD			93017G	*
BYZ (3)	V99H2601CB	Y-GYRO MISALIGNMENT TO Z-REF (3)	MASS MEM	RAD			90525D	
BZX (1)	V99H2602CA	Z-GYRO MISALIGNMENT TO X-REF (1)	IMU GND CAL	RAD			93017G	*
BZX (1)	V99H2602CB	Z-GYRO MISALIGNMENT TO X-REF (1)	MASS MEM	RAD			90525D	
BZX (2)	V99H2603CA	Z-GYRO MISALIGNMENT TO X-REF (2)	IMU GND CAL	RAD			93017G	*
BZX (2)	V99H2603CB	Z-GYRO MISALIGNMENT TO X-REF (2)	MASS MEM	RAD			90525D	
BZX (3)	V99H2604CA	Z-GYRO MISALIGNMENT TO X-REF (3)	IMU GND CAL	RAD			93017G	*
BZX (3)	V99H2604CB	Z-GYRO MISALIGNMENT TO X-REF (3)	MASS MEM	RAD			90525D	
BZY (1)	V99H2605CA	Z-GYRO MISALIGNMENT TO Y-REF (1)	IMU GND CAL	RAD			93017G	*
BZY (1)	V99H2605CB	Z-GYRO MISALIGNMENT TO Y-REF (1)	MASS MEM	RAD			90525D	
BZY (2)	V99H2606CA	Z-GYRO MISALIGNMENT TO Y-REF (2)	IMU GND CAL	RAD			93017G	*
BZY (2)	V99H2606CB	Z-GYRO MISALIGNMENT TO Y-REF (2)	MASS MEM	RAD			90525D	
BZY (3)	V99H2607CA	Z-GYRO MISALIGNMENT TO Y-REF (3)	IMU GND CAL	RAD			93017G	*
BZY (3)	V99H2607CB	Z-GYRO MISALIGNMENT TO Y-REF (3)	MASS MEM	RAD			90525D	
CAP_TEMP_RDY (1)	V71X2406X	IMU 1 CAPRI TEMP READY	IMU 1		BD		93017G	*
CAP_TEMP_RDY (2)	V71X3406X	IMU 2 CAPRI TEMP READY	IMU 2		BD		93017G	*
CAP_TEMP_RDY (3)	V71X4406X	IMU 3 CAPRI TEMP READY	IMU 3		BD		93017G	*
CAP_TEMP_SAFE (1)	V71X2407X	IMU 1 CAPRI TEMP SAFE	IMU 1		BD		93017G	*
CAP_TEMP_SAFE (2)	V71X3407X	IMU 2 CAPRI TEMP SAFE	IMU 2		BD		93017G	*
CAP_TEMP_SAFE (3)	V71X4407X	IMU 3 CAPRI TEMP SAFE	IMU 3		BD		93017G	*
CLOCK/CLOCKTIME	V91W5000C	CLOCK-COMPUTER (GMT)	FCOS	S			93160B	*
CVX (1)	V71L2200B	IMU-1 ACCUMD VX	WD10 IMU 1		HXU		93017G	*
CVX (2)	V71L3200B	IMU-2 ACCUMD VX	WD10 IMU 2		HXU		93017G	*
CVX (3)	V71L4200B	IMU-3 ACCUMD VX	WD10 IMU 3		HXU		93017G	*
CVY (1)	V71L2220B	IMU-1 ACCUMD VY	WD11 IMU 1		HXU		93017G	*
CVY (2)	V71L3220B	IMU-2 ACCUMD VY	WD11 IMU 2		HXU		93017G	*
CVY (3)	V71L4220B	IMU-3 ACCUMD VY	WD11 IMU 3	PULSES	HXU		93017G	*
CVZ (1)	V71L2240B	IMU-1 ACCUMD VZ	WD12 IMU 1		HXU		93017G	*
CVZ (2)	V71L3240B	IMU-2 ACCUMD VZ	WD12 IMU 2		HXU		93017G	*
CVZ (3)	V71L4240B	IMU-3 ACCUMD VZ	WD12 IMU 3	PULSES	HXU		93017G	*
D1/D8_SEQR (1)	V71X2032B	IMU-1 D1/D8 SEQUENCER	WD1B11 IMU 1		BD		93017G	*
D1/D8_SEQR (2)	V71X3032B	IMU-2 D1/D8 SEQUENCER	WD1B11 IMU 2		BD		93017G	*
D1/D8_SEQR (3)	V71X4032B	IMU-3 D1/D8 SEQUENCER	WD1B11 IMU 3		BD		93017G	*
D2_SEQR (1)	V71X2033B	IMU-1 D2 SEQUENCER	WD1B12 IMU 1		BD		93017G	*

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
D2_SEQR(2)	V71X3033B	IMU-2 D2 SEQUENCER	WD1B12	IMU 2	BD		93017G	*
D2_SEQR(3)	V71X4033B	IMU-3 D2 SEQUENCER	WD1B12	IMU 3	BD		93017G	*
D3_SEQR(1)	V71X2034B	IMU-1 D3 SEQUENCER	WD1B13	IMU 1	BD		93017G	*
D3_SEQR(2)	V71X3034B	IMU-2 D3 SEQUENCER	WD1B13	IMU 2	BD		93017G	*
D3_SEQR(3)	V71X4034B	IMU-3 D3 SEQUENCER	WD1B13	IMU 3	BD		93017G	*
D4_SEQR(1)	V71X2035B	IMU-1 D4 SEQUENCER	WD1B14	IMU 1	BD		93017G	*
D4_SEQR(2)	V71X3035B	IMU-2 D4 SEQUENCER	WD1B14	IMU 2	BD		93017G	*
D4_SEQR(3)	V71X4035B	IMU-3 D4 SEQUENCER	WD1B14	IMU 3	BD		93017G	*
D5_SEQR(1)	V71X2036B	IMU-1 D5 SEQUENCER	WD1B15	IMU 1	BD		93017G	*
D5_SEQR(2)	V71X3036B	IMU-2 D5 SEQUENCER	WD1B15	IMU 2	BD		93017G	*
D5_SEQR(3)	V71X4036B	IMU-3 D5 SEQUENCER	WD1B15	IMU 3	BD		93017G	*
DCDC_1_FAIL(1)	V71X2026B	IMU-1 DC/DC NO 1 FAIL	WD1B5	IMU 1	BD		93017G	*
DCDC_1_FAIL(2)	V71X3026B	IMU-2 DC/DC NO 1 FAIL	WD1B5	IMU 2	BD		93017G	*
DCDC_1_FAIL(3)	V71X4026B	IMU-3 DC/DC NO 1 FAIL	WD1B5	IMU 3	BD		93017G	*
DELTXZ(1)	V99H2552CA	X-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTXZ(1)	V99H2552CB	X-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM	MASS MEM	RAD			
DELTXZ(2)	V99H2553CA	X-ACCEL MISALIGNMENT TO Z-REF(2)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTXZ(2)	V99H2553CB	X-ACCEL MISALIGNMENT TO Z-REF(2)	MASS MEM	MASS MEM	RAD			
DELTXZ(3)	V99H2554CA	X-ACCEL MISALIGNMENT TO Z-REF(3)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTXZ(3)	V99H2554CB	X-ACCEL MISALIGNMENT TO Z-REF(3)	MASS MEM	MASS MEM	RAD			
DELTYX(1)	V99H2540CA	Y-ACCEL MISALIGNMENT TO X-REF(1)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTYX(1)	V99H2540CB	Y-ACCEL MISALIGNMENT TO X-REF(1)	MASS MEM	MASS MEM	RAD		90525D	
DELTYX(2)	V99H2541CA	Y-ACCEL MISALIGNMENT TO X-REF(2)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTYX(2)	V99H2541CB	Y-ACCEL MISALIGNMENT TO X-REF(2)	MASS MEM	MASS MEM	RAD		90525D	
DELTYX(3)	V99H2542CA	Y-ACCEL MISALIGNMENT TO X-REF(3)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTYX(3)	V99H2542CB	Y-ACCEL MISALIGNMENT TO X-REF(3)	MASS MEM	MASS MEM	RAD		90525D	
DELTYZ(1)	V99H2549CA	Y-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTYZ(1)	V99H2549CB	Y-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM	MASS MEM	RAD			
DELTYZ(2)	V99H2550CA	Y-ACCEL MISALIGNMENT TO Z-REF(2)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTYZ(2)	V99H2550CB	Y-ACCEL MISALIGNMENT TO Z-REF(2)	MASS MEM	MASS MEM	RAD			
DELTYZ(3)	V99H2551CA	Y-ACCEL MISALIGNMENT TO Z-REF(3)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTYZ(3)	V99H2551CB	Y-ACCEL MISALIGNMENT TO Z-REF(3)	MASS MEM	MASS MEM	RAD			
DELTZX(1)	V99H2543CA	Z-ACCEL MISALIGNMENT TO X-REF(1)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTZX(1)	V99H2543CB	Z-ACCEL MISALIGNMENT TO X-REF(1)	MASS MEM	MASS MEM	RAD		90525D	
DELTZX(2)	V99H2544CA	Z-ACCEL MISALIGNMENT TO X-REF(2)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTZX(2)	V99H2544CB	Z-ACCEL MISALIGNMENT TO X-REF(2)	MASS MEM	MASS MEM	RAD		90525D	
DELTZX(3)	V99H2545CA	Z-ACCEL MISALIGNMENT TO X-REF(3)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTZX(3)	V99H2545CB	Z-ACCEL MISALIGNMENT TO X-REF(3)	MASS MEM	MASS MEM	RAD		90525D	
DELTZY(1)	V99H2546CA	Z-ACCEL MISALIGNMENT TO Y-REF(1)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTZY(1)	V99H2546CB	Z-ACCEL MISALIGNMENT TO Y-REF(1)	MASS MEM	MASS MEM	RAD		90525D	
DELTZY(2)	V99H2547CA	Z-ACCEL MISALIGNMENT TO Y-REF(2)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTZY(2)	V99H2547CB	Z-ACCEL MISALIGNMENT TO Y-REF(2)	MASS MEM	MASS MEM	RAD		90525D	
DELTZY(3)	V99H2548CA	Z-ACCEL MISALIGNMENT TO Y-REF(3)	IMU GND CAL	IMU GND CAL	RAD		93017G	*
DELTZY(3)	V99H2548CB	Z-ACCEL MISALIGNMENT TO Y-REF(3)	MASS MEM	MASS MEM	RAD		90525D	
DFR(1)	V99U5952CA	IMU 1 REDUNDANT GYRO RESTRAINT	IMU GND CAL	IMU GND CAL	DEG/HR		93017G	*
DFR(1)	V99U5952CB	IMU 1 REDUNDANT GYRO RESTRAINT	MASS MEM	MASS MEM	DEG/HR		90525D	

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DFR (2)	V99U5953CA	IMU 2 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR (2)	V99U5953CB	IMU 2 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFR (3)	V99U5954CA	IMU 3 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR (3)	V99U5954CB	IMU 3 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFX (1)	V99R2560CB	X-GYRO RESTRAINT(1)	IMU GND CAL	DEG/HR			93017G	*
DFX (1)	V99R2560CC	X-GYRO RESTRAINT(1)	MASS MEM	DEG/HR			90525D	
DFX (2)	V99R2561CB	X-GYRO RESTRAINT(2)	IMU GND CAL	DEG/HR			93017G	*
DFX (2)	V99R2561CC	X-GYRO RESTRAINT(2)	MASS MEM	DEG/HR			90525D	
DFX (3)	V99R2562CB	X-GYRO RESTRAINT(3)	IMU GND CAL	DEG/HR			93017G	*
DFX (3)	V99R2562CC	X-GYRO RESTRAINT(3)	MASS MEM	DEG/HR			90525D	
DFY (1)	V99R2563CB	Y-GYRO RESTRAINT(1)	IMU GND CAL	DEG/HR			93017G	*
DFY (1)	V99R2563CC	Y-GYRO RESTRAINT(1)	MASS MEM	DEG/HR			90525D	
DFY (2)	V99R2564CB	Y-GYRO RESTRAINT(2)	IMU GND CAL	DEG/HR			93017G	*
DFY (2)	V99R2564CC	Y-GYRO RESTRAINT(2)	MASS MEM	DEG/HR			90525D	
DFY (3)	V99R2565CB	Y-GYRO RESTRAINT(3)	IMU GND CAL	DEG/HR			93017G	*
DFY (3)	V99R2565CC	Y-GYRO RESTRAINT(3)	MASS MEM	DEG/HR			90525D	
DFZ (1)	V99R2566CB	Z-GYRO RESTRAINT(1)	IMU GND CAL	DEG/HR			93017G	*
DFZ (1)	V99R2566CC	Z-GYRO RESTRAINT(1)	MASS MEM	DEG/HR			90525D	
DFZ (2)	V99R2567CB	Z-GYRO RESTRAINT(2)	IMU GND CAL	DEG/HR			93017G	*
DFZ (2)	V99R2567CC	Z-GYRO RESTRAINT(2)	MASS MEM	DEG/HR			90525D	
DFZ (3)	V99R2568CB	Z-GYRO RESTRAINT(3)	IMU GND CAL	DEG/HR			93017G	*
DFZ (3)	V99R2568CC	Z-GYRO RESTRAINT(3)	MASS MEM	DEG/HR			90525D	
DIR (1)	V99U5955CA	IMU 1 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (1)	V99U5955CB	IMU 1 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR (2)	V99U5956CA	IMU 2 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (2)	V99U5956CB	IMU 2 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR (3)	V99U5957CA	IMU 3 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (3)	V99U5957CB	IMU 3 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIX (1)	V99U2570CA	X-GYRO IN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DIX (1)	V99U2570CB	X-GYRO IN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DIX (2)	V99U2571CA	X-GYRO IN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DIX (2)	V99U2571CB	X-GYRO IN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DIX (3)	V99U2572CA	X-GYRO IN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DIX (3)	V99U2572CB	X-GYRO IN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DIZ (1)	V99U2573CA	Z-GYRO IN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ (1)	V99U2573CB	Z-GYRO IN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DIZ (2)	V99U2574CA	Z-GYRO IN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ (2)	V99U2574CB	Z-GYRO IN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DIZ (3)	V99U2575CA	Z-GYRO IN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ (3)	V99U2575CB	Z-GYRO IN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DOR (1)	V99U5958CA	IMU 1 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR (1)	V99U5958CB	IMU 1 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR (2)	V99U5959CA	IMU 2 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR (2)	V99U5959CB	IMU 2 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR (3)	V99U5960CA	IMU 3 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR (3)	V99U5960CB	IMU 3 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DOZ(1)	V99U2582CA	Z-GYRO OUT AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(1)	V99U2582CB	Z-GYRO OUT AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DOZ(2)	V99U2583CA	Z-GYRO OUT AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(2)	V99U2583CB	Z-GYRO OUT AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DOZ(3)	V99U2584CA	Z-GYRO OUT AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(3)	V99U2584CB	Z-GYRO OUT AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DP(1)	V99H2660CA	IMU-1 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(1)	V99H2660CB	IMU 1 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(2)	V99H2661CA	IMU-2 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(2)	V99H2661CB	IMU 2 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(3)	V99H2662CA	IMU-3 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(3)	V99H2662CB	IMU 3 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DSR(1)	V99U5961CA	IMU 1 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(1)	V99U5961CB	IMU 1 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(2)	V99U5962CA	IMU 2 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(2)	V99U5962CB	IMU 2 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(3)	V99U5963CA	IMU 3 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(3)	V99U5963CB	IMU 3 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSX(1)	V99U2576CA	X-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(1)	V99U2576CB	X-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSX(2)	V99U2577CA	X-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(2)	V99U2577CB	X-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSX(3)	V99U2578CA	X-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(3)	V99U2578CB	X-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DSZ(1)	V99U2579CA	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(1)	V99U2579CB	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSZ(2)	V99U2580CA	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(2)	V99U2580CB	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSZ(3)	V99U2581CA	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(3)	V99U2581CB	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
ECHO_13(1)	V71M2260P	IMU-1 ECHO 1	WD13	IMU 1	HMD		93017G	*
ECHO_13(2)	V71M3260P	IMU-2 ECHO 1	WD13	IMU 2	HMD		93017G	*
ECHO_13(3)	V71M4260P	IMU-3 ECHO 1	WD13	IMU 3	HMD		93017G	*
ECHO_14(1)	V71M2280P	IMU-1 ECHO 2	WD14	IMU 1	HMD		93017G	*
ECHO_14(2)	V71M3280P	IMU-2 ECHO 2	WD14	IMU 2	HMD		93017G	*
ECHO_14(3)	V71M4280P	IMU-3 ECHO 2	WD14	IMU 3	HMD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(1)	V71X2027B	IMU 1 FLTR DC2/DSCRET PWR SUP FAIL	IMU 1		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(2)	V71X3027B	IMU 2 FLTR DC2/DSCRET PWR SUP FAIL	IMU 2		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(3)	V71X4027B	IMU 3 FLTR DC2/DSCRET PWR SUP FAIL	IMU 3		BD		93017G	*
IMU_CF(1)	V91X3101X	IMU 1 COMMFAULT		FCOS			92354	
IMU_CF(2)	V91X3131X	IMU 2 COMMFAULT		FCOS			92354	
IMU_CF(3)	V91X3161X	IMU 3 COMMFAULT		FCOS			92354	
IN_OPERATE(1)	V71X2403XB	IMU-1 IN OPERATE MODE		IMU 1			93017G	*
IN_OPERATE(2)	V71X3403XB	IMU-2 IN OPERATE MODE		IMU 2			93017G	*
IN_OPERATE(3)	V71X4403XB	IMU-3 IN OPERATE MODE		IMU 3			93017G	*
IO/MUX_FAIL(1)	V71X2022B	IMU 1 IO/MUX FAIL	WD1B1	IMU 1	BD		93017G	*

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
IO/MUX_FAIL(2)	V71X3022B	IMU 2 IO/MUX FAIL	WD1B1 IMU 2		BD		93017G	*
IO/MUX_FAIL(3)	V71X4022B	IMU 3 IO/MUX FAIL	WD1B1 IMU 3		BD		93017G	*
IRO(1)	V99H2615CA	INNER ROLL RESOLVER OFFSET(1)	IMU GND CAL	DEG			93017G	*
IRO(1)	V99H2615CB	INNER ROLL RESOLVER OFFSET(1)	MASS MEM	DEG				
IRO(2)	V99H2616CA	INNER ROLL RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
IRO(2)	V99H2616CB	INNER ROLL RESOLVER OFFSET(2)	MASS MEM	DEG				
IRO(3)	V99H2617CA	INNER ROLL RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
IRO(3)	V99H2617CB	INNER ROLL RESOLVER OFFSET(3)	MASS MEM	DEG				
KIX(1)	V99A2520CA	LOW GAIN X-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIX(1)	V99A2520CB	LOW GAIN X-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIX(2)	V99A2521CA	LOW GAIN X-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIX(2)	V99A2521CB	LOW GAIN X-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIX(3)	V99A2522CA	LOW GAIN X-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KIX(3)	V99A2522CB	LOW GAIN X-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	
KIXH(1)	V99A2681CA	IMU-1 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(1)	V99A2681CB	HIGH-GAIN X-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIXH(2)	V99A2682CA	IMU-2 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(2)	V99A2682CB	HIGH-GAIN X-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIXH(3)	V99A2683CA	IMU-3 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(3)	V99A2683CB	HIGH-GAIN X-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIY(1)	V99A2523CA	LOW GAIN Y-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIY(1)	V99A2523CB	LOW GAIN Y-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIY(2)	V99A2524CA	LOW GAIN Y-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIY(2)	V99A2524CB	LOW GAIN Y-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIY(3)	V99A2525CA	LOW GAIN Y-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KIY(3)	V99A2525CB	LOW GAIN Y-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	
KIYH(1)	V99A2684CA	IMU-1 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(1)	V99A2684CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIYH(2)	V99A2685CA	IMU-2 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(2)	V99A2685CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIYH(3)	V99A2686CA	IMU-3 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(3)	V99A2686CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIZ(1)	V99A2526CA	LOW GAIN Z-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIZ(1)	V99A2526CB	LOW GAIN Z-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIZ(2)	V99A2527CA	LOW GAIN Z-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIZ(2)	V99A2527CB	LOW GAIN Z-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIZ(3)	V99A2528CA	LOW GAIN Z-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G	SPL		93017G	*
KIZ(3)	V99A2528CB	LOW GAIN Z-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	
KIZH(1)	V99A2687CA	IMU-1 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(1)	V99A2687CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIZH(2)	V99A2688CA	IMU-2 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(2)	V99A2688CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIZH(3)	V99A2689CA	IMU-3 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(3)	V99A2689CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KOX(1)	V99G2530CB	LOW GAIN X ACCELEROMETER BIAS(1)	IMU GND CAL	UG			93017G	*
KOX(1)	V99G2530CC	LOW GAIN X ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOX(2)	V99G2531CB	LOW GAIN X ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*
KOX(2)	V99G2531CC	LOW GAIN X ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOX(3)	V99G2532CB	LOW GAIN X ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KOX(3)	V99G2532CC	LOW GAIN X ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	
KOXH(1)	V99G2670CA	IMU-1 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(1)	V99G2670CB	HIGH-GAIN X-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOXH(2)	V99G2671CA	IMU-2 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(2)	V99G2671CB	HIGH-GAIN X-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOXH(3)	V99G2672CA	IMU-3 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(3)	V99G2672CB	HIGH-GAIN X-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOY(1)	V99G2533CB	LOW GAIN Y ACCELEROMETER BIAS(1)	IMU GND CAL	UG			93017G	*
KOY(1)	V99G2533CC	LOW GAIN Y ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	
KOY(2)	V99G2534CB	LOW GAIN Y ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*
KOY(2)	V99G2534CC	LOW GAIN Y ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOY(3)	V99G2535CB	LOW GAIN Y ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KOY(3)	V99G2535CC	LOW GAIN Y ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	
KOYH(1)	V99G2673CA	IMU-1 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(1)	V99G2673CB	HIGH-GAIN Y-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOYH(2)	V99G2674CA	IMU-2 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(2)	V99G2674CB	HIGH-GAIN Y-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOYH(3)	V99G2675CA	IMU-3 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(3)	V99G2675CB	HIGH-GAIN Y-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOZ(1)	V99G2536CB	LOW GAIN Z ACCELEROMETER BIAS(1)	IMU GND CAL	UG			93017G	*
KOZ(1)	V99G2536CC	LOW GAIN Z ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	
KOZ(2)	V99G2537CB	LOW GAIN Z ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*
KOZ(2)	V99G2537CC	LOW GAIN Z ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOZ(3)	V99G2538CB	LOW GAIN Z ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KOZ(3)	V99G2538CC	LOW GAIN Z ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	
KOZH(1)	V99G2676CA	IMU-1 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(1)	V99G2676CB	HIGH-GAIN Z-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOZH(2)	V99G2677CA	IMU-2 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(2)	V99G2677CB	HIGH-GAIN Z-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOZH(3)	V99G2678CA	IMU-3 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(3)	V99G2678CB	HIGH-GAIN Z-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KSX(1)	V99A2510CA	X-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSX(1)	V99A2510CB	X-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSX(2)	V99A2511CA	X-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KSX(2)	V99A2511CB	X-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSX(3)	V99A2512CA	X-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KSX(3)	V99A2512CB	X-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	
KSY(1)	V99A2513CA	Y-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSY(1)	V99A2513CB	Y-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSY(2)	V99A2514CA	Y-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KSY(2)	V99A2514CB	Y-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSY(3)	V99A2515CA	Y-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KSY(3)	V99A2515CB	Y-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	



TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KSZ(1)	V99A2516CA	Z-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSZ(1)	V99A2516CB	Z-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSZ(2)	V99A2517CA	Z-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KSZ(2)	V99A2517CB	Z-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSZ(3)	V99A2518CA	Z-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KSZ(3)	V99A2518CB	Z-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	
KT70/HAINS_GOOD(1)	V71X2021B	IMU 1 KT70/HAINS GOOD	WD1B0	IMU 1	BD		93017G	*
KT70/HAINS_GOOD(2)	V71X3021B	IMU 2 KT70/HAINS GOOD	WD1B0	IMU 2	BD		93017G	*
KT70/HAINS_GOOD(3)	V71X4021B	IMU 3 KT70/HAINS GOOD	WD1B0	IMU 3	BD		93017G	*
KTX(1)	V99G2500CA	X-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(1)	V99G2500CB	X-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(2)	V99G2501CA	X-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(2)	V99G2501CB	X-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(3)	V99G2502CA	X-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(3)	V99G2502CB	X-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(1)	V99G2503CA	Y-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(1)	V99G2503CB	Y-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(2)	V99G2504CA	Y-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(2)	V99G2504CB	Y-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(3)	V99G2505CA	Y-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(3)	V99G2505CB	Y-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(1)	V99G2506CA	Z-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(1)	V99G2506CB	Z-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(2)	V99G2507CA	Z-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(2)	V99G2507CB	Z-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(3)	V99G2508CA	Z-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(3)	V99G2508CB	Z-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90185A	
KXR(1)	V99U5964CA	IMU 1 RED GYRO X SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KXR(1)	V99U5964CB	IMU 1 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KXR(2)	V99U5965CA	IMU 2 RED GYRO X SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KXR(2)	V99U5965CB	IMU 2 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KXR(3)	V99U5966CA	IMU 3 RED GYRO X SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KXR(3)	V99U5966CB	IMU 3 RED GYRO X SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(1)	V99U5967CA	IMU 1 RED GYRO Y SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KYR(1)	V99U5967CB	IMU 1 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(2)	V99U5968CA	IMU 2 RED GYRO Y SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KYR(2)	V99U5968CB	IMU 2 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KYR(3)	V99U5969CA	IMU 3 RED GYRO Y SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KYR(3)	V99U5969CB	IMU 3 RED GYRO Y SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(1)	V99U5970CA	IMU 1 RED GYRO Z SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KZR(1)	V99U5970CB	IMU 1 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(2)	V99U5971CA	IMU 2 RED GYRO Z SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KZR(2)	V99U5971CB	IMU 2 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
KZR(3)	V99U5972CA	IMU 3 RED GYRO Z SCALE FACTOR	IMU GND CAL	DEG/HR/G			93017G	*
KZR(3)	V99U5972CB	IMU 3 RED GYRO Z SCALE FACTOR	MASS MEM	DEG/HR/DEG/HR			90525D	
M12B	V99U3567C	IMU 1/2 REL ATT ERROR	MASS MEM	RAD				

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
M13B	V99U3568C	IMU 1/3 REL ATT ERROR	MASS MEM	RAD				
M23B	V99U3569C	IMU 2/3 REL ATT ERROR	MASS MEM	RAD				
MODE_BITE(1)	V71M2020P	IMU 1 MODE STATUS WD1	IMU 1		HMD		93017G	*
MODE_BITE(2)	V71M3020P	IMU 2 MODE STATUS WD1	IMU 2		HMD		93017G	*
MODE_BITE(3)	V71M4020P	IMU 3 MODE STATUS WD1	IMU 3		HMD		93017G	*
M_M50TOEF_AT_EPOCH(1,1)	V97U5738C	M50 TO EF TRANS MATRIX ELEM 1,1	RNP MAT COMP	ND	DPL		93090E	
M_M50TOEF_AT_EPOCH(1,2)	V97U5739C	M50 TO EF TRANS MATRIX ELEM 1,2	RNP MAT COMP	ND	DPL		93090E	
M_M50TOEF_AT_EPOCH(1,3)	V97U5740C	M50 TO EF TRANS MATRIX ELEM 1,3	RNP MAT COMP	ND	DPL		93090E	
M_M50TOEF_AT_EPOCH(2,1)	V97U5741C	M50 TO EF TRANS MATRIX ELEM 2,1	RNP MAT COMP	ND	DPL		93090E	
M_M50TOEF_AT_EPOCH(2,2)	V97U5742C	M50 TO EF TRANS MATRIX ELEM 2,2	RNP MAT COMP	ND	DPL		93090E	
M_M50TOEF_AT_EPOCH(2,3)	V97U5743C	M50 TO EF TRANS MATRIX ELEM 2,3	RNP MAT COMP	ND	DPL		93090E	
M_M50TOEF_AT_EPOCH(3,1)	V97U5744C	M50 TO EF TRANS MATRIX ELEM 3,1	RNP MAT COMP	ND	DPL		93090E	
M_M50TOEF_AT_EPOCH(3,2)	V97U5745C	M50 TO EF TRANS MATRIX ELEM 3,2	RNP MAT COMP	ND	DPL		93090E	
M_M50TOEF_AT_EPOCH(3,3)	V97U5746C	M50 TO EF TRANS MATRIX ELEM 3,3	RNP MAT COMP	ND	DPL		93090E	
OMEGA_R(1)	V71R2040B	IMU-1 OMEGA R	WD2 IMU 1	DEG/HR	HFS		93017G	*
OMEGA_R(2)	V71R3040B	IMU-2 OMEGA R	WD2 IMU 2	DEG/HR	HFS		93017G	*
OMEGA_R(3)	V71R4040B	IMU-3 OMEGA R	WD2 IMU 3	DEG/HR	HFS		93017G	*
OPER/STBY(1)	V93X6020X	IMU 1 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(2)	V93X6021X	IMU 2 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(3)	V93X6022X	IMU 3 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPS_PRO_FLAG_101	V93X0009X	OPS 101 PRO FLAG	UI				92157	
PC/CRCT_CRD_OVRTMP(1)	V71X2029B	IMU 1 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 1		BD		93017G	*
PC/CRCT_CRD_OVRTMP(2)	V71X3029B	IMU 2 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 2		BD		93017G	*
PC/CRCT_CRD_OVRTMP(3)	V71X4029B	IMU 3 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 3		BD		93017G	*
PLAT_FAIL(1)	V71X2024B	IMU-1 PLATFORM FAIL	WD1B3 IMU 1		BD		93017G	*
PLAT_FAIL(2)	V71X3024B	IMU-2 PLATFORM FAIL	WD1B3 IMU 2		BD		93017G	*
PLAT_FAIL(3)	V71X4024B	IMU-3 PLATFORM FAIL	WD1B3 IMU 3		BD		93017G	*
PLAT_TEMP_RDY(1)	V71X2404X	IMU 1 PLATFORM TEMP READY	IMU 1		BD		93017G	*
PLAT_TEMP_RDY(2)	V71X3404X	IMU 2 PLATFORM TEMP READY	IMU 2		BD		93017G	*
PLAT_TEMP_RDY(3)	V71X4404X	IMU 3 PLATFORM TEMP READY	IMU 3		BD		93017G	*
PLAT_TEMP_SAFE(1)	V71X2405X	IMU 1 PLATFORM TEMP SAFE	IMU 1		BD		93017G	*
PLAT_TEMP_SAFE(2)	V71X3405X	IMU 2 PLATFORM TEMP SAFE	IMU 2		BD		93017G	*
PLAT_TEMP_SAFE(3)	V71X4405X	IMU 3 PLATFORM TEMP SAFE	IMU 3		BD		93017G	*
PO(1)	V99H2620CA	PITCH RESOLVER OFFSET(1)	IMU GND CAL	DEG				
PO(1)	V99H2620CB	PITCH RESOLVER OFFSET(1)	MASS MEM	DEG				
PO(2)	V99H2621CA	PITCH RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
PO(2)	V99H2621CB	PITCH RESOLVER OFFSET(2)	MASS MEM	DEG				
PO(3)	V99H2622CA	PITCH RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
PO(3)	V99H2622CB	PITCH RESOLVER OFFSET(3)	MASS MEM	DEG				
PRESS/COMM_GOOD(1)	V71X2401X	IMU 1 PRESSURE/COMMUNICATION GOOD	IMU 1		BD		93017G	*
PRESS/COMM_GOOD(2)	V71X3401X	IMU 2 PRESSURE/COMMUNICATION GOOD	IMU 2		BD		93017G	*
PRESS/COMM_GOOD(3)	V71X4401X	IMU 3 PRESSURE/COMMUNICATION GOOD	IMU 3		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(1)	V71X2025B	IMU 1 PWR CNTRLR/DGITAL SBSY FAIL	IMU 1		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(2)	V71X3025B	IMU 2 PWR CNTRLR/DGITAL SBSY FAIL	IMU 2		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(3)	V71X4025B	IMU 3 PWR CNTRLR/DGITAL SBSY FAIL	IMU 3		BD		93017G	*
RX_CUR/RX_FAIL(1)	V71X2028B	IMU 1 RESLVR CURRENT/RESLVR FAIL	IMU 1		BD		93017G	*

TABLE 4.5.4.5.1.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RX_CUR/RX_FAIL(2)	V71X3028B	IMU 2 RESLVR CURRENT/RESLVR FAIL	IMU 2		BD		93017G	*
RX_CUR/RX_FAIL(3)	V71X4028B	IMU 3 RESLVR CURRENT/RESLVR FAIL	IMU 3		BD		93017G	*
THETARL(1)	V71H2060B	IMU-1 THETA R 8X	WD3 IMU 1	DEG	BSU		93017G	*
THETARL(2)	V71H3060B	IMU-2 THETA R 8X	WD3 IMU 2	DEG	BSU		93017G	*
THETARL(3)	V71H4060B	IMU-3 THETA R 8X	WD3 IMU 3	DEG	BSU		93017G	*
THETAXL(1)	V71H2100B	IMU-1 THETA X 8X	WD5 IMU 1	DEG	BSU		93017G	*
THETAXL(2)	V71H3100B	IMU-2 THETA X 8X	WD5 IMU 2	DEG	BSU		93017G	*
THETAXL(3)	V71H4100B	IMU-3 THETA X 8X	WD5 IMU 3	DEG	BSU		93017G	*
THETAXM(1)	V71H2080B	IMU-1 THETA X 1X	WD4 IMU 1	DEG	BSU		93017G	*
THETAXM(2)	V71H3080B	IMU-2 THETA X 1X	WD4 IMU 2	DEG	BSU		93017G	*
THETAXM(3)	V71H4080B	IMU-3 THETA X 1X	WD4 IMU 3	DEG	BSU		93017G	*
THETAYL(1)	V71H2140B	IMU-1 THETA Y 8X	WD7 IMU 1	DEG	BSU		93017G	*
THETAYL(2)	V71H3140B	IMU-2 THETA Y 8X	WD7 IMU 2	DEG	BSU		93017G	*
THETAYL(3)	V71H4140B	IMU-3 THETA Y 8X	WD7 IMU 3	DEG	BSU		93017G	*
THETAYM(1)	V71H2120B	IMU-1 THETA Y 1X	WD6 IMU 1	DEG	BSU		93017G	*
THETAYM(2)	V71H3120B	IMU-2 THETA Y 1X	WD6 IMU 2	DEG	BSU		93017G	*
THETAYM(3)	V71H4120B	IMU-3 THETA Y 1X	WD6 IMU 3	DEG	BSU		93017G	*
THETAZL(1)	V71H2180B	IMU-1 THETA Z 8X	WD9 IMU 1	DEG	BSU		93017G	*
THETAZL(2)	V71H3180B	IMU-2 THETA Z 8X	WD9 IMU 2	DEG	BSU		93017G	*
THETAZL(3)	V71H4180B	IMU-3 THETA Z 8X	WD9 IMU 3	DEG	BSU		93017G	*
THETAZM(1)	V71H2160B	IMU-1 THETA Z 1X	WD8 IMU 1	DEG	BSU		93017G	*
THETAZM(2)	V71H3160B	IMU-2 THETA Z 1X	WD8 IMU 2	DEG	BSU		93017G	*
THETAZM(3)	V71H4160B	IMU-3 THETA Z 1X	WD8 IMU 3	DEG	BSU		93017G	*
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL	WD1B9 IMU 1		BD		93017G	*
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL	WD1B9 IMU 2		BD		93017G	*
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL	WD1B9 IMU 3		BD		93017G	*
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL	WD1B10 IMU 1		BD		93017G	*
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL	WD1B10 IMU 2		BD		93017G	*
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL	WD1B10 IMU 3		BD		93017G	*
T_EPOCH	V97W5528C	TIME TAG FOR M_M50TOEF_AT_EPOCH	RNP MAT COMP	S	DPL		93090E	
	V90X8041X	PLATFORM RELEASE	MSC		BD		89986H	
	V93X6026X	IMU 1 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6027X	IMU 2 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6028X	IMU 3 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6050X	INERTIAL COMMAND	GROUND IMU DISP	EVENT	BD		89986H	
	V93X6055X	TERM/IDLE COMMAND	GROUND IMU DISP	EVENT	BD			

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

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1,2	V99U3262C	G/C FAILED IMU 1,2 PAIR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
1,3	V99U3263C	G/C FAILED IMU 1,3 PAIR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
1TNB_PC_1,1	V99U3405CB	XFMTN NAV BASE-PRES CL (1) ELEM1,1	DL FMT 53/1				93017G	*
1TNB_PC_1,2	V99U3408CB	XFMTN NAV BASE-PRES CL (1) ELEM1,2	DL FMT 53/1				93017G	*
1TNB_PC_1,3	V99U3411CB	XFMTN NAV BASE-PRES CL (1) ELEM1,3	DL FMT 53/1				93017G	*
1TNB_PC_2,1	V99U3414CB	XFMTN NAV BASE-PRES CL (1) ELEM2,1	DL FMT 53/1				93017G	*
1TNB_PC_2,2	V99U3417CB	XFMTN NAV BASE-PRES CL (1) ELEM2,2	DL FMT 53/1				93017G	*
1TNB_PC_2,3	V99U3420CB	XFMTN NAV BASE-PRES CL (1) ELEM2,3	DL FMT 53/1				93017G	*
1TNB_PC_3,1	V99U3423CB	XFMTN NAV BASE-PRES CL (1) ELEM3,1	DL FMT 53/1				93017G	*
1TNB_PC_3,2	V99U3426CB	XFMTN NAV BASE-PRES CL (1) ELEM3,2	DL FMT 53/1				93017G	*
1TNB_PC_3,3	V99U3429CB	XFMTN NAV BASE-PRES CL (1) ELEM3,3	DL FMT 53/1				93017G	*
1TNWU_AC_1,1	V99U2760C	NWU TO ALIGND/IMU-1 ELEMENT 1,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
1TNWU_AC_1,2	V99U2761C	NWU TO ALIGND/IMU-1 ELEMENT 1,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
1TNWU_AC_1,3	V99U2762C	NWU TO ALIGND/IMU-1 ELEMENT 1,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
1TNWU_AC_2,1	V99U2763C	NWU TO ALIGND/IMU-1 ELEMENT 2,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
1TNWU_AC_2,2	V99U2764C	NWU TO ALIGND/IMU-1 ELEMENT 2,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
1TNWU_AC_2,3	V99U2765C	NWU TO ALIGND/IMU-1 ELEMENT 2,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
1TNWU_AC_3,1	V99U2766C	NWU TO ALIGND/IMU-1 ELEMENT 3,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
1TNWU_AC_3,2	V99U2767C	NWU TO ALIGND/IMU-1 ELEMENT 3,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
1TNWU_AC_3,3	V99U2768C	NWU TO ALIGND/IMU-1 ELEMENT 3,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2,3	V99U3264C	G/C FAILED IMU 2,3 PAIR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
2TNB_PC_1,1	V99U3406CB	XFMTN NAV BASE-PRES CL (2) ELEM1,1	DL FMT 53/1				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
2TNB_PC_1,2	V99U3409CB	XFMTN NAV BASE-PRES CL (2) ELEM1,2	DL FMT 53/1				93017G	*
2TNB_PC_1,3	V99U3412CB	XFMTN NAV BASE-PRES CL (2) ELEM1,3	DL FMT 53/1				93017G	*
2TNB_PC_2,1	V99U3415CB	XFMTN NAV BASE-PRES CL (2) ELEM2,1	DL FMT 53/1				93017G	*
2TNB_PC_2,2	V99U3418CB	XFMTN NAV BASE-PRES CL (2) ELEM2,2	DL FMT 53/1				93017G	*
2TNB_PC_2,3	V99U3421CB	XFMTN NAV BASE-PRES CL (2) ELEM2,3	DL FMT 53/1				93017G	*
2TNB_PC_3,1	V99U3424CB	XFMTN NAV BASE-PRES CL (2) ELEM3,1	DL FMT 53/1				93017G	*
2TNB_PC_3,2	V99U3427CB	XFMTN NAV BASE-PRES CL (2) ELEM3,2	DL FMT 53/1				93017G	*
2TNB_PC_3,3	V99U3430CB	XFMTN NAV BASE-PRES CL (2) ELEM3,3	DL FMT 53/1				93017G	*
2TNWU_AC_1,1	V99U2769C	NWU TO ALIGND/IMU-2 ELEMENT 1,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2TNWU_AC_1,2	V99U2770C	NWU TO ALIGND/IMU-2 ELEMENT 1,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2TNWU_AC_1,3	V99U2771C	NWU TO ALIGND/IMU-2 ELEMENT 1,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2TNWU_AC_2,1	V99U2772C	NWU TO ALIGND/IMU-2 ELEMENT 2,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2TNWU_AC_2,2	V99U2773C	NWU TO ALIGND/IMU-2 ELEMENT 2,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2TNWU_AC_2,3	V99U2774C	NWU TO ALIGND/IMU-2 ELEMENT 2,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2TNWU_AC_3,1	V99U2775C	NWU TO ALIGND/IMU-2 ELEMENT 3,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2TNWU_AC_3,2	V99U2776C	NWU TO ALIGND/IMU-2 ELEMENT 3,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
2TNWU_AC_3,3	V99U2777C	NWU TO ALIGND/IMU-2 ELEMENT 3,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNB_PC_1,1	V99U3407CB	XFMTN NAV BASE-PRES CL (3) ELEM1,1	DL FMT 53/1				93017G	*
3TNB_PC_1,2	V99U3410CB	XFMTN NAV BASE-PRES CL (3) ELEM1,2	DL FMT 53/1				93017G	*
3TNB_PC_1,3	V99U3413CB	XFMTN NAV BASE-PRES CL (3) ELEM1,3	DL FMT 53/1				93017G	*
3TNB_PC_2,1	V99U3416CB	XFMTN NAV BASE-PRES CL (3) ELEM2,1	DL FMT 53/1				93017G	*
3TNB_PC_2,2	V99U3419CB	XFMTN NAV BASE-PRES CL (3) ELEM2,2	DL FMT 53/1				93017G	*
3TNB_PC_2,3	V99U3422CB	XFMTN NAV BASE-PRES CL (3) ELEM2,3	DL FMT 53/1				93017G	*
3TNB_PC_3,1	V99U3425CB	XFMTN NAV BASE-PRES CL (3) ELEM3,1	DL FMT 53/1				93017G	*
3TNB_PC_3,2	V99U3428CB	XFMTN NAV BASE-PRES CL (3) ELEM3,2	DL FMT 53/1				93017G	*
3TNB_PC_3,3	V99U3431CB	XFMTN NAV BASE-PRES CL (3) ELEM3,3	DL FMT 53/1				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
3TNWU_AC_1,1	V99U2778C	NWU TO ALIGND/IMU-3 ELEMENT 1,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNWU_AC_1,2	V99U2779C	NWU TO ALIGND/IMU-3 ELEMENT 1,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNWU_AC_1,3	V99U2780C	NWU TO ALIGND/IMU-3 ELEMENT 1,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNWU_AC_2,1	V99U2781C	NWU TO ALIGND/IMU-3 ELEMENT 2,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNWU_AC_2,2	V99U2782C	NWU TO ALIGND/IMU-3 ELEMENT 2,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNWU_AC_2,3	V99U2783C	NWU TO ALIGND/IMU-3 ELEMENT 2,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNWU_AC_3,1	V99U2784C	NWU TO ALIGND/IMU-3 ELEMENT 3,1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNWU_AC_3,2	V99U2785C	NWU TO ALIGND/IMU-3 ELEMENT 3,2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
3TNWU_AC_3,3	V99U2786C	NWU TO ALIGND/IMU-3 ELEMENT 3,3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		SPL		93017G	*
ACCEL_SF(1)	V71K2541BD	IMU 1 CAPRI SC FAC CMD	WD2 B0 IMU 1 TLM					
ACCEL_SF(2)	V71K3541BD	IMU 2 CAPRI SC FAC CMD	WD2 B0 IMU 2 TLM					
ACCEL_SF(3)	V71K4541BD	IMU 3 CAPRI SC FAC CMD	WD2 B0 IMU 3 TLM					
ALIGNCMP	V95X0010X	ALIGN COMPLETE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP		BD		93017G	*
ALIGN_FAIL	V95X0008X	GYROCOMPASS ALIGN FAIL	GROUND IMU DISP		BD		92297B	
AZANG(1)	V95H0051CC	IMU 1 COMP AZIMUTH RES ANGLE	DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AZANG(2)	V95H1051CC	IMU 2 COMP AZIMUTH RES ANGLE	DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
AZANG(3)	V95H2051CC	IMU 3 COMP AZIMUTH RES ANGLE	GROUND IMU DISP DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
CMD_WD1(1)	V71M2520PD	IMU 1 COMMAND WORD 1	GROUND IMU DISP DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD1(2)	V71M3520PD	IMU 2 COMMAND WORD 1	IMU 1 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD1(3)	V71M4520PD	IMU 3 COMMAND WORD 1	IMU 2 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD2(1)	V71M2540PD	IMU 1 COMMAND WORD 2	IMU 3 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
CMD_WD2(2)	V71M3540PD	IMU 2 COMMAND WORD 2	IMU 1 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD2(3)	V71M4540PD	IMU 3 COMMAND WORD 2	IMU 2 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
DVX(1)	V99U2860CC	IMU-1 X-AXIS DELTA VEL MAJ CYC	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DVX(2)	V99U2861CC	IMU-2 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX(3)	V99U2862CC	IMU-3 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX_1SEC(1)	V95L0056CC	IMU 1 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(2)	V95L1056CC	IMU 2 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(3)	V95L2056CC	IMU 3 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY(1)	V99U2863CC	IMU-1 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(2)	V99U2864CC	IMU-2 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(3)	V99U2865CC	IMU-3 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY_1SEC(1)	V95L0057CC	IMU 1 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY_1SEC(2)	V95L1057CC	IMU 2 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY_1SEC(3)	V95L2057CC	IMU 3 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ(1)	V99U2866CC	IMU-1 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(2)	V99U2867CC	IMU-2 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(3)	V99U2868CC	IMU-3 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ_1SEC(1)	V95L0058CC	IMU 1 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ_1SEC(2)	V95L1058CC	IMU 2 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ_1SEC(3)	V95L2058CC	IMU 3 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
E12N	V99U3288C	IMU 1 TO 2 RELATIVE N TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*



TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
E12U	V99U3285C	IMU 1 TO 2 RELATIVE AZ TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*
E12W	V99U3291C	IMU 1 TO 2 RELATIVE W TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*
E13N	V99U3289C	IMU 1 TO 3 RELATIVE N TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*
E13U	V99U3286C	IMU 1 TO 3 RELATIVE AZ TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*
E13W	V99U3292C	IMU 1 TO 3 RELATIVE W TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*
E23N	V99U3290C	IMU 2 TO 3 RELATIVE N TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*
E23U	V99U3287C	IMU 2 TO 3 RELATIVE AZ TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*
E23W	V99U3293C	IMU 2 TO 3 RELATIVE W TILT ERROR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD	SPL		93017G	*
ETD1(1)	V99U2845CB	ETD1(1) IMU-1 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD1(2)	V99U2848CB	ETD1(2) IMU-1 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD1(3)	V99U2851CB	ETD1(3) IMU-1 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD2(1)	V99U2846CB	ETD2(1) IMU-2 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD2(2)	V99U2849CB	ETD2(2) IMU-2 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD2(3)	V99U2852CB	ETD2(3) IMU-2 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD3(1)	V99U2847CB	ETD3(1) IMU-3 LSF EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
ETD3(2)	V99U2850CB	ETD3(2) IMU-3 LSF EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETD3(3)	V99U2853CB	ETD3(3) IMU-3 LSF EST UP DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR			93017G	*
ETDN(1)	V99U3250C	IMU 1 EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR	SPL		93017G	*
ETDN(2)	V99U3251C	IMU 2 EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR	SPL		93017G	*
ETDN(3)	V99U3252C	IMU 3 EST NORTH DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR	SPL		93017G	*
ETDW(1)	V99U3253C	IMU 1 EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR	SPL		93017G	*
ETDW(2)	V99U3254C	IMU 2 EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR	SPL		93017G	*
ETDW(3)	V99U3255C	IMU 3 EST WEST DRIFT	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	DEG/HR	SPL		93017G	*
FAIL_AC(1)	V95X0777X	IMU-1 ALIGNMENT CORRECTION LIMITED	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
FAIL_AC(2)	V95X0778X	IMU-2 ALIGNMENT CORRECTION LIMITED	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
FAIL_AC(3)	V95X0779X	IMU-3 ALIGNMENT CORRECTION LIMITED	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
FAIL_ACCEL_SF(1)	V95X0081XC	IMU 1 ACC/CAPRI SF FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_ACCEL_SF(2)	V95X1081XC	IMU 2 ACC/CAPRI SF FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_ACCEL_SF(3)	V95X2081XC	IMU 3 ACC/CAPRI SF FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_ECHO_1(1)	V95X0030XC	IMU 1 WORD 13 ECHO FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_ECHO_1(2)	V95X1030XC	IMU 2 WORD 13 ECHO FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_ECHO_1(3)	V95X2030XC	IMU 3 WORD 13 ECHO FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_ECHO_2(1)	V95X0031XC	IMU 1 WORD 14 ECHO FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_ECHO_2(2)	V95X1031XC	IMU 2 WORD 14 ECHO FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_ECHO_2(3)	V95X2031XC	IMU 3 WORD 14 ECHO FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_IR_NULL(1)	V95X0034XC	IMU 1 INNER RESOLVER NULL FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_IR_NULL(2)	V95X1034XC	IMU 2 INNER RESOLVER NULL FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_IR_NULL(3)	V95X2034XC	IMU 3 INNER RESOLVER NULL FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_RES_LIM(1)	V95X0037XC	IMU 1 RESOLVER LIMIT FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_RES_LIM(2)	V95X1037XC	IMU 2 RESOLVER LIMIT FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_RES_LIM(3)	V95X2037XC	IMU 3 RESOLVER LIMIT FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_VEL_LIM(1)	V95X0035XC	IMU 1 VELOCITY LIMIT FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_VEL_LIM(2)	V95X1035XC	IMU 2 VELOCITY LIMIT FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
FAIL_VEL_LIM(3)	V95X2035XC	IMU 3 VELOCITY LIMIT FAIL	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
GCP	V99H2720C	GYROCOMPASS POSITION INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		HXS		93017G	*
GYRO_COMP	V95X0015X	GYROCOMPASS ALIGNMENT IN PROGRESS	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
HDW_BITE1(1)	V95Q0076CC	IMU 1 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1				93017G	*
HDW_BITE1(2)	V95Q1076CC	IMU 2 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1				93017G	*
HDW_BITE1(3)	V95Q2076CC	IMU 3 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1				93017G	*
HDW_BITE2(1)	V95Q0077CC	IMU 1 HEX MODE/BITE STATUS WORD	GROUND IMU DISP GROUND IMU DISP TLM					

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
HDW_BITE2(2)	V95Q1077CC	IMU 2 HEX MODE/BITE STATUS WORD	GROUND IMU DISP					
			TLM					
HDW_BITE2(3)	V95Q2077CC	IMU 3 HEX MODE/BITE STATUS WORD	GROUND IMU DISP					
			TLM					
IMU_1_SEL_STATUS	V95X0021XC	IMU 1 SELECT STATUS	GROUND IMU DISP					
			TLM					
IMU_2_SEL_STATUS	V95X1021XC	IMU 2 SELECT STATUS	GROUND IMU DISP					
			TLM					
IMU_3_SEL_STATUS	V95X2021XC	IMU 3 SELECT STATUS	GROUND IMU DISP					
			TLM					
IMU_FAIL_IND(1)	V95X0023XC	IMU 1 FAILURE INDICATOR	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 53/1					
			DL FMT 60/1					
IMU_FAIL_IND(2)	V95X1023XC	IMU 2 FAILURE INDICATOR	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 53/1					
			DL FMT 60/1					
IMU_FAIL_IND(3)	V95X2023XC	IMU 3 FAILURE INDICATOR	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 53/1					
			DL FMT 60/1					
INERTIAL	V95X0001X	IN INERTIAL MODE	TLM		BD		89986H	
IRANG(1)	V95H0053CC	IMU 1 COMP INNER ROLL RES ANGLE	DL FMT 21/1	DEG			93017G	*
			DL FMT 44/2					
			DL FMT 45/2					
			DL FMT 60/2					
IRANG(2)	V95H1053CC	IMU 2 COMP INNER ROLL RES ANGLE	GROUND IMU DISP	DEG			93017G	*
			DL FMT 21/1					
			DL FMT 44/2					
			DL FMT 45/2					
			DL FMT 60/2					
IRANG(3)	V95H2053CC	IMU 3 COMP INNER ROLL RES ANGLE	GROUND IMU DISP	DEG			93017G	*
			DL FMT 21/1					
			DL FMT 44/2					
			DL FMT 45/2					
			DL FMT 60/2					
LATCOMP(1)	V95X0085XC	IMU 1 LARGE ANGLE TORQ COMPLETE	GROUND IMU DISP				93017G	*
			DL FMT 44/1					
			DL FMT 45/1					
			DL FMT 60/1					
LATCOMP(2)	V95X1085XC	IMU 2 LARGE ANGLE TORQ COMPLETE	DL FMT 44/1				93017G	*
			DL FMT 45/1					
			DL FMT 60/1					

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
LATCOMP(3)	V95X2085XC	IMU 3 LARGE ANGLE TORQ COMPLETE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
MN(1)	V95H0781C	IMU-1 MISALIGNMENT ABOUT NORTH	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
MN(2)	V95H0782C	IMU-2 MISALIGNMENT ABOUT NORTH	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
MN(3)	V95H0783C	IMU-3 MISALIGNMENT ABOUT NORTH	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
MU(1)	V95H0787C	IMU-1 MISALIGNMENT ABOUT AZIMUTH	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
MU(2)	V95H0788C	IMU-2 MISALIGNMENT ABOUT AZIMUTH	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
MU(3)	V95H0789C	IMU-3 MISALIGNMENT ABOUT AZIMUTH	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
MW(1)	V95H0784C	IMU-1 MISALIGNMENT ABOUT WEST	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
MW(2)	V95H0785C	IMU-2 MISALIGNMENT ABOUT WEST	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
MW(3)	V95H0786C	IMU-3 MISALIGNMENT ABOUT WEST	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS	SPL		93017G	*
OPER_CMD(1)	V71K2576XD	IMU-1 OPERATE MODE CMD	DL FMT 21/A GROUND IMU DISP IMU 1				93017G	*
OPER_CMD(1)	V95X0655XC	IMU 1 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
OPER_CMD(2)	V71K3576XD	IMU-2 OPERATE MODE CMD	DL FMT 21/A GROUND IMU DISP IMU 2				93017G	*
OPER_CMD(2)	V95X0656XC	IMU 2 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
OPER_CMD(3)	V71K4576XD	IMU-3 OPERATE MODE CMD	DL FMT 21/A GROUND IMU DISP IMU 3				93017G	*
OPER_CMD(3)	V95X0657XC	IMU 3 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
ORANG(1)	V95H0054CC	IMU 1 COMP OUTER ROLL RES ANGLE	DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
ORANG(2)	V95H1054CC	IMU 2 COMP OUTER ROLL RES ANGLE	DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
ORANG(3)	V95H2054CC	IMU 3 COMP OUTER ROLL RES ANGLE	DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(1)	V95H0050CC	IMU 1 COMP PITCH RES ANGLE	DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(2)	V95H1050CC	IMU 2 COMP PITCH RES ANGLE	DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PANG(3)	V95H2050CC	IMU 3 COMP PITCH RES ANGLE	DL FMT 21/1 DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
PHIDIJ(1)	V99R3581CB	REL RATE VECTOR IMU 1 TO 2,COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PHIDIJ(1)	V99R3584CB	REL RATE VECTOR IMU 1 TO 3,COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*
PHIDIJ(1)	V99R3587CB	REL RATE VECTOR IMU 2 TO 3,COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*
PHIDIJ(2)	V99R3582CB	REL RATE VECTOR IMU 1 TO 2,COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*
PHIDIJ(2)	V99R3585CB	REL RATE VECTOR IMU 1 TO 3,COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*
PHIDIJ(2)	V99R3588CB	REL RATE VECTOR IMU 2 TO 3,COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*
PHIDIJ(3)	V99R3583CB	REL RATE VECTOR IMU 1 TO 2,COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*
PHIDIJ(3)	V99R3586CB	REL RATE VECTOR IMU 1 TO 3,COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*
PHIDIJ(3)	V99R3589CB	REL RATE VECTOR IMU 2 TO 3,COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD/SEC			93017G	*
PHIIJ(1)	V99U3571CB	MISALIGN VECTOR IMU 1 TO 2 COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*
PHIIJ(1)	V99U3574CB	MISALIGN VECTOR IMU 1 TO 3 COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*
PHIIJ(1)	V99U3577CB	MISALIGN VECTOR IMU 2 TO 3 COMP 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*
PHIIJ(2)	V99U3572CB	MISALIGN VECTOR IMU 1 TO 2 COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*
PHIIJ(2)	V99U3575CB	MISALIGN VECTOR IMU 1 TO 3 COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*
PHIIJ(2)	V99U3578CB	MISALIGN VECTOR IMU 2 TO 3 COMP 2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*
PHIIJ(3)	V99U3573CB	MISALIGN VECTOR IMU 1 TO 2 COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*



TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PHIIJ(3)	V99U3576CB	MISALIGN VECTOR IMU 1 TO 3 COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*
PHIIJ(3)	V99U3579CB	MISALIGN VECTOR IMU 2 TO 3 COMP 3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	RAD			93017G	*
PN(1)	V99U2830CB	IMU 1 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PN(2)	V99U2831CB	IMU 2 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PN(3)	V99U2832CB	IMU 3 NORTH DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PUP(1)	V99U2836CB	IMU 1 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PUP(2)	V99U2837CB	IMU 2 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PUP(3)	V99U2838CB	IMU 3 UP DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(1)	V99U2833CB	IMU 1 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(2)	V99U2834CB	IMU 2 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PW(3)	V99U2835CB	IMU 3 WEST DEL VEL OVER MAJ CYCLE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
PWR_ON(1)	V95X0020XC	IMU 1 POWER ON	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PWR_ON(2)	V95X1020XC	IMU 2 POWER ON	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PWR_ON(3)	V95X2020XC	IMU 3 POWER ON	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PX(1)	V71K2521BD	IMU-1 TORQUE X CMD	WD1B0-4	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 1	ARCS		93017G	*
PX(2)	V71K3521BD	IMU-2 TORQUE X CMD	WD1B0-4	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	ARCS		93017G	*
PX(3)	V71K4521BD	IMU-3 TORQUE X CMD	WD1B0-4	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	ARCS		93017G	*
PY(1)	V71K2526BD	IMU-1 TORQUE Y CMD	WD1B5-9	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 1	ARCS		93017G	*
PY(2)	V71K3526BD	IMU-2 TORQUE Y CMD	WD1B5-9	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	ARCS		93017G	*
PY(3)	V71K4526BD	IMU-3 TORQUE Y CMD	WD1B5-9	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	ARCS		93017G	*
PZ(1)	V71K2531BD	IMU-1 TORQUE Z CMD	WD1B10-14	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 1	ARCS		93017G	*
PZ(2)	V71K3531BD	IMU-2 TORQUE Z CMD	WD1B10-14	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	ARCS		93017G	*
PZ(3)	V71K4531BD	IMU-3 TORQUE Z CMD	WD1B10-14	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	ARCS		93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
REFS_RDY	V95X0780X	REFSMAT COMPUTATION COMPLETED	A/E ATT PROC DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP IMU RM MSC		BD		93017G	*
S/W_BITE(1)	V95X0046XC	IMU 1 SW BITE STATUS	GROUND IMU DISP				92297B	
S/W_BITE(2)	V95X1046XC	IMU 2 SW BITE STATUS	GROUND IMU DISP				92297B	
S/W_BITE(3)	V95X2046XC	IMU 3 SW BITE STATUS	GROUND IMU DISP				92297B	
SLEW_X_NEG(1)	V71K2543BD	IMU-1 SLEW X NEG	WD2B2 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S			93017G	*
SLEW_X_NEG(2)	V71K3543BD	IMU-2 SLEW X NEG	WD2B2 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S			93017G	*
SLEW_X_NEG(3)	V71K4543BD	IMU-3 SLEW X NEG	WD2B2 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S			93017G	*
SLEW_X_POS(1)	V71K2542BD	IMU-1 SLEW X POS	WD2B1 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S			93017G	*
SLEW_X_POS(2)	V71K3542BD	IMU-2 SLEW X POS	WD2B1 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S			93017G	*
SLEW_X_POS(3)	V71K4542BD	IMU-3 SLEW X POS	WD2B1 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S			93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Y_NEG(1)	V71K2545BD	IMU-1 SLEW Y NEG	WD2B4	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Y_NEG(2)	V71K3545BD	IMU-2 SLEW Y NEG	WD2B4	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Y_NEG(3)	V71K4545BD	IMU-3 SLEW Y NEG	WD2B4	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Y_POS(1)	V71K2544BD	IMU-1 SLEW Y POS	WD2B3	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Y_POS(2)	V71K3544BD	IMU-2 SLEW Y POS	WD2B3	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Y_POS(3)	V71K4544BD	IMU-3 SLEW Y POS	WD2B3	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Z_NEG(1)	V71K2547BD	IMU-1 SLEW Z NEG	WD2B6	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Z_NEG(2)	V71K3547BD	IMU-2 SLEW Z NEG	WD2B6	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Z_NEG(3)	V71K4547BD	IMU-3 SLEW Z NEG	WD2B6	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Z_POS(1)	V71K2546BD	IMU-1 SLEW Z POS	WD2B5	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Z_POS(2)	V71K3546BD	IMU-2 SLEW Z POS	WD2B5	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Z_POS(3)	V71K4546BD	IMU-3 SLEW Z POS	WD2B5	DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
THETA1(1)	V99U3220CB	IMU-1 NORTH COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 3	FT/S2		93017G	*
THETA1(2)	V99U3223CB	IMU-1 WEST COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA1(3)	V99U3226CB	IMU-1 UP COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA2(1)	V99U3221CB	IMU-2 NORTH COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA2(2)	V99U3224CB	IMU-2 WEST COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*
THETA2(3)	V99U3227CB	IMU-2 UP COMP EST ACCEL VECTOR		DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2		93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
THETA3(1)	V99U3222CB	IMU-3 NORTH COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
THETA3(2)	V99U3225CB	IMU-3 WEST COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
THETA3(3)	V99U3228CB	IMU-3 UP COMP EST ACCEL VECTOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	FT/S2			93017G	*
T_CLUSTER_M50(1,1,1)	V99U3450CB	CLUSTER TO M50/IMU-1 COMPONENT 1,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,1,2)	V99U3453CB	CLUSTER TO M50/IMU-1 COMPONENT 1,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,1,3)	V99U3456CB	CLUSTER TO M50/IMU-1 COMPONENT 1,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,2,1)	V99U3459CB	CLUSTER TO M50/IMU 1 COMPONENT 2,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(1,2,2)	V99U3462CB	CLUSTER TO M50/IMU-1 COMPONENT 2,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,2,3)	V99U3465CB	CLUSTER TO M50/IMU-1 COMPONENT 2,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,3,1)	V99U3468CB	CLUSTER TO M50/IMU-1 COMPONENT 3,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,3,2)	V99U3471CB	CLUSTER TO M50/IMU-1 COMPONENT 3,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,3,3)	V99U3474CB	CLUSTER TO M50/IMU-1 COMPONENT 3,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,1,1)	V99U3451CB	CLUSTER TO M50/IMU-2 COMPONENT 1,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(2,1,2)	V99U3454CB	CLUSTER TO M50/IMU-2 COMPONENT 1,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,1,3)	V99U3457CB	CLUSTER TO M50/IMU-2 COMPONENT 1,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,2,1)	V99U3460CB	CLUSTER TO M50/IMU-2 COMPONENT 2,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,2,2)	V99U3463CB	CLUSTER TO M50/IMU-2 COMPONENT 2,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,2,3)	V99U3466CB	CLUSTER TO M50/IMU-2 COMPONENT 2,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,3,1)	V99U3469CB	CLUSTER TO M50/IMU-2 COMPONENT 3,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*



TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(2,3,2)	V99U3472CB	CLUSTER TO M50/IMU-2 COMPONENT 3,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM				93017G	*
T_CLUSTER_M50(2,3,3)	V99U3475CB	CLUSTER TO M50/IMU-2 COMPONENT 3,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM				93017G	*
T_CLUSTER_M50(3,1,1)	V99U3452CB	CLUSTER TO M50/IMU-3 COMPONENT 1,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM				93017G	*
T_CLUSTER_M50(3,1,2)	V99U3455CB	CLUSTER TO M50/IMU-3 COMPONENT 1,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM				93017G	*
T_CLUSTER_M50(3,1,3)	V99U3458CB	CLUSTER TO M50/IMU-3 COMPONENT 1,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM				93017G	*
T_CLUSTER_M50(3,2,1)	V99U3461CB	CLUSTER TO M50/IMU-3 COMPONENT 2,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(3,2,2)	V99U3464CB	CLUSTER TO M50/IMU-3 COMPONENT 2,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,2,3)	V99U3467CB	CLUSTER TO M50/IMU-3 COMPONENT 2,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,3,1)	V99U3470CB	CLUSTER TO M50/IMU-3 COMPONENT 3,1	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,3,2)	V99U3473CB	CLUSTER TO M50/IMU-3 COMPONENT 3,2	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,3,3)	V99U3476CB	CLUSTER TO M50/IMU-3 COMPONENT 3,3	A/E ATT PROC DL FMT 21/A DL FMT 32/A IMU INT PROC IMU ORB A/CAL IMU RM STAR TRCK SOP				93017G	*
VRSS(1)	V95L0060CC	IMU 1 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	FT/S2			93017G	*
VRSS(2)	V95L1060CC	IMU 2 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	FT/S2			93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
VRSS(3)	V95L2060CC	IMU 3 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S2			93017G	*
WRCF(1)	V95R0660CE	IMU 1 COMP AND FLTRD RED AXIS RATE	GROUND IMU DISP DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR			93017G	*
WRCF(2)	V95R0661CE	IMU 2 COMP AND FLTRD RED AXIS RATE	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR			93017G	*
WRCF(3)	V95R0662CE	IMU 3 COMP AND FLTRD RED AXIS RATE	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1	DEG/HR			93017G	*
	V72M6633PD	MDM FF01 DSCR OUT SET	CD 13 CH 0 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V72M6683PD	MDM FF02 DSCR OUT SET	CD 13 CH 0 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V72M6733PD	MDM FF03 DSCR OUT SET	CD 13 CH 0 DL FMT 21/A DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2842PC	CGMB_IMU_FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
	V95M2843PC	CGMB_PWR_ON_DFG	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2844P	CGMB_IMU_FLAG_W2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2846PC	CGMB_POS_COMP	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.5.1.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU GYROCOMPASS ALIGNMENT (V4.11)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V95M2847P	CGMB_FAIL_VT	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
	V95M2849P	CGMB_GC_FAILED	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2850PC	CGMB_SW_BITE\$(1:)	DL FMT 21/1 DL FMT 44/1 DL FMT 45/1				93017G	*
	V95M2851PC	CGMB_SW_BITE\$(2:)	DL FMT 60/1 DL FMT 21/1 DL FMT 44/1				93017G	*
	V95M2852PC	CGMB_SW_BITE\$(3:)	DL FMT 45/1 DL FMT 60/1 DL FMT 21/1				93017G	*
	V95M2872P	CGMB_INERTIAL_IPA	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

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

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

TABLE 4.5.4.5.1.1-3. IMU GYROCOMPASS ALIGNMENT (V4.11) 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 4.5.4.5.1.1-4. IMU GYROCOMPASS ALIGNMENT (V4.11) 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 4.5.4.5.1.1-5. IMU GYROCOMPASS ALIGNMENT (V4.11) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
DEG_PER_RAD RADIAN TO DEGREE CONVERSION FACTOR	V97U0112C	00	+5.72957795131E+01	DEG/RAD	F		S	C A6.9 G4.10 G4.126 G4.127 G4.128 G4.175 G4.20 G4.201 G4.204 G4.208 G4.21 G4.213 G4.220 G4.226 G4.227 G4.23 G4.234 G4.237 G4.24 G4.25 G4.35 G4.36 G4.5 G4.6 G4.66 G4.8 G4.9 G4.97 G5.26 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
GIM_FLIP_B1 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-I	V90H7625C	00	+8.0	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B2 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-II	V90H7626C	00	+1.0	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	

TABLE 4.5.4.5.1.1-5. IMU GYROCOMPASS ALIGNMENT (V4.11) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
GIM_FLIP_B3 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-III	V90H7627C	00	+2.60	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B4 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-IV	V90H7628C	00	+2.80	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GO EARTH GRAV ACCEL CONSTANT	V90A7622C	00	+3.2174049	E+01 FT/SEC**2	F		S	P A6.9 G4.10 G4.105 G4.126 G4.204 G4.208 G4.22 G4.220 G4.227 G4.234 G4.237 G4.36 G4.8 G4.9 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
IRL1 INNER ROLL NULL LIMIT 1	V90H7633C	00	+2.40	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
IRL2 INNER ROLL NULL LIMIT 2	V90H7634C	00	+3.360	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
KTN NOMINAL GYRO TORQUER SCALE FACTOR	V90G7621C	00	-5.0	E-01 ARC-SEC/PULSE	F		S	P G4.208 V4.10 V4.11 V4.11B	90374C	



TABLE 4.5.4.5.1.1-5. IMU GYROCOMPASS ALIGNMENT (V4.11) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
RAD RADIAN TO ARC-SEC CONVERSION	V97U6133C	00	+2.0626481	E+05	ARC-SEC/RAD	F	S	P A6.9 G4.208 G4.38 V4.10 V4.11 V4.9A	90374C	
RESLAGT APPROXIMATE MAXIMUM DATA SKEW TIME	V90W7642C	00	+7.0	E-03	SEC	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
RESLIMO RESOLVER LIMIT	V90H7640C	00	+1.0	E+00	DEG	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
SFH NOMINAL ACCELEROMETER SCALE FACTOR HIGH-GAIN	V96U7004C	00	+3.444880	E-03	FT/SEC/PULSE	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
SFL NOMINAL ACCELEROMETER SCALE FACTOR LOW-GAIN	V90A7644C	00	+3.444880	E-02	FT/SEC/PULSE	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
T_OP_LIMIT TIME IN OPERATE TEST LIMIT	V90W7623C	00	+3.00	E+02	SEC	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
VCMAX VELOCITY COUNTER OVER-FLOW FACTOR EQUALS MSB OF COUNTER	V90Q7637C	00	+2.0	E+15	PULSES	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
VELSUMM50X(1) IMU-1 ACUM SENSED CHANGE X VEL	V95L0065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50X(2) IMU-2 ACUM SENSED CHANGE X VEL	V95L1065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50X(3) IMU-3 ACUM SENSED CHANGE X VEL	V95L2065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	

TABLE 4.5.4.5.1.1-5. IMU GYROCOMPASS ALIGNMENT (V4.11) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
VELSUMM50Y(1) IMU-1 ACUM SENSED CHANGE Y VEL	V95L0066C	00	+0.0	E+00 FT/SEC	F	S	P	G4.208 V4.10 V4.11	90374C	
VELSUMM50Y(2) IMU-2 ACUM SENSED CHANGE Y VEL	V95L1066C	00	+0.0	E+00 FT/SEC	F	S	P	G4.208 V4.10 V4.11	90374C	
VELSUMM50Y(3) IMU-3 ACUM SENSED CHANGE Y VEL	V95L2066C	00	+0.0	E+00 FT/SEC	F	S	P	G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(1) IMU-1 ACUM SENSED CHANGE Z VEL	V95L0067C	00	+0.0	E+00 FT/SEC	F	S	P	G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(2) IMU-2 ACUM SENSED CHANGE Z VEL	V95L1067C	00	+0.0	E+00 FT/SEC	F	S	P	G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(3) IMU-3 ACUM SENSED CHANGE Z VEL	V95L2067C	00	+0.0	E+00 FT/SEC	F	S	P	G4.208 V4.10 V4.11	90374C	

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

#### 4.5.4.5.2 Gyrocompass Alignment 1 (GC\_ALIGN1).

The GC\_ALIGN1 module provides the IMU – related computations and control required to maintain the alignment of the platform and to transition to the inertial (flight) mode of operation.

A. Functional Requirements. The GC\_ALIGN1 module is required to perform the following functions for each applicable IMU:

1. Continue maintaining the earth fixed platform alignment which was determined by the GC\_ALIGN module. This is performed by second position gyrocompass measurements followed by error torque out. Earth rate torquing and excess rate torquing of gyro drift errors are provided during the entire process until platform release.
2. When the OPS–1 REQUEST, the INERTIAL command or the PLATFORM RELEASE is issued or a return from OPS–1 to GN&C 9 is commanded, perform the necessary transitions and processing. Return to the alignment maintenance unless the commands were to go INERTIAL or PLATFORM RELEASE. If so, proceed with the transfer to the M50 coordinate frame and the Inertial Submode.

B. Interface Requirements. The input/output interfaces associated with the GC\_ALIGN1 module are listed in Tables 4.5.4.5.2–1 and 4.5.4.5.2–2.

C. Detailed Requirements. The following sequence of operations is required for each selected IMU in the OPERATE mode after the GC\_ALIGN module is completed.

1. While performing the alignment maintenance processing by the second (final) position measurement and misalignment torque out steps which follow this item. Perform the following interrupt processing:
  - a. If in GN&C 9, monitor for an OPS–1 REQUEST and an INERTIAL Command. If either command occurs, terminate the operation in progress without completing.

If the command was the OPS–1 REQUEST, provide for the determination of transition time (DTOS) and execute the transition. After processing returns, set the IN INERTIAL MODE flag, begin processing at the rates specified in Paragraph D, monitor for PLATFORM RELEASE and reinitiate the alignment maintenance steps.

If the command was the INERTIAL Command, set the IN INERTIAL MODE flag and proceed to step 9 to transfer to the M50 coordinate frame and the inertial submode.
  - b. If in OPS–1, monitor for a return of OPS–1 to GN&C 9, the INERTIAL command and the PLATFORM RELEASE command. If either command occurs, terminate the operation in progress without completing.

If the command was to return to GN&C 9, provide for the determination of transition time (DTOS), execute the transition and upon return, proceed to the alignment maintenance while again monitoring for the OPS-1 request and the INERTIAL command. The processing rates after a return from OPS-1 will be at the Inertial Mode values specified (Para. D).

If the command was the INERTIAL command or the PLATFORM RELEASE command, proceed to step 9.

The alignment maintenance steps follows:

2. Set the transformation from reference to present cluster as:

$$\left[ T_{R}^{PC} \right] = \left[ T_{NWU}^{AC} \right]$$

3. Perform 2nd position data collection or torque out by performing the equivalent of ground sequence 3 with the following conditions:

- a. If this is the period immediately following a OPS transition either to OPS-1 from GN&C 9 or the reverse, perform the following: otherwise proceed to b.

$$ERN = -ETDN, ERW = -ETDW, ERU = -DU$$

Perform the sequence for a DTOS period to allow completion of catch up torquing of earth rate and excess rate. Inhibit the LSF filter or disregard the outputs. After completion, set the LSF flag and return to step 3.

- b. If the LSF flag is not set, this is a torque out period, perform the following; otherwise proceed to c to perform the LSF measurement.

$$ERN = RN - ETDN, ERW = RW - ETDW, ERU = RU - DU$$

Perform the sequence for a TC1 period to remove the misalignments. Inhibit or disregard the LSF outputs. After completion set the LSF flag and return to step 3.

- c. Set the conditions below for the LSF measurement and perform the measurement for a TGYRO1 period.

$$ERN = -ETDN, ERW = -ETDW, ERU = -DU$$

4. Compute the platform misalignment corrections as:

$$\begin{aligned} MN &= -\text{THETA (2) (RAD)} / G - \text{ETD (2) (TGYRO)} \\ MW &= \text{THETA (1) (RAD)} / G + \text{ETD (1) (TGYRO)} \\ MU &= -[ -\text{ETD (1) (RAD)} + (\text{WU}) (\text{THETA (2) (RAD)} / G) \\ &\quad + 1/2 (\text{WU}) (\text{ETD (2) (TGYRO1)})] / (\text{WN}) \end{aligned}$$

5. Filter the misalignment about up for measurement noise as follows:

$$MUF = (MU) (\text{UPGAIN})$$

where upgain is the amount of the measured misalignment to be attenuated for noise.

6. Reset the FAIL\_AC(i) flag and then perform alignment correction limiting as follows:

If  $|MN| > \text{TILTLIM}$  set  $\text{MCN} = \text{SIGN}(MN) (\text{TILTLIM})$  and set FAIL\_AC(i),  
otherwise  $\text{MCN} = MN$

If  $|MW| > \text{TILTLIM}$  set  $\text{MCW} = \text{SIGN}(MW) (\text{TILTLIM})$  and set FAIL\_AC(i),  
otherwise  $\text{MCW} = MW$

If  $|MUF| > \text{AZLIM}$  set  $\text{MCU} = \text{SIGN}(MUF) (\text{AZLIM})$  and set FAIL\_AC(i),  
otherwise  $\text{MCU} = MUF$

where  $i = \text{IMU } 1, 2 \text{ or } 3$ .

7. Compute the torque rates for correcting the misalignment as follows:

$$\text{RN} = \text{MCN} / \text{TC1}$$

$$\text{RW} = \text{MCW} / \text{TC1}$$

$$\text{RU} = \text{MCU} / \text{TC1}$$

8. Reset the LSF flag and return to step 3.

9. Terminate earth rate and excess rate torquing by setting:

$$\text{RDCLX} = 0, \quad \text{RDCLY} = 0, \quad \text{RDCLZ} = 0$$

10. Compute the current NWU-to-Aries M50 transformation:

- a. Call Coordinate transform module, a navigation subfunction module. The required input is the GMT at which earth rate and excess rate torque pulses are removed from the gyro torquing command words.

$$\text{The output is: } \left[ \text{T}_{\text{EF}}^{\text{M50}} \right] = \text{EARTH_FIXED_TO_M50_COORD}(\text{GMT})$$

Note that the RNP\_MAT\_COMP function (G4.16) must have been executed at least once prior to step 10a being executed. This ensures that the RNP matrix ( $\text{M\_M50TOEF\_AT\_EPOCH}$ ) and its  $\text{T\_EPOCH}$  have been computed and are available for computing the  $\text{EF\_TO\_M50}$  matrix.

- b. Call EF\_TO\_TOPDET, a navigation subfunction module. The required inputs are latitude and longitude.

$$\text{The output is : } \left[ \text{T}_{\text{EF}}^{\text{TD}} \right] = \text{EF\_TO\_TOPDET}(\text{LAT}, \text{LONG})$$

- c. Compute the NWU-to-earth-fixed transformation matrix:

$$\left[ \text{T}_{\text{NWU}}^{\text{EF}} \right] = \left[ \text{TEF\_TD}_1^{\text{T}}, -\text{TEF\_TD}_2^{\text{T}}, -\text{TEF\_TD}_3^{\text{T}} \right]$$

where  $\text{TEF\_TD}_1$  is the first row of  $\left[ \text{T}_{\text{EF}}^{\text{TD}} \right]$  etc.

- d. Compute the NWU-to-M50 transformation matrix:

$$\left[ T_{NWU}^{M50} \right] = \left[ T_{EF}^{M50} \right] \left[ T_{NWU}^{EF} \right]$$

Note that the Navigation subfunction modules (and their associated I-loads) referenced in a, b, and c must be available in any OPS load that allows preflight alignment.

11. Compute and store a cluster-to-M50 transformation for each IMU:

$$\left[ T_{Ci}^{M50} \right] = \left[ T_{NWU}^{M50} \right] \left[ T_{NWU}^{ACi} \right]^T$$

12. Set the REFS\_RDY flag to begin M50 coordinate frame velocity processing and to notify users that the REFSMATS are ready. Exit GC\_ALIGN1 and perform processing of the INERTIAL Submode paragraph 4.5.4.6.

A suggested design flow that satisfies the GC\_ALIGN1 requirements is shown in figure 4.5.4.5.2-1.

D. Special Considerations. The anticipated functional use of this module is described in paragraph 4.5.4.5.1.D, GC\_ALIGN, paragraph 4.5.4.6.D INERTIAL and below.

Prior to OPS-1, the scheduling rates of the modules are as specified in the GN&C 9 requirements paragraph 4.1.5. Once OPS-1 has been entered, even if a return to GN&C 9 occurs, the rates are basically as specified in the INERTIAL Submode during high velocity processing. In addition, however, the TOR\_TRSF and LSF\_FILTR modules are required. A list of the modules and their scheduled rates are shown below.

	MODULE	RATE (Hz)
1.	IMU_BITE	1.04
2.	ACP_ACUM	6.25
3.	RES_PROC	1.04
4.	BITE_SUM	1.04
5.	ACP_COMP	6.25
6.	TOR_TRSF	6.25*
7.	GYO_COMP	1.04
8.	GYO_TORQ	6.25
9.	ACP_TRSF	6.25
10.	RGM_COMP	6.25
11.	LSF_FILTR	6.25

\* Update required only once prior to the start of the equivalent ground sequence 3.

The control of the GC\_ALIGN1 is by three commands: the OPS-1 Request, the INERTIAL command (Item 25) and the PLATFORM RELEASE (Event 11) command. For the normal launch sequence the OPS-1 Request will cause the transition from GN&C 9 to OPS-1 and will result in the software modules being run as specified above. The north-west-up coordinate frame will be maintained until Event 11 when the PLATFORM RELEASE command occurs. The PLATFORM RELEASE command will result in the termination of earth rate and excess rate torquing, transfer to the M50 coordinate frame and the generation of the software REFS\_RDY flag which will cause Delta-V outputs to be in the M50 coordinate frame for flight. The REFS\_RDY flag will also indicate to the other users that M50 coordinate frame processing has begun and that the INERTIAL Submode is being entered.

The INERTIAL command is normally used for test purposes. The command which is entered via the display, causes the transfer to the M50 coordinate frame followed by the issuance of the REFS\_RDY flag and the INERTIAL submode processing. The INERTIAL command thus bypasses OPS-1 NWU alignment maintenance processing and the PLATFORM RELEASE command. It can be issued anytime after the GC\_ALIGN module has been completed as indicated by the ALIGNCOMP flag.

Once the M50 coordinate frame processing has begun either through PLATFORM RELEASE or through the INERTIAL command, a return to the alignment maintenance routine in either OPS-1 or GN&C 9 is not permitted. If a hold occurs during the prelaunch sequence after Event 11, the hold time is limited because the excess rate torquing has been terminated. For realignment and reinstating the alignment maintenance, the TERM/IDLE command followed by the GN&C 9 ATT\_DET and GC\_ALIGN command is required.

Although the GC\_ALIGN1 module permits going back and forth between GN&C 9 and OPS-1, operationally, a procedural delay of 2 minutes should be allowed to complete the transition and to permit catch up torquing before issuing another transition command. Otherwise the processing may be erroneous and the gyro pulse torquing may be exceeded thus losing the reference alignment.

Prior to OPS-1, performance of an OPS Mode Recall with Redundant Set change will result in termination of the IMU Preflight Alignment submode (including GC\_ALIGN1) and transition to the TERM/IDLE submode. After an OPS 9 to OPS 1 to OPS 9 transition sequence while alignment maintenance was running (i.e. GC\_ALIGN1 is using the INERTIAL rates in OPS 9), performance of an OPS Mode Recall with Redundant Set change will not result in termination of the IMU Preflight Alignment submode.

The GC\_ALIGN1 module is designed for residence in both the GN&C 9 and the OPS-1 software. For coding convenience or memory savings, it may be possible to implement separate coding for GN&C 9 as described in paragraph C.1.a and for OPS-1 as described in paragraph C.1.b.

Table 4.5.4.5.2-1. GC\_ALIGN1 Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
T <sub>NWU</sub> <sup>AC</sup>	V99U2760C THRU V99U2786C	TRANSFORMATION: NWU TO ALIGNED CLUSTER; 1 PER IMU	GC_ALIGN	MATRIX	+/-1	NA	ONCE
THETA	V99U3220C THRU V99U3228C	ESTIMATED ACCELERATION VECTOR (NWU ORDER); 1 PER IMU	LSF_FILR	VECTOR	+/-3.2	FT/SEC/ SEC	OD
ETD	V99U2845C THRU V99U2853C	ESTIMATED DRIFT VECTOR (NWU ORDER); 1 PER IMU	LSF_FILR	VECTOR	+/-90	DEG/HR	OD
UPGAIN	V99U9808C	ATTENUATION CONSTANT FOR UP AXIS MEASUREMENT NOISE	I-LOAD	SCALAR	0-1	NA	OD
INERTIAL	V93X6050X	INERTIAL COMMAND	DISPLAY	LOGICAL	0,1	NA	OD
PLTF_RLS	V90X8411X	PLATFORM RELEASE CMD	RSLs	LOGICAL	0,1	NA	OD
TC1	V99U9807C	TIME PERIOD TO TORQUE OUT MISALIGNMENT ERROR	I-LOAD	SCALAR	0-60	SEC	OD
G_SITE_N (N=1-9)	V96A7002C	LOCAL GRAVITY VALUE	I-LOAD	SCALAR	32.08 TO 32.21	FT/SEC/SEC	OD
LAT_SITE_N (N=1-9)	V96H7079C	ASTRO LATITUDE OF N/B	I-LOAD	SCALAR	+/-1.58	RAD	OD
LONG_SITE_N (N=1-9)	V96H7080C	ASTRO LONGITUDE OF N/B	I-LOAD	SCALAR	+/-3.15	RAD	OD
RAD	V97U6133C	CONVERSION FACTOR TO CONVERT RADIANS TO ARC-SECONDS	CONSTANT	SCALAR	206264.8	ARC-SEC /RAD	OD
LSF		FLAG FOR LSF TO RUN	GC_ALIGN	LOGICAL	0,1	NA	ONCE
OPS1		OPS 1 REQUEST	SYSTEM	LOGICAL	+/-1	NA	ONCE
CLOCK/ CLOCKTIME	V91W5000C	CLOCK COMPUTER (GMT)	FCOS	SCALAR		SEC	ONCE
ETDN(1)	V99U3250C	IMU-1 EST NORTH DRIFT	GC_ALIGN	SCALAR	+/-1	DEG/HR	ONCE
ETDN(2)	V99U3251C	IMU-2 EST NORTH DRIFT	GC_ALIGN	SCALAR	+/-1	DEG/HR	ONCE
ETDN(3)	V99U3252C	IMU-3 EST NORTH DRIFT	GC_ALIGN	SCALAR	+/-1	DEG/HR	ONCE
ETDW(1)	V99U3252C	IMU-1 EST WEST DRIFT	GC_ALIGN	SCALAR	+/-1	DEG/HR	ONCE
ETDW(2)	V99U3254C	IMU-2 EST WEST DRIFT	GC_ALIGN	SCALAR	+/-1	DEG/HR	ONCE
ETDW(3)	V99U3255C	IMU-3 EST WEST DRIFT	GC_ALIGN	SCALAR	+/-1	DEG/HR	ONCE
TGYRO1	V99U9806C	TIME PERIOD TO COLLECT DATA	I-LOAD	SCALAR	0-1800	SEC	OD
DU(1)	V99U7545C	IMU-1 UP AXIS DRIFT	I-LOAD	SCALAR	+/-0.1	DEG/HR	ONCE
DU(2)	V99U7546C	IMU-2 UP AXIS DRIFT	I-LOAD	SCALAR	+/-0.1	DEG/HR	ONCE
DU(3)	V99U7547C	IMU-3 UP AXIS DRIFT	I-LOAD	SCALAR	+/-0.1	DEG/HR	ONCE
TILTLIM	V99U9805C	TILT MISALIGNMENT TORQUE OUT LIMIT	I-LOAD	SCALAR	0-1000	ARC-SEC	OD
AZLIM	V99U9804C	AZIMUTH MISALIGNMENT TORQUE OUT LIMIT	I-LOAD	SCALAR	0-1000	ARC-SEC	OD
WN	V96R7026C	NORTH COMPONENT OF EARTH'S RATE	I-LOAD	SCALAR	0-15.2	DEG/HR	OD



Table 4.5.4.5.2-1. GC\_ALIGN1 Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
WU	V96R7027C	UP COMPONENT OF EARTH'S RATE	I-LOAD	SCALAR	0-15.2	DEG/HR	OD
IMU_1_SEL_STATUS	V95X0021X	IMU-1 SELECT STATUS	IMU_BITE DISP_SUP	LOGICAL	0,1	NA	OD
IMU_2_SEL_STATUS	V95X1021X	IMU-2 SELECT STATUS	IMU_BITE DISP_SUP	LOGICAL	0,1	NA	OD
IMU_3_SEL_STATUS	V95X2021X	IMU-3 SELECT STATUS	IMU_BITE DISP_SUP	LOGICAL	0,1	NA	OD
M_M50TOEF_AT_EPOCH	V97U5738C - V97U5746C	M50 TO EF TRANS MATRIX ELEM 1,1 - ELEM 3,3	RNP_MAT_ COMP	SCALAR	±1.0	NA	OD
T_EPOCH	V97W5528C	TIME TAG FOR M_M50TOEF_AT_EPOCH	RNP_MAT_ COMP	SCALAR		SEC	OD

Table 4.5.4.5.2-2. GC_ALIGN1 Outputs							
Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
ERN		NORTH COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF	SCALAR	+/-65	DEG/HR	ONCE
ERW		WEST COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF	SCALAR	+/-65	DEG/HR	ONCE
ERU		UP COMPONENT OF EXCESS RATE TORQUING COMMAND; 1 PER IMU	TOR_TRSF	SCALAR	+/-65	DEG/HR	ONCE
FAIL_AC(1)	V95X0777X	IMU1 ALIGNMENT CORRECTION LIMITED	DISP_SUP TLM	LOGICAL	0,1	NA	OD
FAIL_AC(2)	V95X0778X	IMU2 ALIGNMENT CORRECTION LIMITED	DISP_SUP TLM	LOGICAL	0,1	NA	OD
FAIL_AC(3)	V95X0779X	IMU3 ALIGNMENT CORRECTION LIMITED	DISP_SUP TLM	LOGICAL	0,1	NA	OD
INERTIAL	V95X0001X	IN INERTIAL MODE (IMU)	GYRO_TORQ DISPLAYS ATT_PROC ACP_TRSF RES_PROC ACP_COMP ACP_ACUM RGM_COMP TLM	LOGICAL	0,1	NA	ONCE
M50 T (1;1) C	V99U3450C	TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 1,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (1;2) C	V99U3453C V99U3456C	TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 1,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (1;3) C		TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 1,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (1;4) C	V99U3459C	TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 2,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (1;5) C	V99U3462C	TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 2,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE

Table 4.5.4.5.2-2. GC\_ALIGN1 Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
M50 T (1;6) C	V99U3465C	TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 2,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (1;7) C	V99U3468C	TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 3,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (1;8) C	V99U3471C	TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 3,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (1;9) C	V99U3474C	TRANSFORMATION: CLUSTER TO M50; IMU-1 COMPONENT 3,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (2;1) C	V99U3451C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 1,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (2;2) C	V99U3454C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 1,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (2;3) C	V99U3457C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 1,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (2;4) C	V99U3460C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 2,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (2;5) C	V99U3463C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 2,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (2;6) C	V99U3466C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 2,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE

Table 4.5.4.5.2-2. GC\_ALIGN1 Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
M50 T (2;7) C	V99U3469C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 3,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (2;8) C	V99U3472C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 3,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (2;9) C	V99U3475C	TRANSFORMATION: CLUSTER TO M50; IMU-2 COMPONENT 3,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (3;1) C	V99U3452C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 1,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (3;2) C	V99U3455C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 1,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (3;3) C	V99U3458C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 1,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (3;4) C	V99U3461C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 2,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (3;5) C	V99U3464C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 2,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (3;6) C	V99U3467C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 2,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (3;7) C	V99U3470C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 3,1	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE

Table 4.5.4.5.2-2. GC\_ALIGN1 Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
M50 T (3;8) C	V99U3473C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 3,2	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
M50 T (3;9) C	V99U3476C	TRANSFORMATION: CLUSTER TO M50; IMU-3 COMPONENT 3,3	ACP_TRSF ATT_PROC ORBIT_AL RM, TLM ST SOP IMU_INT_PROC	SCALAR	+/-1	NA	ONCE
PC T R		TRANSFORMATION: REFERENCE NWU TO PRESENT CLUSTER; 1 PER IMU	ACP_TRSF TOR_TRSF	MATRIX	+/-1	NA	OD
REFS_RDY	V95X0780X	REFSMAT COMPUTATION COMPLETED	ACP_TRSF DISPLAYS ATT_PROC IMU_BITE RGM_COMP TLM RM	LOGICAL	0,1	NA	OD
GYRO_COMP	V95X0015X	GYROCOMPASS ALIGNMENT IN PROCESS	DISPLAYS TLM	LOGICAL	0,1	NA	OD
RDCLX		DESIRED X-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	ONCE
RDCLY		DESIRED Y-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	ONCE
RDCLZ		DESIRED Z-AXIS TORQUE RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	ONCE
MN(1)	V95H0781C	IMU-1 MISALIGNMENT ABOUT NORTH	TLM	SCALAR	+/-3600	ARC-SEC	OD
MN(2)	V95H0782C	IMU-2 MISALIGNMENT ABOUT NORTH	TLM	SCALAR	+/-3600	ARC-SEC	OD
MN(3)	V95H0783C	IMU-3 MISALIGNMENT ABOUT NORTH	TLM	SCALAR	+/-3600	ARC-SEC	OD
MW(1)	V95H0784C	IMU-1 MISALIGNMENT ABOUT WEST	TLM	SCALAR	+/-3600	ARC-SEC	OD
MW(2)	V95H0785C	IMU-2 MISALIGNMENT ABOUT WEST	TLM	SCALAR	+/-3600	ARC-SEC	OD
MW(3)	V95H0786C	IMU-3 MISALIGNMENT ABOUT WEST	TLM	SCALAR	+/-3600	ARC-SEC	OD
MU(1)	V95H0787C	IMU-1 MISALIGNMENT ABOUT AZIMUTH	TLM	SCALAR	+/-3600	ARC-SEC	OD
MU(2)	V95H0788C	IMU-2 MISALIGNMENT ABOUT AZIMUTH	TLM	SCALAR	+/-3600	ARC-SEC	OD
MU(3)	V95H0789C	IMU-3 MISALIGNMENT ABOUT AZIMUTH	TLM	SCALAR	+/-3600	ARC-SEC	OD

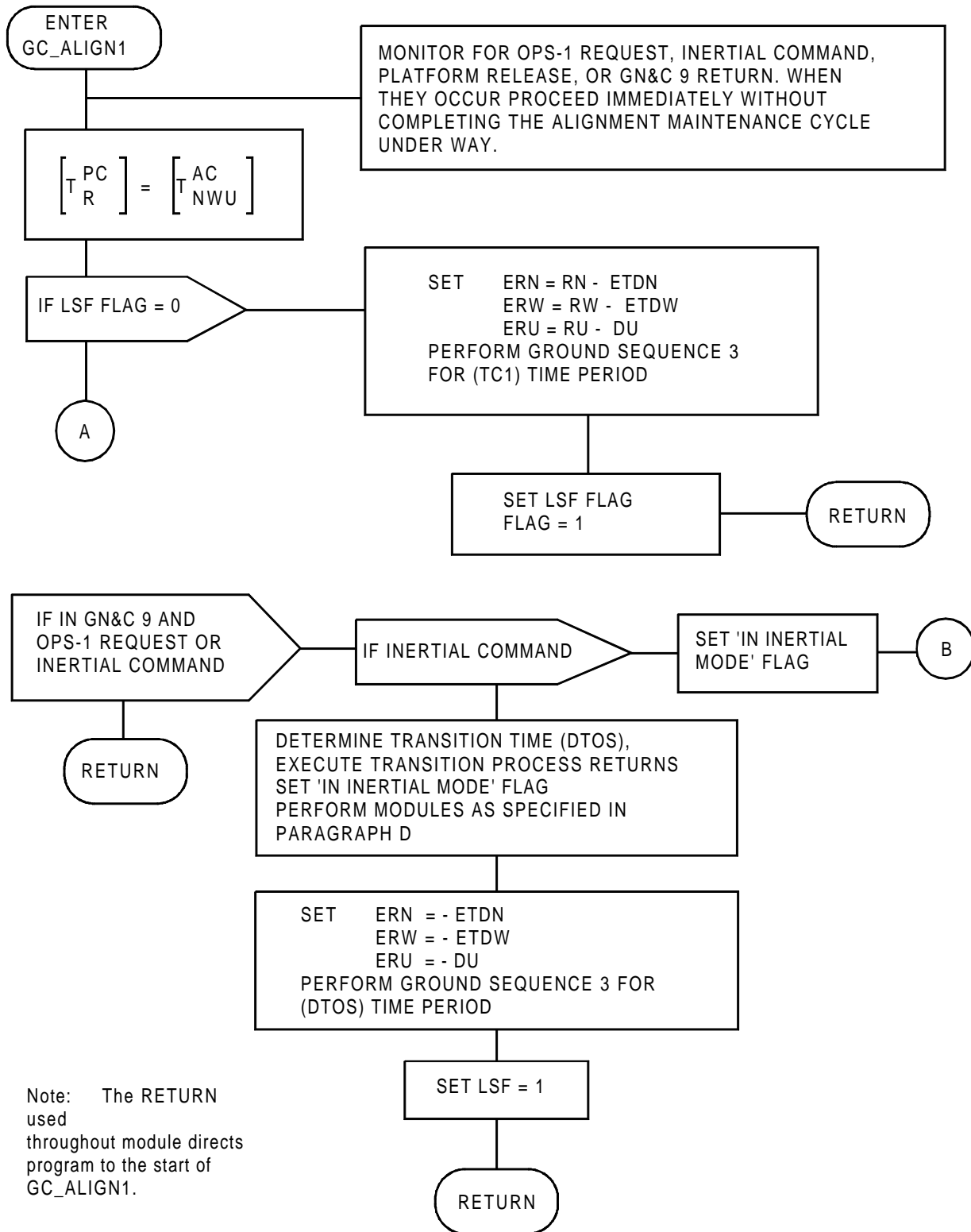


FIGURE 4.5.4.5.2-1.(1) GC\_ALIGN1 Flow Diagram (Sheet 1 of 4)

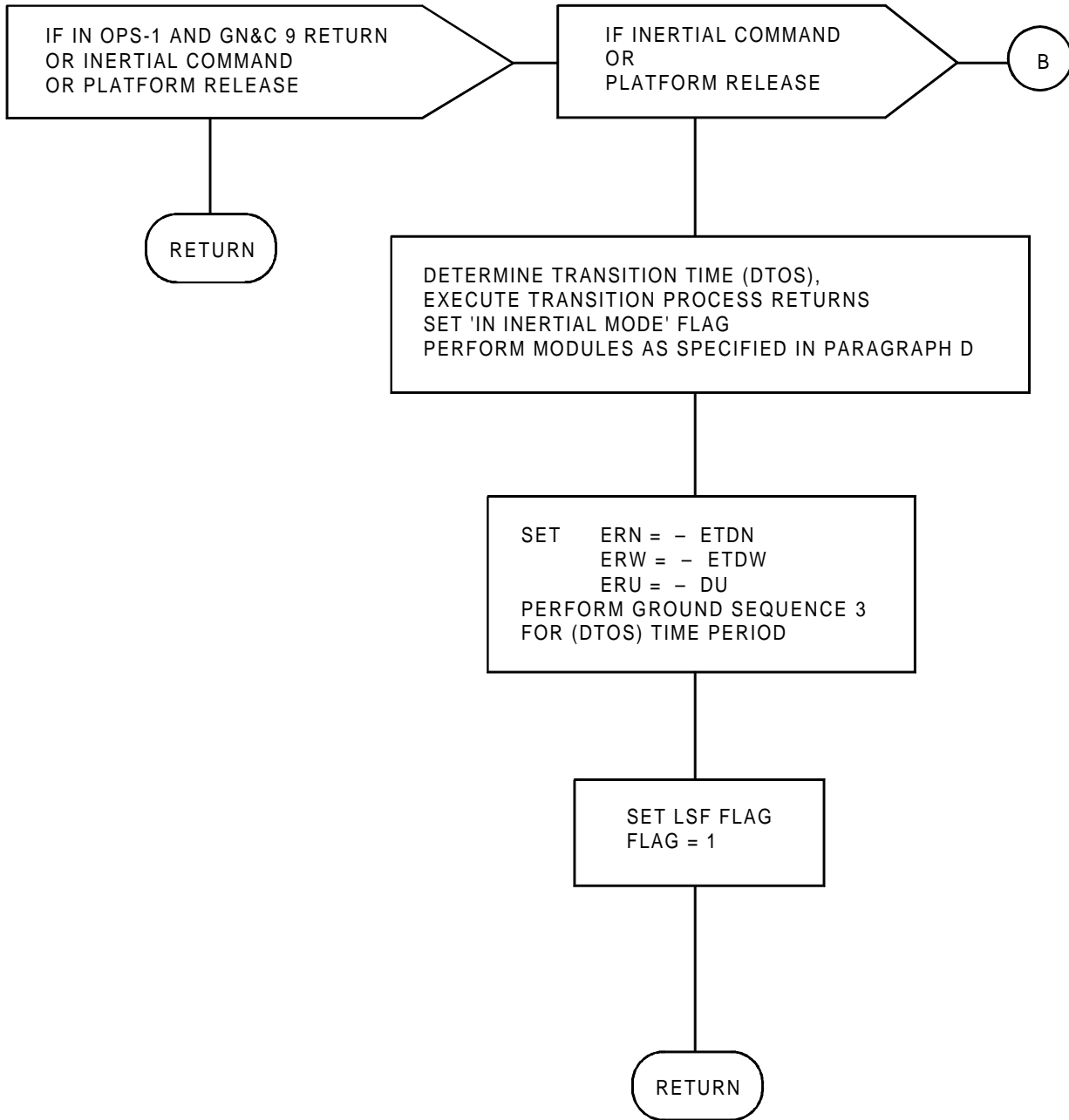


FIGURE 4.5.4.5.2-1.(2) GC\_ALIGN1 Flow Diagram (Sheet 2 of 4)

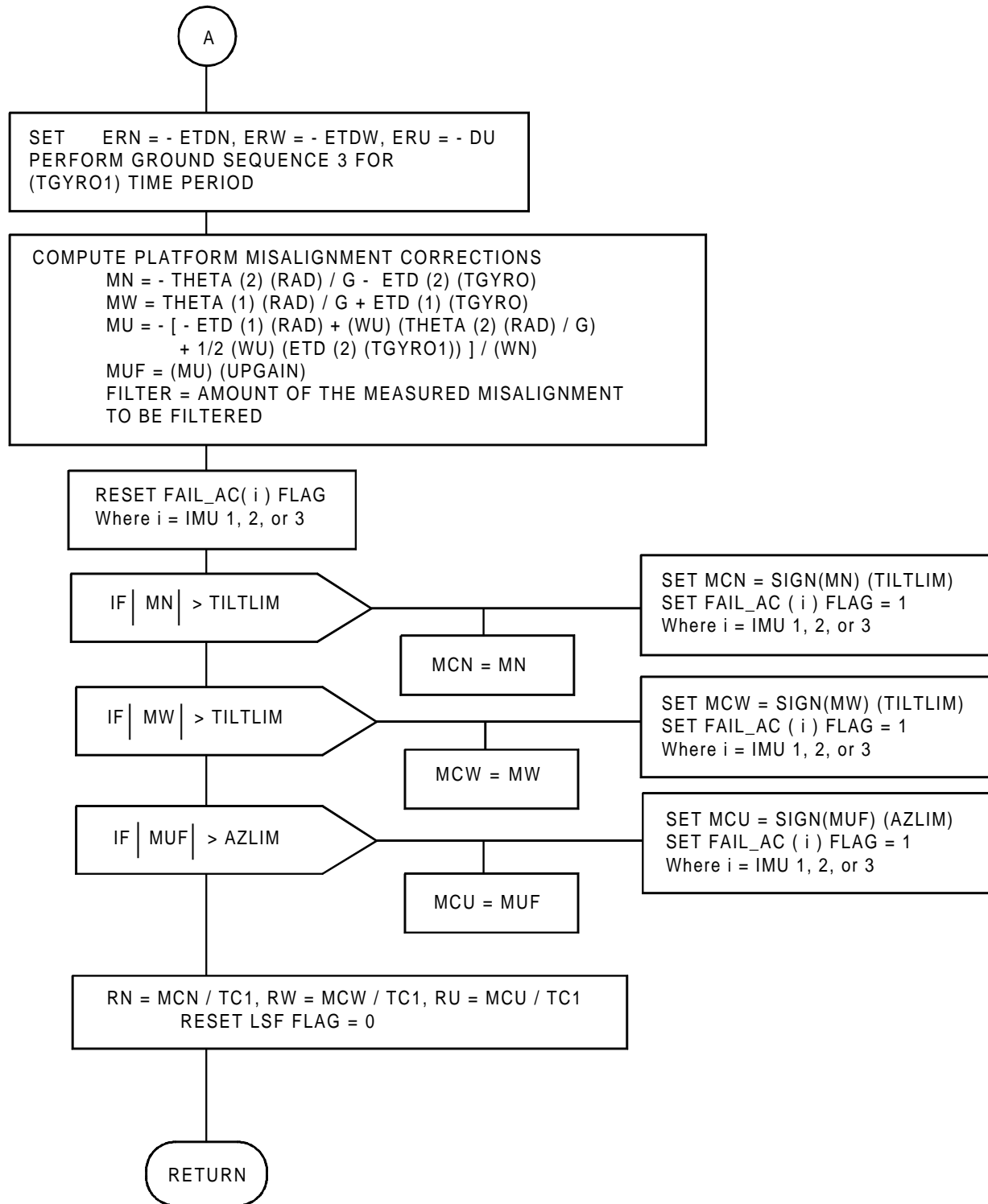


FIGURE 4.5.4.5.2-1.( 3 ) GC\_ALIGN1 Flow Diagram (Sheet 3 of 4)



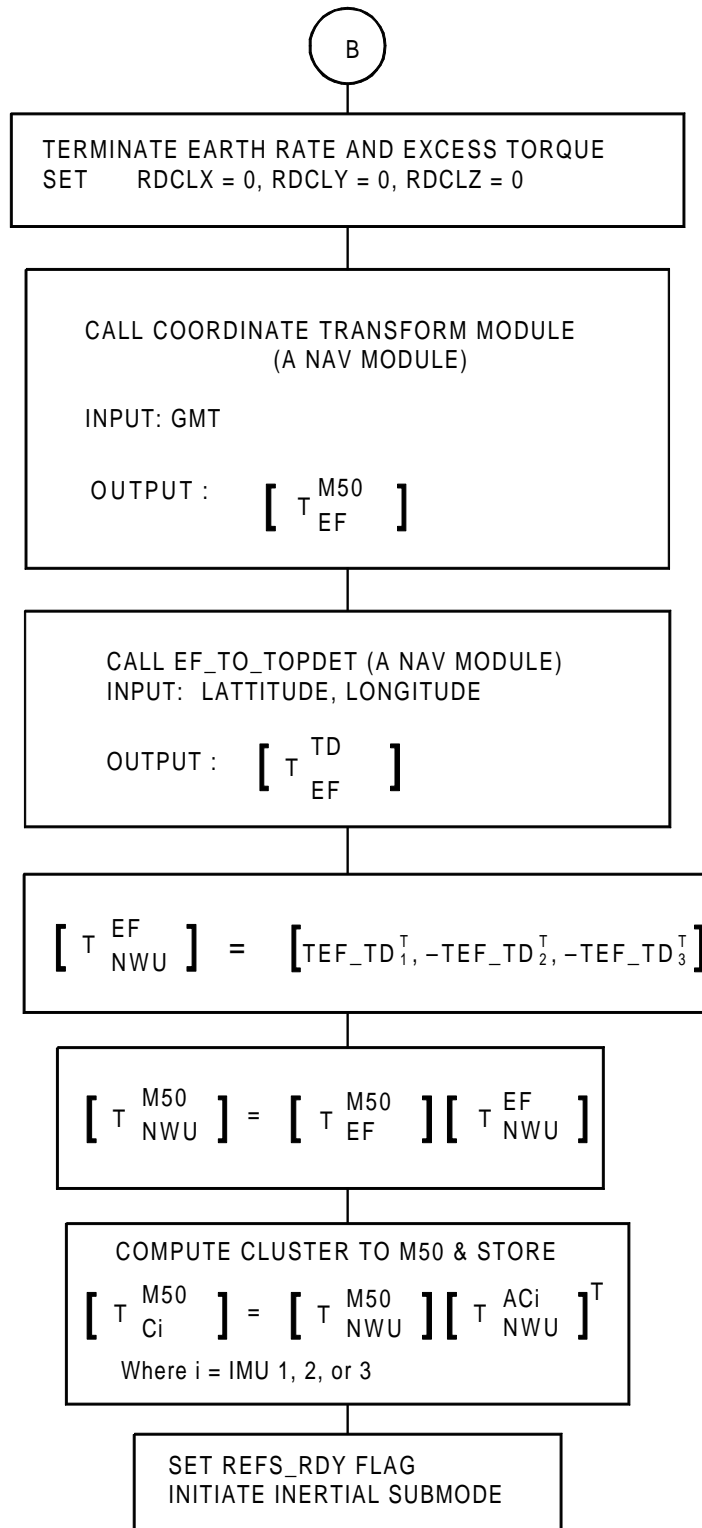


FIGURE 4.5.4.5.2-1.(4) GC\_ALIGN1 Flow Diagram (Sheet 4 of 4)

#### 4.5.4.6 IMU INERTIAL Submode Requirements.

The INERTIAL submode provides the processing sequence required to support the navigation, redundancy management, and user interface functions during most flight modes. INERTIAL is also the default submode during all flight operations; that is, whenever any IMU is in OPERATE during a flight OPS, the INERTIAL submode shall exist. The INERTIAL submode is normally first entered from the GC\_ALIGN1 module. During on-orbit operations, the INERTIAL submode is entered upon any transition from STANDBY to OPERATE.

A. Functional Requirements. The INERTIAL submode provides the following functions for each applicable IMU in the OPERATE mode:

- 1 a. Initialize  $[T_{M50}^{DC}]$  upon cleanup of GC\_ALIGN1.
- b. Torque the gyros to compensate for gyro restraints and mass unbalance.
- c. During Flight OPS, if the INERTIAL flag is off and GC\_ALIGN1 is not active, upon entering the OPS then set the INERTIAL and the REFS\_RDY flags on.
2. Compensate and accumulate velocity in M50 coordinates to support the navigation and redundancy management functions.
3. Make compensated gimbal angles available to the user interface and to navigation.
4. Provide status and failure data to redundancy management and the user interface.

B. Interface Requirements. The interfaces required are completely defined by the individual modules of Sections 4.5.1, 4.5.2, and 4.5.3.

C. Detailed Requirements. The modules of Sections 4.5.1, 4.5.2, and 4.5.3 adequately support the required functions of the INERTIAL submode. Hence, this submode consists of scheduling the following modules at the indicated rate.

1. IMU\_BITE (at 1.04-Hz rate and at 6.25 Hz on RM demand)
2. ACP\_ACUM (at 1.04-Hz rate)\*
3. RES\_PROC (at 1.04-Hz rate)\*\*
4. BITE\_SUM (at 1.04-Hz rate and at 6.25 Hz on RM demand)
5. ACP\_COMP (at 1.04-Hz rate)\*
6. GYO\_COMP (at 1.04-Hz rate)
7. GYO\_TORQ (at 6.25-Hz rate)
8. ACP\_TRSF (at 1.04-Hz rate)\*
9. IMU\_UPLINK (at TBD-Hz in OPS-2 and MM301 of OPS-3)
10. RGM\_COMP (at 6.25-Hz rate)

\* IMU velocity processing is required at the 6.25-Hz rate during MM103 before MECO command 601, 602, 603, 304, and 305. For MM101, 102, 103 after MECO command, 104, 105, 106, 202, 302, 303, and OPS-8, IMU velocity processing is required at the 1.04-Hz rate.

\*\* The execution rate of RES\_PROC shall be 6.25 Hz when the Star Tracker DATA\_FILR is active during MM201 and 301, during OPS-2 and OPS-8 to support the ON\_ORB\_DAP, and on demand from BITE\_SUM (at 6.25 Hz RM demand).

Note that the following relative sequences are important and must be maintained (except on no operation cycle).

IMU_BITE	ACP_ACUM	ACP_ACUM
BITE_SUM	ACP_COMP	ACP_COMP
	RGM_COMP	RGM_COMP
	ACP_TRSF	GYO_COMP
		GYO_TORQ

The only allowed exits of this submode are TERM/IDLE (GN&C 9 only), STANDBY, and Power Off as commanded by the User Interface or power source.

**NOTE:**

During GNC OPS-2 and -8 operation, it is not necessary to compensate for g-sensitive drift. Therefore, during these OPS the following simplifications can be made to the ACP\_COMP and GYO\_COMP detailed requirements.

ACP_COMP (Section 4.5.2.1)	– Delete Detailed Requirement step C6. No DVTi terms are required.
-------------------------------	--

GYRO\_COMP – Simplify Detailed Requirement step C2 by allowing  
(Section 4.5.2.2) all DVTi to be zero; delete Detailed Requirement step C4.

This simplification of GYRO\_COMP reduces computations. However, it must be noted that both modules are required to support the repositioning torquing of On-Orbit Alignment.

D. Special Considerations. All OPS transitions (except GN&C 9 to 1 and GN&C 1 to 9 before PLATFORM RELEASE) take place during the INERTIAL submodule. No mode (or principal function) change is to occur due to the OPS transition. It is important to note that following any OPS transition (either forward: GN&C 9 to 1, 1 to 2, etc., or reverse: OPS-1 to GN&C 9), the INERTIAL mode is really a biased INERTIAL, in that additional torquing is applied to compensate for the absence of torquing during the OPS transition. The REFS\_RDY flag occurs because of the RSLs PLATFORM RELEASE command or the INERTIAL Command from DISPLAY. It must remain set for all INERTIAL Submode operations.

During cleanup after platform release, the transformation from desired cluster-to-M50 shall be set equal to the cluster-to-M50 transformation. Therefore, set:

$$\begin{bmatrix} T_{M50}^{DCK} \end{bmatrix} = \begin{bmatrix} T_{CK}^{M50} \end{bmatrix}^T$$

#### 4.5.4.6.1 Parameter Tables for IMU Inertial Processing.

The IDD inputs and outputs are listed in Tables 4.5.4.6.1-1 and 4.5.4.6.1-2. In the table it should be noted that the CAPRI TEMP discrettes are set true (=1) when power is applied to the HAINS IMU and some dual discrettes have been designated with dual names dependent upon IMU hardware. The first part of the dual name is for the KT-70 IMU while the second part is for the HAINS IMU. Values for the I-loads are contained in the I-load requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.5.4.6.1-3. K-loads are listed in Table 4.5.4.6.1-4. Constants are listed in Table 4.5.4.6.1-5.

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TM50_DC_1,1	V96U7185CB	M50 TO DESIRED ORIENT, IMU 1 EL 1,1	UL					
1TM50_DC_1,2	V96U7186CB	M50 TO DESIRED ORIENT, IMU 1 EL 1,2	UL					
1TM50_DC_1,3	V96U7187CB	M50 TO DESIRED ORIENT, IMU 1 EL 1,3	UL					
1TM50_DC_2,1	V96U7188CB	M50 TO DESIRED ORIENT, IMU 1 EL 2,1	UL					
1TM50_DC_2,2	V96U7189CB	M50 TO DESIRED ORIENT, IMU 1 EL 2,2	UL					
1TM50_DC_2,3	V96U7190CB	M50 TO DESIRED ORIENT, IMU 1 EL 2,3	UL					
1TM50_DC_3,1	V96U7191CB	M50 TO DESIRED ORIENT, IMU 1 EL 3,1	UL					
1TM50_DC_3,2	V96U7192CB	M50 TO DESIRED ORIENT, IMU 1 EL 3,2	UL					
1TM50_DC_3,3	V96U7193CB	M50 TO DESIRED ORIENT, IMU 1 EL 3,3	UL					
2TM50_DC_1,1	V96U7194CB	M50 TO DESIRED ORIENT, IMU 2 EL 1,1	UL					
2TM50_DC_1,2	V96U7195CB	M50 TO DESIRED ORIENT, IMU 2 EL 1,2	UL					
2TM50_DC_1,3	V96U7196CB	M50 TO DESIRED ORIENT, IMU 2 EL 1,3	UL					
2TM50_DC_2,1	V96U7197CB	M50 TO DESIRED ORIENT, IMU 2 EL 2,1	UL					
2TM50_DC_2,2	V96U7198CB	M50 TO DESIRED ORIENT, IMU 2 EL 2,2	UL					
2TM50_DC_2,3	V96U7199CB	M50 TO DESIRED ORIENT, IMU 2 EL 2,3	UL					
2TM50_DC_3,1	V96U7200CB	M50 TO DESIRED ORIENT, IMU 2 EL 3,1	UL					
2TM50_DC_3,2	V96U7201CB	M50 TO DESIRED ORIENT, IMU 2 EL 3,2	UL					
2TM50_DC_3,3	V96U7202CB	M50 TO DESIRED ORIENT, IMU 2 EL 3,3	UL					
3TM50_DC_1,1	V96U7203CB	M50 TO DESIRED ORIENT, IMU 3 EL 1,1	UL					
3TM50_DC_1,2	V96U7204CB	M50 TO DESIRED ORIENT, IMU 3 EL 1,2	UL					
3TM50_DC_1,3	V96U7205CB	M50 TO DESIRED ORIENT, IMU 3 EL 1,3	UL					
3TM50_DC_2,1	V96U7206CB	M50 TO DESIRED ORIENT, IMU 3 EL 2,1	UL					
3TM50_DC_2,2	V96U7207CB	M50 TO DESIRED ORIENT, IMU 3 EL 2,2	UL					
3TM50_DC_2,3	V96U7208CB	M50 TO DESIRED ORIENT, IMU 3 EL 2,3	UL					
3TM50_DC_3,1	V96U7209CB	M50 TO DESIRED ORIENT, IMU 3 EL 3,1	UL					
3TM50_DC_3,2	V96U7210CB	M50 TO DESIRED ORIENT, IMU 3 EL 3,2	UL					
3TM50_DC_3,3	V96U7211CB	M50 TO DESIRED ORIENT, IMU 3 EL 3,3	UL					
AD_FAIL(1)	V71X2023B	IMU-1 A/D FAIL	WD1B2	IMU 1	BD		93017G	*
AD_FAIL(2)	V71X3023B	IMU-2 A/D FAIL	WD1B2	IMU 2	BD		93017G	*
AD_FAIL(3)	V71X4023B	IMU-3 A/D FAIL	WD1B2	IMU 3	BD		93017G	*
AZO(1)	V99H2610CA	AZIMUTH RESOLVER OFFSET(1)		IMU GND CAL	DEG		93017G	*
AZO(1)	V99H2610CB	AZIMUTH RESOLVER OFFSET(1)		MASS MEM	DEG			
AZO(2)	V99H2611CA	AZIMUTH RESOLVER OFFSET(2)		IMU GND CAL	DEG		93017G	*
AZO(2)	V99H2611CB	AZIMUTH RESOLVER OFFSET(2)		MASS MEM	DEG			
AZO(3)	V99H2612CA	AZIMUTH RESOLVER OFFSET(3)		IMU GND CAL	DEG		93017G	*
AZO(3)	V99H2612CB	AZIMUTH RESOLVER OFFSET(3)		MASS MEM	DEG			
BXY(1)	V99H2590CA	X-GYRO MISALIGNMENT TO Y-REF(1)		IMU GND CAL	RAD		93017G	*
BXY(1)	V99H2590CB	X-GYRO MISALIGNMENT TO Y-REF(1)		MASS MEM	RAD		90525D	
BXY(2)	V99H2591CA	X-GYRO MISALIGNMENT TO Y-REF(2)		IMU GND CAL	RAD		93017G	*
BXY(2)	V99H2591CB	X-GYRO MISALIGNMENT TO Y-REF(2)		MASS MEM	RAD		90525D	
BXY(3)	V99H2592CA	X-GYRO MISALIGNMENT TO Y-REF(3)		IMU GND CAL	RAD		93017G	*
BXY(3)	V99H2592CB	X-GYRO MISALIGNMENT TO Y-REF(3)		MASS MEM	RAD		90525D	
BXZ(1)	V99H2593CA	X-GYRO MISALIGNMENT TO Z-REF(1)		IMU GND CAL	RAD		93017G	*
BXZ(1)	V99H2593CB	X-GYRO MISALIGNMENT TO Z-REF(1)		MASS MEM	RAD		90525D	
BXZ(2)	V99H2594CA	X-GYRO MISALIGNMENT TO Z-REF(2)		IMU GND CAL	RAD		93017G	*
BXZ(2)	V99H2594CB	X-GYRO MISALIGNMENT TO Z-REF(2)		MASS MEM	RAD		90525D	

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BXZ(3)	V99H2595CA	X-GYRO MISALIGNMENT TO Z-REF(3)	IMU GND CAL	RAD			93017G	*
BXZ(3)	V99H2595CB	X-GYRO MISALIGNMENT TO Z-REF(3)	MASS MEM	RAD			90525D	
BYX(1)	V99H2596CA	Y-GYRO MISALIGNMENT TO X-REF(1)	IMU GND CAL	RAD			93017G	*
BYX(1)	V99H2596CB	Y-GYRO MISALIGNMENT TO X-REF(1)	MASS MEM	RAD			90525D	
BYX(2)	V99H2597CA	Y-GYRO MISALIGNMENT TO X-REF(2)	IMU GND CAL	RAD			93017G	*
BYX(2)	V99H2597CB	Y-GYRO MISALIGNMENT TO X-REF(2)	MASS MEM	RAD			90525D	
BYX(3)	V99H2598CA	Y-GYRO MISALIGNMENT TO X-REF(3)	IMU GND CAL	RAD			93017G	*
BYX(3)	V99H2598CB	Y-GYRO MISALIGNMENT TO X-REF(3)	MASS MEM	RAD			90525D	
BYZ(1)	V99H2599CA	Y-GYRO MISALIGNMENT TO Z-REF(1)	IMU GND CAL	RAD			93017G	*
BYZ(1)	V99H2599CB	Y-GYRO MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD			90525D	
BYZ(2)	V99H2600CA	Y-GYRO MISALIGNMENT TO Z-REF(2)	IMU GND CAL	RAD			93017G	*
BYZ(2)	V99H2600CB	Y-GYRO MISALIGNMENT TO Z-REF(2)	MASS MEM	RAD			90525D	
BYZ(3)	V99H2601CA	Y-GYRO MISALIGNMENT TO Z-REF(3)	IMU GND CAL	RAD			93017G	*
BYZ(3)	V99H2601CB	Y-GYRO MISALIGNMENT TO Z-REF(3)	MASS MEM	RAD			90525D	
BZX(1)	V99H2602CA	Z-GYRO MISALIGNMENT TO X-REF(1)	IMU GND CAL	RAD			93017G	*
BZX(1)	V99H2602CB	Z-GYRO MISALIGNMENT TO X-REF(1)	MASS MEM	RAD			90525D	
BZX(2)	V99H2603CA	Z-GYRO MISALIGNMENT TO X-REF(2)	IMU GND CAL	RAD			93017G	*
BZX(2)	V99H2603CB	Z-GYRO MISALIGNMENT TO X-REF(2)	MASS MEM	RAD			90525D	
BZX(3)	V99H2604CA	Z-GYRO MISALIGNMENT TO X-REF(3)	IMU GND CAL	RAD			93017G	*
BZX(3)	V99H2604CB	Z-GYRO MISALIGNMENT TO X-REF(3)	MASS MEM	RAD			90525D	
BZY(1)	V99H2605CA	Z-GYRO MISALIGNMENT TO Y-REF(1)	IMU GND CAL	RAD			93017G	*
BZY(1)	V99H2605CB	Z-GYRO MISALIGNMENT TO Y-REF(1)	MASS MEM	RAD			90525D	
BZY(2)	V99H2606CA	Z-GYRO MISALIGNMENT TO Y-REF(2)	IMU GND CAL	RAD			93017G	*
BZY(2)	V99H2606CB	Z-GYRO MISALIGNMENT TO Y-REF(2)	MASS MEM	RAD			90525D	
BZY(3)	V99H2607CA	Z-GYRO MISALIGNMENT TO Y-REF(3)	IMU GND CAL	RAD			93017G	*
BZY(3)	V99H2607CB	Z-GYRO MISALIGNMENT TO Y-REF(3)	MASS MEM	RAD			90525D	
CAP_TEMP_RDY(1)	V71X2406X	IMU 1 CAPRI TEMP READY	IMU 1		BD		93017G	*
CAP_TEMP_RDY(2)	V71X3406X	IMU 2 CAPRI TEMP READY	IMU 2		BD		93017G	*
CAP_TEMP_RDY(3)	V71X4406X	IMU 3 CAPRI TEMP READY	IMU 3		BD		93017G	*
CAP_TEMP_SAFE(1)	V71X2407X	IMU 1 CAPRI TEMP SAFE	IMU 1		BD		93017G	*
CAP_TEMP_SAFE(2)	V71X3407X	IMU 2 CAPRI TEMP SAFE	IMU 2		BD		93017G	*
CAP_TEMP_SAFE(3)	V71X4407X	IMU 3 CAPRI TEMP SAFE	IMU 3		BD		93017G	*
CLOCK/CLOCKTIME	V91W5000C	CLOCK-COMPUTER(GMT)	FCOS	S			93160B	*
CVX(1)	V71L2200B	IMU-1 ACCUMD VX	WD10 IMU 1		HXU		93017G	*
CVX(2)	V71L3200B	IMU-2 ACCUMD VX	WD10 IMU 2		HXU		93017G	*
CVX(3)	V71L4200B	IMU-3 ACCUMD VX	WD10 IMU 3		HXU		93017G	*
CVY(1)	V71L2220B	IMU-1 ACCUMD VY	WD11 IMU 1		HXU		93017G	*
CVY(2)	V71L3220B	IMU-2 ACCUMD VY	WD11 IMU 2		HXU		93017G	*
CVY(3)	V71L4220B	IMU-3 ACCUMD VY	WD11 IMU 3	PULSES	HXU		93017G	*
CVZ(1)	V71L2240B	IMU-1 ACCUMD VZ	WD12 IMU 1		HXU		93017G	*
CVZ(2)	V71L3240B	IMU-2 ACCUMD VZ	WD12 IMU 2		HXU		93017G	*
CVZ(3)	V71L4240B	IMU-3 ACCUMD VZ	WD12 IMU 3	PULSES	HXU		93017G	*
D1/D8_SEQR(1)	V71X2032B	IMU-1 D1/D8 SEQUENCER	WD1B11 IMU 1		BD		93017G	*
D1/D8_SEQR(2)	V71X3032B	IMU-2 D1/D8 SEQUENCER	WD1B11 IMU 2		BD		93017G	*
D1/D8_SEQR(3)	V71X4032B	IMU-3 D1/D8 SEQUENCER	WD1B11 IMU 3		BD		93017G	*
D2_SEQR(1)	V71X2033B	IMU-1 D2 SEQUENCER	WD1B12 IMU 1		BD		93017G	*

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
D2_SEQR(2)	V71X3033B	IMU-2 D2 SEQUENCER	WD1B12	IMU 2	BD		93017G	*
D2_SEQR(3)	V71X4033B	IMU-3 D2 SEQUENCER	WD1B12	IMU 3	BD		93017G	*
D3_SEQR(1)	V71X2034B	IMU-1 D3 SEQUENCER	WD1B13	IMU 1	BD		93017G	*
D3_SEQR(2)	V71X3034B	IMU-2 D3 SEQUENCER	WD1B13	IMU 2	BD		93017G	*
D3_SEQR(3)	V71X4034B	IMU-3 D3 SEQUENCER	WD1B13	IMU 3	BD		93017G	*
D4_SEQR(1)	V71X2035B	IMU-1 D4 SEQUENCER	WD1B14	IMU 1	BD		93017G	*
D4_SEQR(2)	V71X3035B	IMU-2 D4 SEQUENCER	WD1B14	IMU 2	BD		93017G	*
D4_SEQR(3)	V71X4035B	IMU-3 D4 SEQUENCER	WD1B14	IMU 3	BD		93017G	*
D5_SEQR(1)	V71X2036B	IMU-1 D5 SEQUENCER	WD1B15	IMU 1	BD		93017G	*
D5_SEQR(2)	V71X3036B	IMU-2 D5 SEQUENCER	WD1B15	IMU 2	BD		93017G	*
D5_SEQR(3)	V71X4036B	IMU-3 D5 SEQUENCER	WD1B15	IMU 3	BD		93017G	*
DCDC_1_FAIL(1)	V71X2026B	IMU-1 DC/DC NO 1 FAIL	WD1B5	IMU 1	BD		93017G	*
DCDC_1_FAIL(2)	V71X3026B	IMU-2 DC/DC NO 1 FAIL	WD1B5	IMU 2	BD		93017G	*
DCDC_1_FAIL(3)	V71X4026B	IMU-3 DC/DC NO 1 FAIL	WD1B5	IMU 3	BD		93017G	*
DELTXZ(1)	V99H2552CA	X-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL		RAD			*
DELTXZ(1)	V99H2552CB	X-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM		RAD			*
DELTXZ(2)	V99H2553CA	X-ACCEL MISALIGNMENT TO Z-REF(2)	IMU GND CAL		RAD		93017G	*
DELTXZ(2)	V99H2553CB	X-ACCEL MISALIGNMENT TO Z-REF(2)	MASS MEM		RAD			*
DELTXZ(3)	V99H2554CA	X-ACCEL MISALIGNMENT TO Z-REF(3)	IMU GND CAL		RAD		93017G	*
DELTXZ(3)	V99H2554CB	X-ACCEL MISALIGNMENT TO Z-REF(3)	MASS MEM		RAD			*
DELTXY(1)	V99H2540CA	Y-ACCEL MISALIGNMENT TO X-REF(1)	IMU GND CAL		RAD		93017G	*
DELTXY(1)	V99H2540CB	Y-ACCEL MISALIGNMENT TO X-REF(1)	MASS MEM		RAD		90525D	*
DELTXY(2)	V99H2541CA	Y-ACCEL MISALIGNMENT TO X-REF(2)	IMU GND CAL		RAD		93017G	*
DELTXY(2)	V99H2541CB	Y-ACCEL MISALIGNMENT TO X-REF(2)	MASS MEM		RAD		90525D	*
DELTXY(3)	V99H2542CA	Y-ACCEL MISALIGNMENT TO X-REF(3)	IMU GND CAL		RAD		93017G	*
DELTXY(3)	V99H2542CB	Y-ACCEL MISALIGNMENT TO X-REF(3)	MASS MEM		RAD		90525D	*
DELTZY(1)	V99H2549CA	Y-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL		RAD		93017G	*
DELTZY(1)	V99H2549CB	Y-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM		RAD			*
DELTZY(2)	V99H2550CA	Y-ACCEL MISALIGNMENT TO Z-REF(2)	IMU GND CAL		RAD		93017G	*
DELTZY(2)	V99H2550CB	Y-ACCEL MISALIGNMENT TO Z-REF(2)	MASS MEM		RAD			*
DELTZY(3)	V99H2551CA	Y-ACCEL MISALIGNMENT TO Z-REF(3)	IMU GND CAL		RAD		93017G	*
DELTZY(3)	V99H2551CB	Y-ACCEL MISALIGNMENT TO Z-REF(3)	MASS MEM		RAD			*
DELTZX(1)	V99H2543CA	Z-ACCEL MISALIGNMENT TO X-REF(1)	IMU GND CAL		RAD		93017G	*
DELTZX(1)	V99H2543CB	Z-ACCEL MISALIGNMENT TO X-REF(1)	MASS MEM		RAD		90525D	*
DELTZX(2)	V99H2544CA	Z-ACCEL MISALIGNMENT TO X-REF(2)	IMU GND CAL		RAD		93017G	*
DELTZX(2)	V99H2544CB	Z-ACCEL MISALIGNMENT TO X-REF(2)	MASS MEM		RAD		90525D	*
DELTZX(3)	V99H2545CA	Z-ACCEL MISALIGNMENT TO X-REF(3)	IMU GND CAL		RAD		93017G	*
DELTZX(3)	V99H2545CB	Z-ACCEL MISALIGNMENT TO X-REF(3)	MASS MEM		RAD		90525D	*
DELTZY(1)	V99H2546CA	Z-ACCEL MISALIGNMENT TO Y-REF(1)	IMU GND CAL		RAD		93017G	*
DELTZY(1)	V99H2546CB	Z-ACCEL MISALIGNMENT TO Y-REF(1)	MASS MEM		RAD		90525D	*
DELTZY(2)	V99H2547CA	Z-ACCEL MISALIGNMENT TO Y-REF(2)	IMU GND CAL		RAD		93017G	*
DELTZY(2)	V99H2547CB	Z-ACCEL MISALIGNMENT TO Y-REF(2)	MASS MEM		RAD		90525D	*
DELTZY(3)	V99H2548CA	Z-ACCEL MISALIGNMENT TO Y-REF(3)	IMU GND CAL		RAD		93017G	*
DELTZY(3)	V99H2548CB	Z-ACCEL MISALIGNMENT TO Y-REF(3)	MASS MEM		RAD		90525D	*
DFR(1)	V99U5952CA	IMU 1 REDUNDANT GYRO RESTRAINT	IMU GND CAL		DEG/HR		93017G	*
DFR(1)	V99U5952CB	IMU 1 REDUNDANT GYRO RESTRAINT	MASS MEM		DEG/HR		90525D	*

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DFR (2)	V99U5953CA	IMU 2 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR (2)	V99U5953CB	IMU 2 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFR (3)	V99U5954CA	IMU 3 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR (3)	V99U5954CB	IMU 3 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFX (1)	V99R2560CA	X-GYRO RESTRAINT (1)	IMU ORB A/CAL	DEG/HR			93017G	*
DFX (1)	V99R2560CB	X-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFX (1)	V99R2560CC	X-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFX (1)	V99R2560CD	X-GYRO RESTRAINT (1)	UL	DEG/HR			90525D	
DFX (2)	V99R2561CA	X-GYRO RESTRAINT (2)	IMU ORB A/CAL	DEG/HR			93017G	*
DFX (2)	V99R2561CB	X-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFX (2)	V99R2561CC	X-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFX (2)	V99R2561CD	X-GYRO RESTRAINT (2)	UL	DEG/HR			90525D	
DFX (3)	V99R2562CA	X-GYRO RESTRAINT (3)	IMU ORB A/CAL	DEG/HR			93017G	*
DFX (3)	V99R2562CB	X-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFX (3)	V99R2562CC	X-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DFX (3)	V99R2562CD	X-GYRO RESTRAINT (3)	UL	DEG/HR			90525D	
DFY (1)	V99R2563CA	Y-GYRO RESTRAINT (1)	IMU ORB A/CAL	DEG/HR			93017G	*
DFY (1)	V99R2563CB	Y-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFY (1)	V99R2563CC	Y-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFY (1)	V99R2563CD	Y-GYRO RESTRAINT (1)	UL	DEG/HR			90525D	
DFY (2)	V99R2564CA	Y-GYRO RESTRAINT (2)	IMU ORB A/CAL	DEG/HR			93017G	*
DFY (2)	V99R2564CB	Y-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFY (2)	V99R2564CC	Y-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFY (2)	V99R2564CD	Y-GYRO RESTRAINT (2)	UL	DEG/HR			90525D	
DFY (3)	V99R2565CA	Y-GYRO RESTRAINT (3)	IMU ORB A/CAL	DEG/HR			93017G	*
DFY (3)	V99R2565CB	Y-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFY (3)	V99R2565CC	Y-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DFY (3)	V99R2565CD	Y-GYRO RESTRAINT (3)	UL	DEG/HR			90525D	
DFZ (1)	V99R2566CA	Z-GYRO RESTRAINT (1)	IMU ORB A/CAL	DEG/HR			93017G	*
DFZ (1)	V99R2566CB	Z-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFZ (1)	V99R2566CC	Z-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFZ (1)	V99R2566CD	Z-GYRO RESTRAINT (1)	UL	DEG/HR			90525D	
DFZ (2)	V99R2567CA	Z-GYRO RESTRAINT (2)	IMU ORB A/CAL	DEG/HR			93017G	*
DFZ (2)	V99R2567CB	Z-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFZ (2)	V99R2567CC	Z-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFZ (2)	V99R2567CD	Z-GYRO RESTRAINT (2)	UL	DEG/HR			90525D	
DFZ (3)	V99R2568CA	Z-GYRO RESTRAINT (3)	IMU ORB A/CAL	DEG/HR			93017G	*
DFZ (3)	V99R2568CB	Z-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFZ (3)	V99R2568CC	Z-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DFZ (3)	V99R2568CD	Z-GYRO RESTRAINT (3)	UL	DEG/HR			90525D	
DIR (1)	V99U5955CA	IMU 1 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (1)	V99U5955CB	IMU 1 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR (2)	V99U5956CA	IMU 2 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (2)	V99U5956CB	IMU 2 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR (3)	V99U5957CA	IMU 3 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR (3)	V99U5957CB	IMU 3 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	



TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DIX(1)	V99U2570CA	X-GYRO IN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DIX(1)	V99U2570CB	X-GYRO IN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DIX(2)	V99U2571CA	X-GYRO IN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DIX(2)	V99U2571CB	X-GYRO IN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DIX(3)	V99U2572CA	X-GYRO IN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DIX(3)	V99U2572CB	X-GYRO IN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DIZ(1)	V99U2573CA	Z-GYRO IN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(1)	V99U2573CB	Z-GYRO IN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DIZ(2)	V99U2574CA	Z-GYRO IN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(2)	V99U2574CB	Z-GYRO IN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DIZ(3)	V99U2575CA	Z-GYRO IN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(3)	V99U2575CB	Z-GYRO IN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DOR(1)	V99U5958CA	IMU 1 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(1)	V99U5958CB	IMU 1 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR(2)	V99U5959CA	IMU 2 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(2)	V99U5959CB	IMU 2 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR(3)	V99U5960CA	IMU 3 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(3)	V99U5960CB	IMU 3 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOZ(1)	V99U2582CA	Z-GYRO OUT AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(1)	V99U2582CB	Z-GYRO OUT AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DOZ(2)	V99U2583CA	Z-GYRO OUT AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(2)	V99U2583CB	Z-GYRO OUT AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DOZ(3)	V99U2584CA	Z-GYRO OUT AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(3)	V99U2584CB	Z-GYRO OUT AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DSR(1)	V99U5961CA	IMU 1 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(1)	V99U5961CB	IMU 1 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(2)	V99U5962CA	IMU 2 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(2)	V99U5962CB	IMU 2 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(3)	V99U5963CA	IMU 3 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(3)	V99U5963CB	IMU 3 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSX(1)	V99U2576CA	X-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(1)	V99U2576CB	X-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSX(2)	V99U2577CA	X-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(2)	V99U2577CB	X-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSX(3)	V99U2578CA	X-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(3)	V99U2578CB	X-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DSZ(1)	V99U2579CA	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(1)	V99U2579CB	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSZ(2)	V99U2580CA	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(2)	V99U2580CB	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSZ(3)	V99U2581CA	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(3)	V99U2581CB	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
ECHO_13(1)	V71M2260P	IMU-1 ECHO 1	WD13	IMU 1	HMD		93017G	*
ECHO_13(2)	V71M3260P	IMU-2 ECHO 1	WD13	IMU 2	HMD		93017G	*
ECHO_13(3)	V71M4260P	IMU-3 ECHO 1	WD13	IMU 3	HMD		93017G	*
ECHO_14(1)	V71M2280P	IMU-1 ECHO 2	WD14	IMU 1	HMD		93017G	*

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
ECHO_14(2)	V71M3280P	IMU-2 ECHO 2	WD14 IMU 2		HMD		93017G	*
ECHO_14(3)	V71M4280P	IMU-3 ECHO 2	WD14 IMU 3		HMD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(1)	V71X2027B	IMU 1 FLTR DC2/DSCRET PWR SUP FAIL	IMU 1		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(2)	V71X3027B	IMU 2 FLTR DC2/DSCRET PWR SUP FAIL	IMU 2		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(3)	V71X4027B	IMU 3 FLTR DC2/DSCRET PWR SUP FAIL	IMU 3		BD		93017G	*
IMU_CF(1)	V91X3101X	IMU 1 COMMFault	FCOS				92354	
IMU_CF(2)	V91X3131X	IMU 2 COMMFault	FCOS				92354	
IMU_CF(3)	V91X3161X	IMU 3 COMMFault	FCOS				92354	
IN_OPERATE(1)	V71X2403XB	IMU-1 IN OPERATE MODE	IMU 1				93017G	*
IN_OPERATE(2)	V71X3403XB	IMU-2 IN OPERATE MODE	IMU 2				93017G	*
IN_OPERATE(3)	V71X4403XB	IMU-3 IN OPERATE MODE	IMU 3				93017G	*
IO/MUX_FAIL(1)	V71X2022B	IMU 1 IO/MUX FAIL	WD1B1 IMU 1		BD		93017G	*
IO/MUX_FAIL(2)	V71X3022B	IMU 2 IO/MUX FAIL	WD1B1 IMU 2		BD		93017G	*
IO/MUX_FAIL(3)	V71X4022B	IMU 3 IO/MUX FAIL	WD1B1 IMU 3		BD		93017G	*
IRO(1)	V99H2615CA	INNER ROLL RESOLVER OFFSET(1)	IMU GND CAL	DEG			93017G	*
IRO(1)	V99H2615CB	INNER ROLL RESOLVER OFFSET(1)	MASS MEM	DEG				
IRO(2)	V99H2616CA	INNER ROLL RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
IRO(2)	V99H2616CB	INNER ROLL RESOLVER OFFSET(2)	MASS MEM	DEG				
IRO(3)	V99H2617CA	INNER ROLL RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
IRO(3)	V99H2617CB	INNER ROLL RESOLVER OFFSET(3)	MASS MEM	DEG				
KIX(1)	V99A2520CA	LOW GAIN X-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIX(1)	V99A2520CB	LOW GAIN X-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIX(1)	V99A2520CC	LOW GAIN X-ACCEL SCALE FACTOR(1)	UL	UG/G	SPL		90525D	
KIX(2)	V99A2521CA	LOW GAIN X-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIX(2)	V99A2521CB	LOW GAIN X-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIX(2)	V99A2521CC	LOW GAIN X-ACCEL SCALE FACTOR(2)	UL	UG/G	SPL		90525D	
KIX(3)	V99A2522CA	LOW GAIN X-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KIX(3)	V99A2522CB	LOW GAIN X-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	
KIX(3)	V99A2522CC	LOW GAIN X-ACCEL SCALE FACTOR(3)	UL	UG/G	SPL		90525D	
KIY(1)	V99A2523CA	LOW GAIN Y-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIY(1)	V99A2523CB	LOW GAIN Y-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIY(1)	V99A2523CC	LOW GAIN Y-ACCEL SCALE FACTOR(1)	UL	UG/G	SPL		90525D	
KIY(2)	V99A2524CA	LOW GAIN Y-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIY(2)	V99A2524CB	LOW GAIN Y-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIY(2)	V99A2524CC	LOW GAIN Y-ACCEL SCALE FACTOR(2)	UL	UG/G	SPL		90525D	
KIY(3)	V99A2525CA	LOW GAIN Y-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KIY(3)	V99A2525CB	LOW GAIN Y-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	
KIY(3)	V99A2525CC	LOW GAIN Y-ACCEL SCALE FACTOR(3)	UL	UG/G	SPL		90525D	
KIZ(1)	V99A2526CA	LOW GAIN Z-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIZ(1)	V99A2526CB	LOW GAIN Z-ACCEL SCALE FACTOR(1)	MASS MEM	UG/G			90525D	
KIZ(1)	V99A2526CC	LOW GAIN Z-ACCEL SCALE FACTOR(1)	UL	UG/G	SPL		90525D	
KIZ(2)	V99A2527CA	LOW GAIN Z-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIZ(2)	V99A2527CB	LOW GAIN Z-ACCEL SCALE FACTOR(2)	MASS MEM	UG/G			90525D	
KIZ(2)	V99A2527CC	LOW GAIN Z-ACCEL SCALE FACTOR(2)	UL	UG/G	SPL		90525D	
KIZ(3)	V99A2528CA	LOW GAIN Z-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KIZ(3)	V99A2528CB	LOW GAIN Z-ACCEL SCALE FACTOR(3)	MASS MEM	UG/G			90525D	

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KIZ(3)	V99A2528CC	LOW GAIN Z-ACCEL SCALE FACTOR(3)	UL	UG/G	SPL		93017G	*
KOX(1)	V99G2530CA	LOW GAIN X ACCELEROMETER BIAS(1)	IMU ORB A/CAL	UG			93017G	*
KOX(1)	V99G2530CB	LOW GAIN X ACCELEROMETER BIAS(1)	IMU GND CAL	UG			93017G	*
KOX(1)	V99G2530CC	LOW GAIN X ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	
KOX(1)	V99G2530CD	LOW GAIN X ACCELEROMETER BIAS(1)	UL	UG			90525D	
KOX(2)	V99G2531CA	LOW GAIN X ACCELEROMETER BIAS(2)	IMU ORB A/CAL	UG			93017G	*
KOX(2)	V99G2531CB	LOW GAIN X ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*
KOX(2)	V99G2531CC	LOW GAIN X ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOX(2)	V99G2531CD	LOW GAIN X ACCELEROMETER BIAS(2)	UL	UG			90525D	
KOX(3)	V99G2532CA	LOW GAIN X ACCELEROMETER BIAS(3)	IMU ORB A/CAL	UG			93017G	*
KOX(3)	V99G2532CB	LOW GAIN X ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KOX(3)	V99G2532CC	LOW GAIN X ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	
KOX(3)	V99G2532CD	LOW GAIN X ACCELEROMETER BIAS(3)	UL	UG			90525D	
KOY(1)	V99G2533CA	LOW GAIN Y ACCELEROMETER BIAS(1)	IMU ORB A/CAL	UG			93017G	*
KOY(1)	V99G2533CB	LOW GAIN Y ACCELEROMETER BIAS(1)	IMU GND CAL	UG			93017G	*
KOY(1)	V99G2533CC	LOW GAIN Y ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	
KOY(1)	V99G2533CD	LOW GAIN Y ACCELEROMETER BIAS(1)	UL	UG			90525D	
KOY(2)	V99G2534CA	LOW GAIN Y ACCELEROMETER BIAS(2)	IMU ORB A/CAL	UG			93017G	*
KOY(2)	V99G2534CB	LOW GAIN Y ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*
KOY(2)	V99G2534CC	LOW GAIN Y ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOY(2)	V99G2534CD	LOW GAIN Y ACCELEROMETER BIAS(2)	UL	UG			90525D	
KOY(3)	V99G2535CA	LOW GAIN Y ACCELEROMETER BIAS(3)	IMU ORB A/CAL	UG			93017G	*
KOY(3)	V99G2535CB	LOW GAIN Y ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KOY(3)	V99G2535CC	LOW GAIN Y ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	
KOY(3)	V99G2535CD	LOW GAIN Y ACCELEROMETER BIAS(3)	UL	UG			90525D	
KOZ(1)	V99G2536CA	LOW GAIN Z ACCELEROMETER BIAS(1)	IMU ORB A/CAL	UG			93017G	*
KOZ(1)	V99G2536CB	LOW GAIN Z ACCELEROMETER BIAS(1)	IMU GND CAL	UG			93017G	*
KOZ(1)	V99G2536CC	LOW GAIN Z ACCELEROMETER BIAS(1)	MASS MEM	UG			90525D	
KOZ(1)	V99G2536CD	LOW GAIN Z ACCELEROMETER BIAS(1)	UL	UG			90525D	
KOZ(2)	V99G2537CA	LOW GAIN Z ACCELEROMETER BIAS(2)	IMU ORB A/CAL	UG			93017G	*
KOZ(2)	V99G2537CB	LOW GAIN Z ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*
KOZ(2)	V99G2537CC	LOW GAIN Z ACCELEROMETER BIAS(2)	MASS MEM	UG			90525D	
KOZ(2)	V99G2537CD	LOW GAIN Z ACCELEROMETER BIAS(2)	UL	UG			90525D	
KOZ(3)	V99G2538CA	LOW GAIN Z ACCELEROMETER BIAS(3)	IMU ORB A/CAL	UG			93017G	*
KOZ(3)	V99G2538CB	LOW GAIN Z ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KOZ(3)	V99G2538CC	LOW GAIN Z ACCELEROMETER BIAS(3)	MASS MEM	UG			90525D	
KOZ(3)	V99G2538CD	LOW GAIN Z ACCELEROMETER BIAS(3)	UL	UG			90525D	
KSX(1)	V99A2510CA	X-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSX(1)	V99A2510CB	X-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSX(2)	V99A2511CA	X-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KSX(2)	V99A2511CB	X-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSX(3)	V99A2512CA	X-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KSX(3)	V99A2512CB	X-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	
KSY(1)	V99A2513CA	Y-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSY(1)	V99A2513CB	Y-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSY(2)	V99A2514CA	Y-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KSY(2)	V99A2514CB	Y-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSY(3)	V99A2515CA	Y-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KSY(3)	V99A2515CB	Y-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	
KSZ(1)	V99A2516CA	Z-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSZ(1)	V99A2516CB	Z-ACCELEROMETER SYMMETRY FACTOR(1)	MASS MEM	UG/G			90525D	
KSZ(2)	V99A2517CA	Z-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KSZ(2)	V99A2517CB	Z-ACCELEROMETER SYMMETRY FACTOR(2)	MASS MEM	UG/G			90525D	
KSZ(3)	V99A2518CA	Z-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KSZ(3)	V99A2518CB	Z-ACCELEROMETER SYMMETRY FACTOR(3)	MASS MEM	UG/G			90525D	
KT70/HAINS_GOOD(1)	V71X2021B	IMU 1 KT70/HAINS GOOD	WD1B0 IMU 1		BD		93017G	*
KT70/HAINS_GOOD(2)	V71X3021B	IMU 2 KT70/HAINS GOOD	WD1B0 IMU 2		BD		93017G	*
KT70/HAINS_GOOD(3)	V71X4021B	IMU 3 KT70/HAINS GOOD	WD1B0 IMU 3		BD		93017G	*
KTX(1)	V99G2500CA	X-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(1)	V99G2500CB	X-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(2)	V99G2501CA	X-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(2)	V99G2501CB	X-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(3)	V99G2502CA	X-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(3)	V99G2502CB	X-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(1)	V99G2503CA	Y-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(1)	V99G2503CB	Y-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(2)	V99G2504CA	Y-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(2)	V99G2504CB	Y-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(3)	V99G2505CA	Y-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(3)	V99G2505CB	Y-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(1)	V99G2506CA	Z-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(1)	V99G2506CB	Z-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(2)	V99G2507CA	Z-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(2)	V99G2507CB	Z-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(3)	V99G2508CA	Z-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(3)	V99G2508CB	Z-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90185A	
LAUNCH_YEAR	V97U5383C	LAUNCH YEAR FOR RNP MATRIX CALC	UL	YEARS	HXS		93160B	*
MASK_CMD(1)	V93X6717X	IMU-1 BITE MASK CMD	IMU ALIGN DISP		BD		89813B	
MASK_CMD(2)	V93X6718X	IMU-2 BITE MASK CMD	IMU ALIGN DISP		BD		89813B	
MASK_CMD(3)	V93X6719X	IMU-3 BITE MASK CMD	IMU ALIGN DISP		BD		89813B	
MODE_BITE(1)	V71M2020P	IMU 1 MODE STATUS WD1	IMU 1		HMD		93017G	*
MODE_BITE(2)	V71M3020P	IMU 2 MODE STATUS WD1	IMU 2		HMD		93017G	*
MODE_BITE(3)	V71M4020P	IMU 3 MODE STATUS WD1	IMU 3		HMD		93017G	*
OMEGA_R(1)	V71R2040B	IMU-1 OMEGA R	WD2 IMU 1	DEG/HR	HFS		93017G	*
OMEGA_R(2)	V71R3040B	IMU-2 OMEGA R	WD2 IMU 2	DEG/HR	HFS		93017G	*
OMEGA_R(3)	V71R4040B	IMU-3 OMEGA R	WD2 IMU 3	DEG/HR	HFS		93017G	*
OPER/STBY(1)	V93X6020X	IMU 1 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(2)	V93X6021X	IMU 2 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(3)	V93X6022X	IMU 3 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
PC/CRCT_CRD_OVRTMP(1)	V71X2029B	IMU 1 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 1		BD		93017G	*
PC/CRCT_CRD_OVRTMP(2)	V71X3029B	IMU 2 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 2		BD		93017G	*
PC/CRCT_CRD_OVRTMP(3)	V71X4029B	IMU 3 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 3		BD		93017G	*

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PLAT_FAIL(1)	V71X2024B	IMU-1 PLATFORM FAIL	WD1B3	IMU 1	BD		93017G	*
PLAT_FAIL(2)	V71X3024B	IMU-2 PLATFORM FAIL	WD1B3	IMU 2	BD		93017G	*
PLAT_FAIL(3)	V71X4024B	IMU-3 PLATFORM FAIL	WD1B3	IMU 3	BD		93017G	*
PLAT_TEMP_RDY(1)	V71X2404X	IMU 1 PLATFORM TEMP READY		IMU 1	BD		93017G	*
PLAT_TEMP_RDY(2)	V71X3404X	IMU 2 PLATFORM TEMP READY		IMU 2	BD		93017G	*
PLAT_TEMP_RDY(3)	V71X4404X	IMU 3 PLATFORM TEMP READY		IMU 3	BD		93017G	*
PLAT_TEMP_SAFE(1)	V71X2405X	IMU 1 PLATFORM TEMP SAFE		IMU 1	BD		93017G	*
PLAT_TEMP_SAFE(2)	V71X3405X	IMU 2 PLATFORM TEMP SAFE		IMU 2	BD		93017G	*
PLAT_TEMP_SAFE(3)	V71X4405X	IMU 3 PLATFORM TEMP SAFE		IMU 3	BD		93017G	*
PO(1)	V99H2620CA	PITCH RESOLVER OFFSET(1)		IMU GND CAL	DEG		93017G	*
PO(1)	V99H2620CB	PITCH RESOLVER OFFSET(1)		MASS MEM	DEG			
PO(2)	V99H2621CA	PITCH RESOLVER OFFSET(2)		IMU GND CAL	DEG		93017G	*
PO(2)	V99H2621CB	PITCH RESOLVER OFFSET(2)		MASS MEM	DEG			
PO(3)	V99H2622CA	PITCH RESOLVER OFFSET(3)		IMU GND CAL	DEG		93017G	*
PO(3)	V99H2622CB	PITCH RESOLVER OFFSET(3)		MASS MEM	DEG			
PRESS/COMM_GOOD(1)	V71X2401X	IMU 1 PRESSURE/COMMUNICATION GOOD		IMU 1	BD		93017G	*
PRESS/COMM_GOOD(2)	V71X3401X	IMU 2 PRESSURE/COMMUNICATION GOOD		IMU 2	BD		93017G	*
PRESS/COMM_GOOD(3)	V71X4401X	IMU 3 PRESSURE/COMMUNICATION GOOD		IMU 3	BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(1)	V71X2025B	IMU 1 PWR CNTRLR/DGITAL SBSY FAIL		IMU 1	BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(2)	V71X3025B	IMU 2 PWR CNTRLR/DGITAL SBSY FAIL		IMU 2	BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(3)	V71X4025B	IMU 3 PWR CNTRLR/DGITAL SBSY FAIL		IMU 3	BD		93017G	*
RX_CUR/RX_FAIL(1)	V71X2028B	IMU 1 RESLVR CURRENT/RESLVR FAIL		IMU 1	BD		93017G	*
RX_CUR/RX_FAIL(2)	V71X3028B	IMU 2 RESLVR CURRENT/RESLVR FAIL		IMU 2	BD		93017G	*
RX_CUR/RX_FAIL(3)	V71X4028B	IMU 3 RESLVR CURRENT/RESLVR FAIL		IMU 3	BD		93017G	*
THETARL(1)	V71H2060B	IMU-1 THETA R 8X	WD3	IMU 1	DEG	BSU	93017G	*
THETARL(2)	V71H3060B	IMU-2 THETA R 8X	WD3	IMU 2	DEG	BSU	93017G	*
THETARL(3)	V71H4060B	IMU-3 THETA R 8X	WD3	IMU 3	DEG	BSU	93017G	*
THETAXL(1)	V71H2100B	IMU-1 THETA X 8X	WD5	IMU 1	DEG	BSU	93017G	*
THETAXL(2)	V71H3100B	IMU-2 THETA X 8X	WD5	IMU 2	DEG	BSU	93017G	*
THETAXL(3)	V71H4100B	IMU-3 THETA X 8X	WD5	IMU 3	DEG	BSU	93017G	*
THETAXM(1)	V71H2080B	IMU-1 THETA X 1X	WD4	IMU 1	DEG	BSU	93017G	*
THETAXM(2)	V71H3080B	IMU-2 THETA X 1X	WD4	IMU 2	DEG	BSU	93017G	*
THETAXM(3)	V71H4080B	IMU-3 THETA X 1X	WD4	IMU 3	DEG	BSU	93017G	*
THETAYL(1)	V71H2140B	IMU-1 THETA Y 8X	WD7	IMU 1	DEG	BSU	93017G	*
THETAYL(2)	V71H3140B	IMU-2 THETA Y 8X	WD7	IMU 2	DEG	BSU	93017G	*
THETAYL(3)	V71H4140B	IMU-3 THETA Y 8X	WD7	IMU 3	DEG	BSU	93017G	*
THETAYM(1)	V71H2120B	IMU-1 THETA Y 1X	WD6	IMU 1	DEG	BSU	93017G	*
THETAYM(2)	V71H3120B	IMU-2 THETA Y 1X	WD6	IMU 2	DEG	BSU	93017G	*
THETAYM(3)	V71H4120B	IMU-3 THETA Y 1X	WD6	IMU 3	DEG	BSU	93017G	*
THETAZL(1)	V71H2180B	IMU-1 THETA Z 8X	WD9	IMU 1	DEG	BSU	93017G	*
THETAZL(2)	V71H3180B	IMU-2 THETA Z 8X	WD9	IMU 2	DEG	BSU	93017G	*
THETAZL(3)	V71H4180B	IMU-3 THETA Z 8X	WD9	IMU 3	DEG	BSU	93017G	*
THETAZM(1)	V71H2160B	IMU-1 THETA Z 1X	WD8	IMU 1	DEG	BSU	93017G	*
THETAZM(2)	V71H3160B	IMU-2 THETA Z 1X	WD8	IMU 2	DEG	BSU	93017G	*
THETAZM(3)	V71H4160B	IMU-3 THETA Z 1X	WD8	IMU 3	DEG	BSU	93017G	*
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL	WD1B9	IMU 1	BD		93017G	*

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL	WD1B9	IMU 2	BD		93017G	*
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL	WD1B9	IMU 3	BD		93017G	*
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL	WD1B10	IMU 1	BD		93017G	*
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL	WD1B10	IMU 2	BD		93017G	*
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL	WD1B10	IMU 3	BD		93017G	*
T_CLUSTER_M50(1,1,1)	V99U3450CA	CLUSTER TO M50/IMU-1 COMPONENT 1,1		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,1,1)	V99U3450CB	CLUSTER TO M50/IMU-1 COMPONENT 1,1		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(1,1,2)	V99U3453CA	CLUSTER TO M50/IMU-1 COMPONENT 1,2		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,1,2)	V99U3453CB	CLUSTER TO M50/IMU-1 COMPONENT 1,2		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(1,1,3)	V99U3456CA	CLUSTER TO M50/IMU-1 COMPONENT 1,3		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,1,3)	V99U3456CB	CLUSTER TO M50/IMU-1 COMPONENT 1,3		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(1,2,1)	V99U3459CA	CLUSTER TO M50/IMU 1 COMPONENT 2,1		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,2,1)	V99U3459CB	CLUSTER TO M50/IMU 1 COMPONENT 2,1		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(1,2,2)	V99U3462CA	CLUSTER TO M50/IMU-1 COMPONENT 2,2		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,2,2)	V99U3462CB	CLUSTER TO M50/IMU-1 COMPONENT 2,2		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(1,2,3)	V99U3465CA	CLUSTER TO M50/IMU-1 COMPONENT 2,3		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,2,3)	V99U3465CB	CLUSTER TO M50/IMU-1 COMPONENT 2,3		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(1,3,1)	V99U3468CA	CLUSTER TO M50/IMU-1 COMPONENT 3,1		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,3,1)	V99U3468CB	CLUSTER TO M50/IMU-1 COMPONENT 3,1		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(1,3,2)	V99U3471CA	CLUSTER TO M50/IMU-1 COMPONENT 3,2		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,3,2)	V99U3471CB	CLUSTER TO M50/IMU-1 COMPONENT 3,2		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(1,3,3)	V99U3474CA	CLUSTER TO M50/IMU-1 COMPONENT 3,3		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(1,3,3)	V99U3474CB	CLUSTER TO M50/IMU-1 COMPONENT 3,3		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,1,1)	V99U3451CA	CLUSTER TO M50/IMU-2 COMPONENT 1,1		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,1,1)	V99U3451CB	CLUSTER TO M50/IMU-2 COMPONENT 1,1		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,1,2)	V99U3454CA	CLUSTER TO M50/IMU-2 COMPONENT 1,2		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,1,2)	V99U3454CB	CLUSTER TO M50/IMU-2 COMPONENT 1,2		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,1,3)	V99U3457CA	CLUSTER TO M50/IMU-2 COMPONENT 1,3		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,1,3)	V99U3457CB	CLUSTER TO M50/IMU-2 COMPONENT 1,3		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,2,1)	V99U3460CA	CLUSTER TO M50/IMU-2 COMPONENT 2,1		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,2,1)	V99U3460CB	CLUSTER TO M50/IMU-2 COMPONENT 2,1		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,2,2)	V99U3463CA	CLUSTER TO M50/IMU-2 COMPONENT 2,2		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,2,2)	V99U3463CB	CLUSTER TO M50/IMU-2 COMPONENT 2,2		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,2,3)	V99U3466CA	CLUSTER TO M50/IMU-2 COMPONENT 2,3		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,2,3)	V99U3466CB	CLUSTER TO M50/IMU-2 COMPONENT 2,3		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,3,1)	V99U3469CA	CLUSTER TO M50/IMU-2 COMPONENT 3,1		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,3,1)	V99U3469CB	CLUSTER TO M50/IMU-2 COMPONENT 3,1		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,3,2)	V99U3472CA	CLUSTER TO M50/IMU-2 COMPONENT 3,2		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,3,2)	V99U3472CB	CLUSTER TO M50/IMU-2 COMPONENT 3,2		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(2,3,3)	V99U3475CA	CLUSTER TO M50/IMU-2 COMPONENT 3,3		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(2,3,3)	V99U3475CB	CLUSTER TO M50/IMU-2 COMPONENT 3,3		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(3,1,1)	V99U3452CA	CLUSTER TO M50/IMU-3 COMPONENT 1,1		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(3,1,1)	V99U3452CB	CLUSTER TO M50/IMU-3 COMPONENT 1,1		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(3,1,2)	V99U3455CA	CLUSTER TO M50/IMU-3 COMPONENT 1,2		IMU ORB A/CAL			93017G	*
T_CLUSTER_M50(3,1,2)	V99U3455CB	CLUSTER TO M50/IMU-3 COMPONENT 1,2		IMU GC ALIGN			93017G	*
T_CLUSTER_M50(3,1,3)	V99U3458CA	CLUSTER TO M50/IMU-3 COMPONENT 1,3		IMU ORB A/CAL			93017G	*

TABLE 4.5.4.6.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(3,1,3)	V99U3458CB	CLUSTER TO M50/IMU-3 COMPONENT 1,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,2,1)	V99U3461CA	CLUSTER TO M50/IMU-3 COMPONENT 2,1	IMU ORB A/CAL				93017G	*
T_CLUSTER_M50(3,2,1)	V99U3461CB	CLUSTER TO M50/IMU-3 COMPONENT 2,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,2,2)	V99U3464CA	CLUSTER TO M50/IMU-3 COMPONENT 2,2	IMU ORB A/CAL				93017G	*
T_CLUSTER_M50(3,2,2)	V99U3464CB	CLUSTER TO M50/IMU-3 COMPONENT 2,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,2,3)	V99U3467CA	CLUSTER TO M50/IMU-3 COMPONENT 2,3	IMU ORB A/CAL				93017G	*
T_CLUSTER_M50(3,2,3)	V99U3467CB	CLUSTER TO M50/IMU-3 COMPONENT 2,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,3,1)	V99U3470CA	CLUSTER TO M50/IMU-3 COMPONENT 3,1	IMU ORB A/CAL				93017G	*
T_CLUSTER_M50(3,3,1)	V99U3470CB	CLUSTER TO M50/IMU-3 COMPONENT 3,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,3,2)	V99U3473CA	CLUSTER TO M50/IMU-3 COMPONENT 3,2	IMU ORB A/CAL				93017G	*
T_CLUSTER_M50(3,3,2)	V99U3473CB	CLUSTER TO M50/IMU-3 COMPONENT 3,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,3,3)	V99U3476CA	CLUSTER TO M50/IMU-3 COMPONENT 3,3	IMU ORB A/CAL				93017G	*
T_CLUSTER_M50(3,3,3)	V99U3476CB	CLUSTER TO M50/IMU-3 COMPONENT 3,3	IMU GC ALIGN				93017G	*
UP_OP_CODE	V96J3521C	OP CODE FOR UPLINK	UL		HXS		92067D	
VELSUMM50X(1)/V_1(1)	V95L0065CA	IMU 1 ACCUM SENSED CHANGE X VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
VELSUMM50X(2)/V_2(1)	V95L1065CA	IMU 2 ACCUM SENSED CHANGE X VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
VELSUMM50X(3)/V_3(1)	V95L2065CA	IMU 3 ACCUM SENSED CHANGE X VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
VELSUMM50Y(1)/V_1(2)	V95L0066CA	IMU 1 ACCUM SENSED CHANGE Y VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
VELSUMM50Y(2)/V_2(2)	V95L1066CA	IMU 2 ACCUM SENSED CHANGE Y VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
VELSUMM50Y(3)/V_3(2)	V95L2066CA	IMU 3 ACCUM SENSED CHANGE Y VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
VELSUMM50Z(1)/V_1(3)	V95L0067CA	IMU 1 ACCUM SENSED CHANGE Z VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
VELSUMM50Z(2)/V_2(3)	V95L1067CA	IMU 2 ACCUM SENSED CHANGE Z VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
VELSUMM50Z(3)/V_3(3)	V95L2067CA	IMU 3 ACCUM SENSED CHANGE Z VEL	IMU TERM/IDLE	FT/S	DPL		93017G	*
	V93X6026X	IMU 1 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6027X	IMU 2 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6028X	IMU 3 SELECT	GROUND IMU DISP	EVENT	BD			
	V93X6055X	TERM/IDLE COMMAND	GROUND IMU DISP	EVENT	BD			

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

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TM50_DC_1,1	V96U7185CA	M50 TO DESIRED ORIENT, IMU 1 EL 1,1	IMU ORB A/CAL				92297B	
1TM50_DC_1,2	V96U7186CA	M50 TO DESIRED ORIENT, IMU 1 EL 1,2	IMU ORB A/CAL				92297B	
1TM50_DC_1,3	V96U7187CA	M50 TO DESIRED ORIENT, IMU 1 EL 1,3	IMU ORB A/CAL				92297B	
1TM50_DC_2,1	V96U7188CA	M50 TO DESIRED ORIENT, IMU 1 EL 2,1	IMU ORB A/CAL				92297B	
1TM50_DC_2,2	V96U7189CA	M50 TO DESIRED ORIENT, IMU 1 EL 2,2	IMU ORB A/CAL				92297B	
1TM50_DC_2,3	V96U7190CA	M50 TO DESIRED ORIENT, IMU 1 EL 2,3	IMU ORB A/CAL				92297B	
1TM50_DC_3,1	V96U7191CA	M50 TO DESIRED ORIENT, IMU 1 EL 3,1	IMU ORB A/CAL				92297B	
1TM50_DC_3,2	V96U7192CA	M50 TO DESIRED ORIENT, IMU 1 EL 3,2	IMU ORB A/CAL				92297B	
1TM50_DC_3,3	V96U7193CA	M50 TO DESIRED ORIENT, IMU 1 EL 3,3	IMU ORB A/CAL				92297B	
2TM50_DC_1,1	V96U7194CA	M50 TO DESIRED ORIENT, IMU 2 EL 1,1	IMU ORB A/CAL				92297B	
2TM50_DC_1,2	V96U7195CA	M50 TO DESIRED ORIENT, IMU 2 EL 1,2	IMU ORB A/CAL				92297B	
2TM50_DC_1,3	V96U7196CA	M50 TO DESIRED ORIENT, IMU 2 EL 1,3	IMU ORB A/CAL				92297B	
2TM50_DC_2,1	V96U7197CA	M50 TO DESIRED ORIENT, IMU 2 EL 2,1	IMU ORB A/CAL				92297B	
2TM50_DC_2,2	V96U7198CA	M50 TO DESIRED ORIENT, IMU 2 EL 2,2	IMU ORB A/CAL				92297B	
2TM50_DC_2,3	V96U7199CA	M50 TO DESIRED ORIENT, IMU 2 EL 2,3	IMU ORB A/CAL				92297B	
2TM50_DC_3,1	V96U7200CA	M50 TO DESIRED ORIENT, IMU 2 EL 3,1	IMU ORB A/CAL				92297B	
2TM50_DC_3,2	V96U7201CA	M50 TO DESIRED ORIENT, IMU 2 EL 3,2	IMU ORB A/CAL				92297B	
2TM50_DC_3,3	V96U7202CA	M50 TO DESIRED ORIENT, IMU 2 EL 3,3	IMU ORB A/CAL				92297B	
3TM50_DC_1,1	V96U7203CA	M50 TO DESIRED ORIENT, IMU 3 EL 1,1	IMU ORB A/CAL				92297B	
3TM50_DC_1,2	V96U7204CA	M50 TO DESIRED ORIENT, IMU 3 EL 1,2	IMU ORB A/CAL				92297B	
3TM50_DC_1,3	V96U7205CA	M50 TO DESIRED ORIENT, IMU 3 EL 1,3	IMU ORB A/CAL				92297B	
3TM50_DC_2,1	V96U7206CA	M50 TO DESIRED ORIENT, IMU 3 EL 2,1	IMU ORB A/CAL				92297B	
3TM50_DC_2,2	V96U7207CA	M50 TO DESIRED ORIENT, IMU 3 EL 2,2	IMU ORB A/CAL				92297B	
3TM50_DC_2,3	V96U7208CA	M50 TO DESIRED ORIENT, IMU 3 EL 2,3	IMU ORB A/CAL				92297B	
3TM50_DC_3,1	V96U7209CA	M50 TO DESIRED ORIENT, IMU 3 EL 3,1	IMU ORB A/CAL				92297B	
3TM50_DC_3,2	V96U7210CA	M50 TO DESIRED ORIENT, IMU 3 EL 3,2	IMU ORB A/CAL				92297B	
3TM50_DC_3,3	V96U7211CA	M50 TO DESIRED ORIENT, IMU 3 EL 3,3	IMU ORB A/CAL				92297B	
ACCEL_SF(1)	V71K2541BA	IMU 1 CAPRI SC FAC CMD	WD2 B0	IMU 1 TLM				
ACCEL_SF(2)	V71K3541BA	IMU 2 CAPRI SC FAC CMD	WD2 B0	IMU 2 TLM				
ACCEL_SF(3)	V71K4541BA	IMU 3 CAPRI SC FAC CMD	WD2 B0	IMU 3 TLM				
AREA(1)	V96H7217C	IMU 1 GIMBAL AREA PARAMETER		STAR TRCK SOP	DEG			
AREA(2)	V96H7218C	IMU 2 GIMBAL AREA PARAMETER		STAR TRCK SOP	DEG			
AREA(3)	V96H7219C	IMU 3 GIMBAL AREA PARAMETER		STAR TRCK SOP	DEG			
AZANG(1)	V95H0051CA	IMU 1 COMP AZIMUTH RES ANGLE		A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG		93017G	*



TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AZANG(2)	V95H1051CA	IMU 2 COMP AZIMUTH RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
AZANG(3)	V95H2051CA	IMU 3 COMP AZIMUTH RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
CMD_WD1(1)	V71M2520PA	IMU 1 COMMAND WORD 1	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1				93017G	*
CMD_WD1(2)	V71M3520PA	IMU 2 COMMAND WORD 1	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2				93017G	*
CMD_WD1(3)	V71M4520PA	IMU 3 COMMAND WORD 1	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3				93017G	*
CMD_WD2(1)	V71M2540PA	IMU 1 COMMAND WORD 2	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1				93017G	*
CMD_WD2(2)	V71M3540PA	IMU 2 COMMAND WORD 2	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2				93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING  
(G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
CMD_WD2(3)	V71M4540PA	IMU 3 COMMAND WORD 2	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3				93017G	*
DELVELM50X(1)	V99L3267C	IMU 1 SENSED CHANGE IN X VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DELVELM50X(2)	V99L3268C	IMU 2 SENSED CHANGE IN X VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DELVELM50X(3)	V99L3269C	IMU 3 SENSED CHANGE IN X VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DELVELM50Y(1)	V99L3270C	IMU 1 SENSED CHANGE IN Y VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DELVELM50Y(2)	V99L3271C	IMU 2 SENSED CHANGE IN Y VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DELVELM50Y(3)	V99L3272C	IMU 3 SENSED CHANGE IN Y VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DELVELM50Z(1)	V99L3273C	IMU 1 SENSED CHANGE IN Z VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DELVELM50Z(2)	V99L3274C	IMU 2 SENSED CHANGE IN Z VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DELVELM50Z(3)	V99L3275C	IMU 3 SENSED CHANGE IN Z VEL(M50)	DL FMT 22/1	FT/S	SPL		93017G	*
DFX(1)	V99R2560CE	X-GYRO RESTRAINT(1)	DL FMT 22/1	DEG/HR			93017G	*
DFX(2)	V99R2561CE	X-GYRO RESTRAINT(2)	DL FMT 22/1	DEG/HR			93017G	*
DFX(3)	V99R2562CE	X-GYRO RESTRAINT(3)	DL FMT 22/1	DEG/HR			93017G	*
DFY(1)	V99R2563CE	Y-GYRO RESTRAINT(1)	DL FMT 22/1	DEG/HR			93017G	*
DFY(2)	V99R2564CE	Y-GYRO RESTRAINT(2)	DL FMT 22/1	DEG/HR			93017G	*
DFY(3)	V99R2565CE	Y-GYRO RESTRAINT(3)	DL FMT 22/1	DEG/HR			93017G	*
DFZ(1)	V99R2566CE	Z-GYRO RESTRAINT(1)	DL FMT 22/1	DEG/HR			93017G	*
DFZ(2)	V99R2567CE	Z-GYRO RESTRAINT(2)	DL FMT 22/1	DEG/HR			93017G	*
DFZ(3)	V99R2568CE	Z-GYRO RESTRAINT(3)	DL FMT 22/1	DEG/HR			93017G	*
DP(1)	V99H2660CC	IMU-1 ROLL/PITCH NONORTHOGONALITY	TLM	RAD			93017G	*
DP(2)	V99H2661CC	IMU-2 ROLL/PITCH NONORTHOGONALITY	TLM	RAD			93017G	*
DP(3)	V99H2662CC	IMU-3 ROLL/PITCH NONORTHOGONALITY	TLM	RAD			93017G	*
DVX(1)	V99U2860CA	IMU-1 X-AXIS DELTA VEL MAJ CYC	TLM	FT/S			93017G	*
DVX(2)	V99U2861CA	IMU 2 X AXIS DELTA VEL MAJ CY	TLM	FT/S				
DVX(3)	V99U2862CA	IMU 3 X AXIS DELTA VEL MAJ CY	TLM	FT/S				
DVX_1SEC(1)	V95L0056CA	IMU 1 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(2)	V95L1056CA	IMU 2 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(3)	V95L2056CA	IMU 3 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY(1)	V99U2863CA	IMU 1 Y AXIS DELTA VEL MAJ CY	TLM	FT/S				
DVY(2)	V99U2864CA	IMU 2 Y AXIS DELTA VEL MAJ CY	TLM	FT/S				
DVY(3)	V99U2865CA	IMU 3 Y AXIS DELTA VEL MAJ CY	TLM	FT/S				
DVY_1SEC(1)	V95L0057CA	IMU 1 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY_1SEC(2)	V95L1057CA	IMU 2 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY_1SEC(3)	V95L2057CA	IMU 3 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ(1)	V99U2866CA	IMU 1 Z AXIS DELTA VEL MAJ CY	TLM	FT/S				

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DVZ(2)	V99U2867CA	IMU 2 Z AXIS DELTA VEL MAJ CY	TLM	FT/S				
DVZ(3)	V99U2868CA	IMU 3 Z AXIS DELTA VEL MAJ CY	TLM	FT/S				
DVZ_1SEC(1)	V95L0058CA	IMU 1 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
DVZ_1SEC(2)	V95L1058CA	IMU 2 Z AXIS DEL VEL OVER 1 SEC	TLM					
DVZ_1SEC(3)	V95L2058CA	IMU 3 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP	FT/S2				
FAIL_ACCEL_SF(1)	V95X0081XA	IMU 1 ACC/CAPRI SF FAIL	DL FMT 21/1				93017G	*
			DL FMT 22/1					
			DL FMT 23/1					
FAIL_ACCEL_SF(2)	V95X1081XA	IMU 2 ACC/CAPRI SF FAIL	DL FMT 32/1				93017G	*
			DL FMT 21/1					
			DL FMT 22/1					
			DL FMT 23/1					
FAIL_ACCEL_SF(3)	V95X2081XA	IMU 3 ACC/CAPRI SF FAIL	DL FMT 32/1				93017G	*
			DL FMT 21/1					
			DL FMT 22/1					
			DL FMT 23/1					
FAIL_ECHO_1(1)	V95X0030XA	IMU 1 WORD 13 ECHO FAIL	DL FMT 32/1				93017G	*
			DL FMT 21/1					
			DL FMT 22/1					
			DL FMT 23/1					
FAIL_ECHO_1(2)	V95X1030XA	IMU 2 WORD 13 ECHO FAIL	DL FMT 32/1				93017G	*
			DL FMT 21/1					
			DL FMT 22/1					
			DL FMT 23/1					
FAIL_ECHO_1(3)	V95X2030XA	IMU 3 WORD 13 ECHO FAIL	DL FMT 32/1				93017G	*
			DL FMT 21/1					
			DL FMT 22/1					
			DL FMT 23/1					
FAIL_ECHO_2(1)	V95X0031XA	IMU 1 WORD 14 ECHO FAIL	DL FMT 32/1				93017G	*
			DL FMT 21/1					
			DL FMT 22/1					
			DL FMT 23/1					
FAIL_ECHO_2(2)	V95X1031XA	IMU 2 WORD 14 ECHO FAIL	DL FMT 32/1				93017G	*
			DL FMT 21/1					
			DL FMT 22/1					
			DL FMT 23/1					
FAIL_ECHO_2(3)	V95X2031XA	IMU 3 WORD 14 ECHO FAIL	DL FMT 32/1				93017G	*
			DL FMT 21/1					
			DL FMT 22/1					
			DL FMT 23/1					
			DL FMT 32/1					

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING  
(G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_IR_NULL(1)	V95X0034XA	IMU 1 INNER RESOLVER NULL FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
FAIL_IR_NULL(2)	V95X1034XA	IMU 2 INNER RESOLVER NULL FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
FAIL_IR_NULL(3)	V95X2034XA	IMU 3 INNER RESOLVER NULL FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
FAIL_RED_RTE(1)	V95X0033X	IMU 1 REDUNDANT RATE FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1		BD		93017G	*
FAIL_RED_RTE(2)	V95X1033X	IMU 2 REDUNDANT RATE FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1		BD		93017G	*
FAIL_RED_RTE(3)	V95X2033X	IMU 3 REDUNDANT RATE FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1		BD		93017G	*
FAIL_RES_LIM(1)	V95X0037XA	IMU 1 RESOLVER LIMIT FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
FAIL_RES_LIM(2)	V95X1037XA	IMU 2 RESOLVER LIMIT FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
FAIL_RES_LIM(3)	V95X2037XA	IMU 3 RESOLVER LIMIT FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
FAIL_VEL_LIM(1)	V95X0035XA	IMU 1 VELOCITY LIMIT FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
FAIL_VEL_LIM(2)	V95X1035XA	IMU 2 VELOCITY LIMIT FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_VEL_LIM(3)	V95X2035XA	IMU 3 VELOCITY LIMIT FAIL	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
HDW_BITE1(1)	V95Q0076CA	IMU 1 HEX DISCRETE WORD	GROUND IMU DISP TLM					
HDW_BITE1(2)	V95Q1076CA	IMU 2 HEX DISCRETE WORD	GROUND IMU DISP TLM					
HDW_BITE1(3)	V95Q2076CA	IMU 3 HEX DISCRETE WORD	GROUND IMU DISP TLM					
HDW_BITE2(1)	V95Q0077CA	IMU 1 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
HDW_BITE2(2)	V95Q1077CA	IMU 2 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
HDW_BITE2(3)	V95Q2077CA	IMU 3 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
IMU_1_BITE_FAIL	V95X0044X	IMU 1 FAILURE IND BY BITE	IMU RM					
IMU_1_MASK_STAT	V95X0026X	IMU-1 BITE MASK IN EFFECT	IMU ALIGN DISP		BD		89813B	
IMU_1_SEL_STATUS	V95X0021XA	IMU 1 SELECT STATUS	GROUND IMU DISP TLM					
IMU_2_BITE_FAIL	V95X1044X	IMU 2 FAILURE IND BY BITE	IMU RM					
IMU_2_MASK_STAT	V95X1026X	IMU-2 BITE MASK IN EFFECT	IMU ALIGN DISP		BD		89813B	
IMU_2_SEL_STATUS	V95X1021XA	IMU 2 SELECT STATUS	GROUND IMU DISP TLM					
IMU_3_BITE_FAIL	V95X2044X	IMU 3 FAILURE IND BY BITE	IMU RM					
IMU_3_MASK_STAT	V95X2026X	IMU-3 BITE MASK IN EFFECT	IMU ALIGN DISP		BD		89813B	
IMU_3_SEL_STATUS	V95X2021XA	IMU 3 SELECT STATUS	GROUND IMU DISP TLM					
IMU_BITE_STATUS(1)	V95J0029B	IMU-1 BITE STATUS WORD	IMU ALIGN DISP				89813B	
IMU_BITE_STATUS(2)	V95J1029B	IMU-2 BITE STATUS WORD	IMU ALIGN DISP				89813B	
IMU_BITE_STATUS(3)	V95J2029B	IMU-3 BITE STATUS WORD	IMU ALIGN DISP				89813B	
IMU_FAIL_IND(1)	V95X0023XA	IMU 1 FAILURE INDICATOR	DL FMT 22/1 DL FMT 32/1 GAX IMU RM				93017G	*
IMU_FAIL_IND(2)	V95X1023XA	IMU 2 FAILURE INDICATOR	DL FMT 22/1 DL FMT 32/1 GAX IMU RM OVERRIDE DISP				93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING  
(G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
IMU_FAIL_IND(3)	V95X2023XA	IMU 3 FAILURE INDICATOR	DL FMT 22/1 DL FMT 32/1 GAX IMU RM OVERRIDE DISP				93017G	*
IRANG(1)	V95H0053CA	IMU 1 COMP INNER ROLL RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
IRANG(2)	V95H1053CA	IMU 2 COMP INNER ROLL RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
IRANG(3)	V95H2053CA	IMU 3 COMP INNER ROLL RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
KIX(1)	V99A2520CD	LOW GAIN X-ACCEL SCALE FACTOR(1)	TLM	UG/G	SPL		90525D	
KIX(2)	V99A2521CD	LOW GAIN X-ACCEL SCALE FACTOR(2)	TLM	UG/G	SPL		90525D	
KIX(3)	V99A2522CD	LOW GAIN X-ACCEL SCALE FACTOR(3)	TLM	UG/G	SPL		90525D	
KIY(1)	V99A2523CD	LOW GAIN Y-ACCEL SCALE FACTOR(1)	TLM	UG/G	SPL		90525D	
KIY(2)	V99A2524CD	LOW GAIN Y-ACCEL SCALE FACTOR(2)	TLM	UG/G	SPL		90525D	
KIY(3)	V99A2525CD	LOW GAIN Y-ACCEL SCALE FACTOR(3)	TLM	UG/G	SPL		90525D	
KIZ(1)	V99A2526CD	LOW GAIN Z-ACCEL SCALE FACTOR(1)	TLM	UG/G	SPL		90525D	
KIZ(2)	V99A2527CD	LOW GAIN Z-ACCEL SCALE FACTOR(2)	TLM	UG/G	SPL		90525D	
KIZ(3)	V99A2528CD	LOW GAIN Z-ACCEL SCALE FACTOR(3)	TLM	UG/G	SPL		93017G	*
KOX(1)	V99G2530CE	LOW GAIN X ACCELEROMETER BIAS(1)	DL FMT 22/1	UG			93017G	*
KOX(2)	V99G2531CE	LOW GAIN X ACCELEROMETER BIAS(2)	DL FMT 22/1	UG			93017G	*
KOX(3)	V99G2532CE	LOW GAIN X ACCELEROMETER BIAS(3)	DL FMT 22/1	UG			93017G	*
KOY(1)	V99G2533CE	LOW GAIN Y ACCELEROMETER BIAS(1)	DL FMT 22/1	UG			93017G	*
KOY(2)	V99G2534CE	LOW GAIN Y ACCELEROMETER BIAS(2)	DL FMT 22/1	UG			93017G	*
KOY(3)	V99G2535CE	LOW GAIN Y ACCELEROMETER BIAS(3)	DL FMT 22/1	UG			93017G	*
KOZ(1)	V99G2536CE	LOW GAIN Z ACCELEROMETER BIAS(1)	DL FMT 22/1	UG			93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOZ(2)	V99G2537CE	LOW GAIN Z ACCELEROMETER BIAS(2)	DL FMT 22/1	UG			93017G	*
KOZ(3)	V99G2538CE	LOW GAIN Z ACCELEROMETER BIAS(3)	DL FMT 22/1	UG			93017G	*
OPER_CMD(1)	V71K2576XA	IMU-1 OPERATE MODE CMD	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A GROUND IMU DISP IMU 1				93017G	*
OPER_CMD(1)	V95X0655XA	IMU 1 OPERATE MODE CMD	TLM					
OPER_CMD(2)	V71K3576XA	IMU-2 OPERATE MODE CMD	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A GROUND IMU DISP IMU 2				93017G	*
OPER_CMD(2)	V95X0656XA	IMU 2 OPERATE MODE CMD	TLM					
OPER_CMD(3)	V71K4576XA	IMU-3 OPERATE MODE CMD	DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A GROUND IMU DISP IMU 3				93017G	*
OPER_CMD(3)	V95X0657XA	IMU 3 OPERATE MODE CMD	TLM					
ORANG(1)	V95H0054CA	IMU 1 COMP OUTER ROLL RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
ORANG(2)	V95H1054CA	IMU 2 COMP OUTER ROLL RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING  
(G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
ORANG(3)	V95H2054CA	IMU 3 COMP OUTER ROLL RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
PANG(1)	V95H0050CA	IMU 1 COMP PITCH RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
PANG(2)	V95H1050CA	IMU 2 COMP PITCH RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
PANG(3)	V95H2050CA	IMU 3 COMP PITCH RES ANGLE	A/E ATT PROC DL FMT 21/1 DL FMT 22/A DL FMT 23/1 DL FMT 32/B GROUND IMU DISP ORB ATT PROC STAR TRCK SOP	DEG			93017G	*
PWR_ON(1)	V95X0020XA	IMU 1 POWER ON	GROUND IMU DISP TLM					
PWR_ON(2)	V95X1020XA	IMU 2 POWER ON	GROUND IMU DISP TLM					
PWR_ON(3)	V95X2020XA	IMU 3 POWER ON	GROUND IMU DISP TLM				93017G	*
PX(1)	V71K2521BA	IMU-1 TORQUE X CMD	WD1B0-4 DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	ARCS			93017G	*



TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PX(2)	V71K3521BA	IMU-2 TORQUE X CMD	WD1B0-4	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2	ARCS		93017G	*
PX(3)	V71K4521BA	IMU-3 TORQUE X CMD	WD1B0-4	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3	ARCS		93017G	*
PY(1)	V71K2526BA	IMU-1 TORQUE Y CMD	WD1B5-9	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	ARCS		93017G	*
PY(2)	V71K3526BA	IMU-2 TORQUE Y CMD	WD1B5-9	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2	ARCS		93017G	*
PY(3)	V71K4526BA	IMU-3 TORQUE Y CMD	WD1B5-9	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3	ARCS		93017G	*
PZ(1)	V71K2531BA	IMU-1 TORQUE Z CMD	WD1B10-14	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	ARCS		93017G	*
PZ(2)	V71K3531BA	IMU-2 TORQUE Z CMD	WD1B10-14	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2	ARCS		93017G	*
PZ(3)	V71K4531BA	IMU-3 TORQUE Z CMD	WD1B10-14	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3	ARCS		93017G	*
REFS_RDY	V95X0780XA	REFSMAT COMPUTATION COMPLETED		A/E ATT PROC DL FMT 21/1 GPS SOP GROUND IMU DISP IMU RM		BD	93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING  
(G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
S/W_BITE(1)	V95X0046XA	IMU 1 SW BITE STATUS	GROUND	IMU DISP			92141A	
S/W_BITE(2)	V95X1046XA	IMU 2 SW BITE STATUS	GROUND	IMU DISP			92141A	
S/W_BITE(3)	V95X2046XA	IMU 3 SW BITE STATUS	GROUND	IMU DISP			92141A	
SLEW_X_NEG(1)	V71K2543BA	IMU-1 SLEW X NEG	WD2B2	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	DEG/S		93017G	*
SLEW_X_NEG(2)	V71K3543BA	IMU-2 SLEW X NEG	WD2B2	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	DEG/S		93017G	*
SLEW_X_NEG(3)	V71K4543BA	IMU-3 SLEW X NEG	WD2B2	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2	DEG/S		93017G	*
SLEW_X_POS(1)	V71K2542BA	IMU-1 SLEW X POS	WD2B1	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3	DEG/S		93017G	*
SLEW_X_POS(2)	V71K3542BA	IMU-2 SLEW X POS	WD2B1	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	DEG/S		93017G	*
SLEW_X_POS(3)	V71K4542BA	IMU-3 SLEW X POS	WD2B1	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2	DEG/S		93017G	*
SLEW_Y_NEG(1)	V71K2545BA	IMU-1 SLEW Y NEG	WD2B4	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3	DEG/S		93017G	*
SLEW_Y_NEG(2)	V71K3545BA	IMU-2 SLEW Y NEG	WD2B4	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	DEG/S		93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Y_NEG(3)	V71K4545BA	IMU-3 SLEW Y NEG	WD2B4	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3	DEG/S		93017G	*
SLEW_Y_POS(1)	V71K2544BA	IMU-1 SLEW Y POS	WD2B3	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	DEG/S		93017G	*
SLEW_Y_POS(2)	V71K3544BA	IMU-2 SLEW Y POS	WD2B3	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2	DEG/S		93017G	*
SLEW_Y_POS(3)	V71K4544BA	IMU-3 SLEW Y POS	WD2B3	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3	DEG/S		93017G	*
SLEW_Z_NEG(1)	V71K2547BA	IMU-1 SLEW Z NEG	WD2B6	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	DEG/S		93017G	*
SLEW_Z_NEG(2)	V71K3547BA	IMU-2 SLEW Z NEG	WD2B6	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2	DEG/S		93017G	*
SLEW_Z_NEG(3)	V71K4547BA	IMU-3 SLEW Z NEG	WD2B6	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 3	DEG/S		93017G	*
SLEW_Z_POS(1)	V71K2546BA	IMU-1 SLEW Z POS	WD2B5	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 1	DEG/S		93017G	*
SLEW_Z_POS(2)	V71K3546BA	IMU-2 SLEW Z POS	WD2B5	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A IMU 2	DEG/S		93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING  
(G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Z_POS(3)	V71K4546BA	IMU-3 SLEW Z POS	WD2B5	DL FMT 21/A DL FMT 22/A DL FMT 23/1 DL FMT 32/A	DEG/S		93017G	*
T_IMUS	V95W0002C	IMU INPUT TRANS TIME TAG	IMU 3 A/E ATT PROC A/L UPP ASC UPP D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV ENT UPP G/C STEER IMU RM ORB ATT PROC ORB UPP ORB/RND NAV ORB/RND NAV SEQ PRELAND NAV RTLS NAV RTLS UPP STAR TRCK SOP TAEM UPP	S	DPL		93017G	*
T_IMUS_GA_TLM	V95W0036C	IMU GIMBAL DATA TIME TAG	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1	S	DPL		93017G	*
VELSUMM50X(1)/V_1(1)	V95L0065C	IMU 1 ACCUM SENSED CHANGE X VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*
VELSUMM50X(2)/V_2(1)	V95L1065C	IMU 2 ACCUM SENSED CHANGE X VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
VELSUMM50X(3)/V_3(1)	V95L2065C	IMU 3 ACCUM SENSED CHANGE X VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*
VELSUMM50Y(1)/V_1(2)	V95L0066C	IMU 1 ACCUM SENSED CHANGE Y VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*
VELSUMM50Y(2)/V_2(2)	V95L1066C	IMU 2 ACCUM SENSED CHANGE Y VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*
VELSUMM50Y(3)/V_3(2)	V95L2066C	IMU 3 ACCUM SENSED CHANGE Y VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*
VELSUMM50Z(1)/V_1(3)	V95L0067C	IMU 1 ACCUM SENSED CHANGE Z VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*
VELSUMM50Z(2)/V_2(3)	V95L1067C	IMU 2 ACCUM SENSED CHANGE Z VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING  
(G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
VELSUMM50Z(3)/V_3(3)	V95L2067C	IMU 3 ACCUM SENSED CHANGE Z VEL	D/L NAV SEQ DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A ENT NAV IMU RM	FT/S	DPL		93017G	*
VRSS(1)	V95L0060CA	IMU 1 SENSED CHANGE IN VEL(1 SEC)	GROUND IMU DISP TLM	FT/S <sup>2</sup>				
VRSS(2)	V95L1060CA	IMU 2 SENSED CHANGE IN VEL(1 SEC)	GROUND IMU DISP TLM	FT/S <sup>2</sup>				
VRSS(3)	V95L2060CA	IMU 3 SENSED CHANGE IN VEL(1 SEC)	GROUND IMU DISP TLM	FT/S <sup>2</sup>				
WRCF(1)/RGM_RATE_1	V95R0660CA	IMU 1 COMP AND FLTRD RED AXIS RATE	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1 IMU RM	DEG/HR			93017G	*
WRCF(2)/RGM_RATE_2	V95R0661CA	IMU 2 COMP AND FLTRD RED AXIS RATE	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1 IMU RM	DEG/HR			93017G	*
WRCF(3)/RGM_RATE_3	V95R0662CA	IMU 3 COMP AND FLTRD RED AXIS RATE	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1 IMU RM	DEG/HR			93017G	*
	V72M6633PA	MDM FF01 DSCR OUT SET	CD 13 CH 0 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A				93017G	*
	V72M6683PA	MDM FF02 DSCR OUT SET	CD 13 CH 0 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A				93017G	*
	V72M6733PA	MDM FF03 DSCR OUT SET	CD 13 CH 0 DL FMT 21/A DL FMT 22/A DL FMT 23/A DL FMT 32/A				93017G	*
	V95M2842PA	CGMB_IMU_FAIL	DL FMT 22/1 DL FMT 32/1				93017G	*

TABLE 4.5.4.6.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V95M2850PA	CGMB_SW_BITE\$(1:)	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
	V95M2851PA	CGMB_SW_BITE\$(2:)	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
	V95M2852PA	CGMB_SW_BITE\$(3:)	DL FMT 21/1 DL FMT 22/1 DL FMT 23/1 DL FMT 32/1				93017G	*
	V95M2872PA	CGMB_INERTIAL_IPA	DL FMT 21/1				93017G	*

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

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

This page intentionally left blank.



TABLE 4.5.4.6.1-3. INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38) I-LOADS

FSSR NAME	MSID	ENG UNITS	DT	PR	D	S	PR FCTN	MC	CAT	LAST CR	R E V
LAUNCH_YEAR	V97U5383C	YEARS	I	S	D	C	G4.123 G4.16 G4.38 G4.72	00	GPT	93160B	*

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

TABLE 4.5.4.6.1-4. INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38) 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 4.5.4.6.1-5. INERTIAL MEASUREMENT UNIT INERTIAL PROCESSING (G4.38) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
RAD RADIAN TO ARC-SEC CONVERSION	V97U6133C	00	+2.0626481	E+05	ARC-SEC/RAD	F	S	P A6.9 G4.208 G4.38 V4.10 V4.11 V4.9A	90374C	

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

#### 4.5.4.7 IMU On-Orbit Alignment (IMU\_ORBIT\_AL).

The purpose of the IMU\_ORBIT\_AL module is to compute an accurate definition of the IMU cluster orientation with respect to inertial space and/or to realign (reposition) the selected IMU's to desired cluster orientations that are known with respect to inertial space.

There are four options available for on-orbit IMU alignment: (1) IMU repositioning based on cluster misalignment defined by Star Tracker/COAS data, (2) IMU repositioning based on cluster misalignment defined by a reference IMU, (3) update the cluster orientation matrix based on Star Tracker/COAS data, or (4) update the cluster orientation matrix based on reference IMU data. These options are summarized in Table 4.5.4.7-1.

##### Option 1: IMU Alignment Based on Star Tracker/COAS Data

An accurate computation of the IMU cluster orientation with respect to inertial space is normally accomplished by using the Star Tracker measurements or COAS measurements to determine the transformation from present cluster-to-M50. This is required periodically during flight because of uncompensated gyro errors that cause the IMU's clusters to drift away from the orientation defined by the stored transformation from cluster-to-M50.

To determine the transformation from present cluster-to-M50, the IMU\_ORBIT\_AL module obtains measurements of two usable star unit LOS vectors in present cluster coordinates via the STAR\_TRACK mode or via the COAS\_SIGHT mode. The measured unit LOS vectors in present cluster coordinates and the stored unit LOS vectors in M50 coordinates are used to determine the transformation from present cluster-to-M50 coordinates.

Once an updated transformation from present cluster-to-M50 has been computed, an estimate of the delta angles from the IMU present-to-desired cluster is computed as a function of the stored transformation from M50-to-desired (preferred) cluster and the computed transformation from present cluster-to-M50. The crew monitors the display of the delta angles to determine whether to proceed with the alignment by torquing out these delta angles.

##### Option 2: IMU-to-IMU Alignment

When at least one IMU is already aligned, an option is available to align (reposition) any IMU to its stored desired (preferred) reference using a crew selected aligned IMU as reference. Resolver data and the present alignment of a selected reference IMU are utilized to define the present cluster orientation and compute the delta angles to the stored or uplinked desired (preferred) orientation. If an IMU other than the crew selected reference IMU is to be realigned, it will be realigned using the crew selected reference IMU as the reference. If the crew selected reference IMU is to be realigned, the lowest number selected nonreference IMU will be used as the reference IMU. If no other IMU except the crew selected reference IMU is to be aligned, the crew selected reference IMU will be digital torqued to its desired orientation.

##### Option 3: Matrix Update Based on Star Tracker/COAS Data

The present cluster-to-M50 orientation is determined in the same manner as in Option 1. However, the delta angles are computed as a function of the current reference (result of previous alignment) instead of the desired (preferred) orientation. Also, as stated above, the alignment consists of a matrix update rather than repositioning.

##### Option 4: Matrix Alignment Based on a Reference IMU

The present cluster-to-M50 orientation for any IMU to be aligned is determined in the same manner as in Option 2. However, the computation of delta angles and the alignment method are similar to Option 3. The delta angles are computed using the current reference orientation in place of the desired orientation. The alignment consists of a matrix update rather than repositioning. If the designated reference IMU is the only IMU to be aligned with this option, the matrix update consists of copying the desired matrix to the current matrix. If the reference IMU is selected for alignment in addition to at least one other IMU, the reference IMU's current cluster orientation after alignment will reflect the current cluster orientation prior to alignment (in effect, a null operation).

A. Functional Requirements. The IMU\_ORBIT\_AL module performs the following functions:

1. Determine the transformation from present cluster-to-M50 coordinates using Star Tracker or COAS sightings of navigation stars (except when the IMU-to-IMU realignment option is requested).
2. Compute present-to-desired orientation delta angles about each of the three cluster axes for display.
3. Upon crew command, digital torque out the delta angles computed in step A2 to drive the clusters to their desired (preferred) orientation.
4. Upon crew command, align (reposition) by slewing and/or torquing the selected IMU's to the desired reference using an aligned IMU as a reference.
5. Upon crew command, update the cluster-to-M50 reference to the Star Tracker/COAS defined reference.
6. Upon crew command, update the cluster-to-M50 reference to the reference IMU or ground defined reference.

B. Interface Requirements. The input/output interfaces associated with IMU\_ORBIT\_AL are listed in Tables 4.5.4.7-2 and 4.5.4.7-3.

C. Detailed Functional Requirements. The following sequence of operations is required for each IMU(K) that is in OPERATE mode, except for steps C2 and C3, where processing is only performed for the selected IMU's in OPERATE mode.

1. If Option 1 or 3, IMU-to-ST/COAS alignment or matrix update, is requested, proceed to step C1a; else, proceed to step C1b.
  - (a) Use the stored unit LOS vectors in M50 coordinates and the measured unit LOS vectors in present cluster coordinates to compute the transformation from present cluster-to-M50 as follows:

$$\bar{I}_1 = I_{\bar{S}STAR\_SEL1}$$

$$\bar{I}_2 = \text{Unit}(I_{\bar{S}STAR\_SEL1} \times I_{\bar{S}STAR\_SEL2})$$

$$\bar{I}_3 = \text{Unit}(\bar{I}_1 \times \bar{I}_2)$$

Form the transformation from star coordinates-to-M50 as follows:

$$\left[ T_s^{M50} \right] = \begin{bmatrix} I1(1) & I2(1) & I3(1) \\ I1(2) & I2(2) & I3(2) \\ I1(3) & I2(3) & I3(3) \end{bmatrix}$$

$$\bar{IP}1 = I\_STAR\_SELC(1,K)$$

$$\bar{IP}2 = \text{UNIT} [I\_STAR\_SELC(1,K) \times I\_STAR\_SELC(2,K)]$$

$$\bar{IP}3 = \text{UNIT} [\bar{IP}1 \times \bar{IP}2]$$

Form the transformation from present cluster(K)-to-star coordinates as follows:

$$\left[ T_{PCK}^S \right] = \begin{bmatrix} IP1(1) & IP1(2) & IP1(3) \\ IP2(1) & IP2(2) & IP2(3) \\ IP3(1) & IP3(2) & IP3(3) \end{bmatrix}$$

Determine the transformation from present cluster(K)-to-M50 (as determined by star sighting data) as follows:

$$\left[ T_{PCK}^{M50} \right] = \left[ T_S^{M50} \right] \left[ T_{PCK}^S \right]$$

- (b) If Option 2 or Option 4, IMU-to-IMU alignment, is requested:

Call TNB\_CL module for each IMU(K) that is in OPERATE.

$$\text{Set } \left[ T_{PCK}^{M50} \right] = \left[ T_{CIMUR}^{M50} \right] \left[ T_{NB}^{PCIMUR} \right] \left[ T_{NB}^{PCK} \right]^T$$

for each IMU(K).

- (c) Compute the delta angles for each IMU(K) that is in the OPERATE mode as follows:

If Option 3 or Option 4,  $TDEL = \left[ T_{CK}^{M50} \right]^T$  ; else,

If Option 1 or 2,  $TDEL = \left[ T_{M50}^{DCK} \right]$

In either case, set  $T = (TDEL) \left[ T_{PCK}^{M50} \right]$

Determine the equivalent quaternion of the directional cosine matrix, T.

Call: MAT\_TO\_QUAT  
Input: M\_CB\_I = T  
Output: Q\_CB\_I

Determine the angle of rotation:

$$BB = [(Q\_CB\_I(2))^2 + (Q\_CB\_I(3))^2 + (Q\_CB\_I(4))^2]^{1/2}$$

$$ANG(K) = (2) \text{ARCSIN}(BB)$$

$$A = (ANG(K)) \text{RADDEG}$$

Determine the delta angles for IMU(K):

$$X\_ANG(K) = -(A) (Q\_CB\_I(2))/BB$$

$$Y\_ANG(K) = -(A) (Q\_CB\_I(3))/BB$$

$$Z\_ANG(K) = -(A) (Q\_CB\_I(4))/BB$$

- (d) Wait for a crew input command (keyboard item entry 16) to execute the alignment before proceeding with step C2. When either Option 1 or 3 is active, and when waiting for the align execute command, continue to compute the delta angles once each 60 seconds by re-executing the requirements of step C1.

2. If Option 1, 3, or 4 has been selected or if Option 2 has been selected and only the reference IMU is to be aligned, proceed to step C2a; otherwise proceed to step C3 for all other Option 2 alignments.

- (a) If Option 1 or 2 has been selected, proceed to step C2b; otherwise, perform the following for Option 3 or Option 4:

- If Option 4 is selected and the only IMU selected for alignment is the reference IMU, set the present cluster to M50 transformation to the desired cluster to M50 transformation.

$$\begin{bmatrix} T_{M50} \\ T_{PCK} \end{bmatrix} = \begin{bmatrix} T_{DCK} \\ T_{M50} \end{bmatrix}^T$$

- Update the alignment matrix for each crew selected IMU(K) that is in OPERATE:

$$\begin{bmatrix} T_{CK}^{M50} \end{bmatrix} = \begin{bmatrix} T_{PCK}^{M50} \end{bmatrix}$$

- Zero the delta angles:

$$X\_ANG(K) = 0$$

$$Y\_ANG(K) = 0$$

$$Z\_ANG(K) = 0$$

- Set the following flags:

$$ORB\_AL\_COMP(K) = 1$$

$$ST\_AL\_COMP = 1$$

$$IMU\_QUAT\_UPD\_REQ = 1$$

- Exit IMU\_ORBIT\_AL

- (b) Digital torque the selected IMU's that are in operate mode as follows:

- Compute the number of passes of the gyro compensation module (GYO\_COMP) to complete the required digital torquing.

$$TTORQ(K)^* = \text{INTEGER} \left( \frac{1/6 \text{ ANG}(K)}{(\text{MAX\_TORQ } 4.84813 \times 10^{-6} \text{ TMAJ\_AL})} + \frac{2}{3} \right)$$

\*  $4.84813 \times 10^{-6}$  is the conversion factor from deg/hr to rad/sec.

- Compute the required digital torquing rates.

$$\text{LATX(K)} = [(1/6 \text{ X\_ANG(K)}) / (\text{TTORQ(K)} \text{ TMAJ\_AL})] 3600$$

$$\text{LATY(K)} = [(1/6 \text{ Y\_ANG(K)}) / (\text{TTORQ(K)} \text{ TMAJ\_AL})] 3600$$

$$\text{LATZ(K)} = [(1/6 \text{ Z\_ANG(K)}) / (\text{TTORQ(K)} \text{ TMAJ\_AL})] 3600$$

- Save the initial value of computed misalignment angles as follows:

$$\text{X\_ANG\_INIT(K)} = \text{X\_ANG(K)}$$

$$\text{Y\_ANG\_INIT(K)} = \text{Y\_ANG(K)}$$

$$\text{Z\_ANG\_INIT(K)} = \text{Z\_ANG(K)}$$

- Apply these digital torquing rates for TTORQ(K) passes of the gyro compensation module (GYO\_COMP) for each applicable IMU(K).

- Compute the delta angles from present-to-desired cluster as follows at the display rate:

$$\text{X\_ANG(K)} = \text{X\_ANG\_INIT(K)} - (\text{TORQ\_CTR(K)} (\text{TMAJ\_AL}/3600) 6.0 \text{ LATX(K)})$$

$$\text{Y\_ANG(K)} = \text{Y\_ANG\_INIT(K)} - (\text{TORQ\_CTR(K)} (\text{TMAJ\_AL}/3600) 6.0 \text{ LATY(K)})$$

$$\text{Z\_ANG(K)} = \text{Z\_ANG\_INIT(K)} - (\text{TORQ\_CTR(K)} (\text{TMAJ\_AL}/3600) 6.0 \text{ LATZ(K)})$$

where TORQ\_CTR is the number of digital torquing passes of GYO\_COMP which have occurred.

- (c) When TTORQ(K) passes of GYO\_COMP have occurred for IMU(K), perform the following:

(1)  $\text{LATX(K)} = \text{LATY(K)} = \text{LATZ(K)} = 0$

- (2) Set the on-orbit alignment complete flag  $\text{ORB\_AL\_COMP(K)} = 1$  for IMU(K) and set  $\text{IMU\_QUAT\_UPD\_REQ} = 1$

(3) Set  $\begin{bmatrix} T_{CK}^{M50} \end{bmatrix} = \begin{bmatrix} T_{M50}^{DCK} \end{bmatrix}^T$

- (d) When all applicable alignment complete flags have been set to 1, set  $\text{ST\_AL\_COMP} = 1$  and exit  $\text{IMU\_ORBIT\_AL}$ .

3. If Option 2 has been selected and one or more IMU's have been selected and are in the OPERATE mode, reposition each applicable IMU(J) cluster as follows:



- (a) Determine the transformation from present reference cluster, REFER, to desired cluster J for each selected nonreference IMU(J) that is in the OPERATE mode as follows:

$$\left[ T_{PCREFER}^{DCJ} \right] = \left[ T_{M50}^{DCJ} \right] \left[ T_{PCIMUR}^{M50} \right]$$

where REFER = IMUR

Set the IMU slew flag (IMU\_SLEW(J)) for IMU(J) to valid.

- (b) Perform cluster repositioning for each selected nonreference IMU(J) that is in OPERATE mode. Initialize R\_PLANE = 1, REFER = IMUR.

During cluster repositioning of IMU(J), compute the delta angles at the display rate as follows:

Call = MAT\_TO\_QUAT

$$\text{Input} = M\_CB\_I = \left[ T_{PC}^{DCJ} \right]$$

Output = Q\_CB\_I

Determine the angle of rotation:

$$BB = \left[ (Q\_CB\_I(2))^2 + (Q\_CB\_I(3))^2 + (Q\_CB\_I(4))^2 \right]^{\frac{1}{2}}$$

$$ANG(J) = (2) \text{ ARCSIN}(BB)$$

$$A = (ANG(J)) \text{ RADDEG}$$

Determine the delta angles for IMU(J)

$$X\_ANG(J) = -(A) (Q\_CB\_I(2))/BB$$

$$Y\_ANG(J) = -(A) (Q\_CB\_I(3))/BB$$

$$Z\_ANG(J) = -(A) (Q\_CB\_I(4))/BB$$

where  $\left[ T_{PC}^{DCJ} \right]$  is from LAT\_FUNC and may be provided at less than the display rate.

- (c) After cluster repositioning for each selected nonreference IMU(J) has been completed, update the transformation from cluster-to-M50 as follows:

$$\left[ T_{CJ}^{M50} \right] = \left[ T_{M50}^{DCJ} \right]^T$$

Set the IMU slew flag (IMU\_SLEW(J)) for IMU(J) to invalid. Set ORB\_AL\_COMP(J) = 1 and IMU\_QUAT\_UPD\_REQ = 1. If selected reference IMU realignment is requested, proceed to step d; otherwise, set ST\_AL\_COMP = 1 and exit.

- (d) If the selected reference IMU IMUR realignment is requested, use the lowest number selected nonreference IMU(I) that is in OPERATE mode as a reference. Determine the

transformation from present reference cluster REFER—to—desired cluster IMUR, as follows:

$$\left[ T_{PCREFER}^{DCIMUR} \right] = \left[ T_{M50}^{DCIMUR} \right] \left[ T_{CI}^{M50} \right]$$

where REFER = I

Set the IMU slew flag (IMU\_SLEW (IMUR)) for IMU IMUR, to valid.

- (e) Perform cluster repositioning for the selected reference IMU IMUR. Initialize R\_PLANE = 1, REFER = I. Compute the delta angles for DISPLAYS in accordance with step 3b. Note that “J” = IMUR.
- (f) After cluster repositioning for the selected reference IMU IMUR, has been completed, update the transformation from cluster—to—M50 as follows:

$$\left[ T_{CIMUR}^{M50} \right] = \left[ T_{M50}^{DCIMUR} \right]^T$$

Set the IMU slew flag (IMU\_SLEW (IMUR)) for IMU IMUR, to invalid.

Set ORB\_AL\_COMP(IMUR) = 1, ST\_AL\_COMP = 1, and IMU\_QUAT\_UPD\_REQ = 1

NOTE: The required module execution sequence and processing rates for the on-orbit cluster repositioning sequence is as follows:

IMU_BITE	1.04 Hz
ACP_ACUM	1.04 Hz
RES_PROC	6.25 Hz
BITE_SUM	1.04 Hz
ACP_COMP	1.04 Hz
ACP_TRSF	1.04 Hz
LAT_FUNC	3.125 Hz
GYO_COMP	3.125 Hz
GYO_TORQ	6.25 Hz

The IMU\_ORBIT\_AL module shall be executed in response to any of the three alignment option keyboard entries. Refer to the DISP\_SUP module for related requirements. A suggested flow diagram for the IMU\_ORBIT\_AL module is shown in Figure 4.5.4.7–1.

D. Special Considerations. The following conditions have been assumed in the development of the requirements:

1. The capability to perform an IMU—to—IMU realignment for all IMU’s is required.
2. A star sighting realignment will be performed as required to meet alignment performance requirements.

3. When an IMU-to-IMU realignment is performed, it is assumed that the crew selected reference IMU is operating in INERTIAL and is properly aligned.
4. If only one IMU is in INERTIAL and that IMU is determined to be properly aligned, the IMU-to-IMU alignment is sufficient to realign any other IMU in OPERATE mode.
5. If no IMU is aligned and an alignment is required, it is essential that star sightings be made via COAS and a star sighting alignment or matrix update alignment be performed first prior to an IMU-to-IMU alignment.

Table 4.5.4.7-1. On-Orbit Alignment Options				
Option No.	Description	Align Reference	TC_M50 Updated	Clusters Repositioned
1	Star Tracker/COAS data used to define actual present orientation (SPEC 21 : item 13 indicated and item 15 indicates TORQUE)  Torque out misalignment of selected IMU's	Each IMU's current alignment	Selected IMU's	Selected IMU's
2	IMU-to-IMU repositioning (SPEC 21 : item 14 data entry and item 15 indicates TORQUE)  Slew/torque crew selected IMU's to the desired reference	Crew designated reference IMU (prime)	Selected IMU's	Selected IMU's
3	Cluster-to-M50 matrix based on Star Tracker/COAS data (SPEC 21 : item 13 indicated and item 15 indicates MATRIX)	Each IMU's current alignment	Selected IMU's	NONE
4	Cluster-to-M50 matrix based on reference IMU data (SPEC 21 : item 14 data entry and item 15 indicates MATRIX)	Crew designated reference IMU or Uplinked Matrix	Selected IMU's	NONE

Table 4.5.4.7-2. IMU\_ORBITAL\_AL Inputs

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
$T_{M50}^{DC}$	V96U7185CA THRU V96U7211CA	TRANSFORMATION: M50 to DESIRED ORIENTATION; 1 PER IMU	IMU_UPLINK	MATRIX	+/-1	NA	OD
$T_{NB}^{PC}$	V99U3405C THRU V99U3431C	TRANSFORMATION: NAV BASE TO PRESENT CLUSTER; 1 PER IMU	TNB_CL	MATRIX	+/-1	NA	OD
I_STAR_SEL1	V95H4732C V95H4733C V95H4734C	UNIT LOS VECTOR FROM THE CENTER OF EARTH TO SEL STAR NO. 1 IN M50 COORD	ST SOP (4.66)	VECTOR	+/-1	NA	OD
I_STAR_SEL2	V95H4748C V95H4749C V95H4750C	UNIT LOS VECTOR FROM THE CENTER OF EARTH TO SEL STAR NO. 2 IN M50 COORD	ST SOP (4.66)	VECTOR	+/-1	NA	OD
I_STAR_SEL(1,K)	V95H4721C THRU V95H4729C	MEASURED UNIT LOS VECTOR FROM CENTER OF EARTH TO SEL STAR NO. 1 IN CLUSTER COORD;IMU(K), K = 1,2,3	ST SOP (4.66)	VECTOR	+/-1	NA	OD
I_STAR_SEL(2,K)	V95H4738C THRU V95H4746C	MEASURED UNIT LOS VECTOR FROM CENTER OF EARTH TO SEL STAR NO. 2 IN CLUSTER COORD; IMU(K), K = 1,2,3	ST SOP (4.66)	VECTOR	+/-1	NA	OD
I_STAR_SEL(3,K)	V95H4790C THRU V95H4798C	MEASURED UNIT LOS VECTOR FROM CENTER OF EARTH TO SEL STAR NO. 3 IN CLUSTER COORD; IMU(K), K = 1,2,3	ST SOP (4.66)	VECTOR	+/-1	NA	OD
ALIGN_COMP	V95X4986X	ST BASED ALIGN COMP	ST SOP (4.66)	LOGICAL	0,1	NA	OD
ORB_AL_COMP(1)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-1	DISP_SUP	LOGICAL	0,1	NA	OD
ORB_AL_COMP(2)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-2	DISP_SUP	LOGICAL	0,1	NA	OD
ORB_AL_COMP(3)		IMU ON-ORBIT ALIGNMENT COMPLETE FLAG, IMU-3	DISP_SUP	LOGICAL	0,1	NA	OD
ITEM_16	V93X6770X	EXECUTE ALIGN OPTION SEL	IMU ALIGN (6.26)	LOGICAL	0,1	NA	OD
TMAJ_AL	V96U7212C	MAJOR CYCLE RATE FOR ON-ORBIT ALIGNMENT	K-LOAD	SCALAR	0.160	SEC	OD
IMUR	V95U0603C	IMU/IMU OPTION SELECTED	DISP_SUP	INTEGER	0,1,2,3	NA	OD
OPTION		IMU REALIGNMENT OPTION NUMBER	DISP_SUP	INTEGER	1,2,3,4	NA	OD
$T_C^{M50}$	V99U3450C THRU V99U3476C	TRANSFORMATION: CLUSTER TO M50; 1 PER IMU	GC_ALIGN1 COMPOOL	MATRIX	+/-1	NA	OD
LATCOMP(1)	V95X0085X	IMU-1 LARGE ANGLE TORQ COMPLETE	LAT_FUNC	LOGICAL	0,1	NA	OD
LATCOMP(2)	V95X1085X	IMU-2 LARGE ANGLE TORQ COMPLETE	LAT_FUNC	LOGICAL	0,1	NA	OD
LATCOMP(3)	V95X2085X	IMU-3 LARGE ANGLE TORQ COMPLETE	LAT_FUNC	LOGICAL	0,1	NA	OD
ALIMU(1)	V93X6755X	ALIGN IMU-1	IMU ALIGN (6.26)	LOGICAL	0,1	NA	OD
ALIMU(2)	V93X6756X	ALIGN IMU-2	IMU ALIGN (6.26)	LOGICAL	0,1	NA	OD
ALIMU(3)	V93X6757X	ALIGN IMU-3	IMU ALIGN (6.26)	LOGICAL	0,1	NA	OD

Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
$T_{PC}^{DC}$		TRANSFORMATION: PRESENT CLUSTER TO DESIRED CLUSTER; 1 PER IMU BEING REPOSITIONED	LAT_FUNC	MATRIX	+/-1	NA	OD
MAX_TORQ	V96U7005C	LARGE-ANGLE TORQUING RATE	I-LOAD	SCALAR		DEG/HR	OD
RAD	V97U6133C	CONVERSION FACTOR RADIANS TO ARC-SECONDS	CONSTANT	SCALAR	206264.8	ARC-SEC/RAD	OD
RADDEG	V96U7007C	CONVERSION FACTOR RADIANS TO DEGREES	CONSTANT	SCALAR	57.29578	DEG/RAD	OD
IMU_QUAT_UPD_REQ	V95X0532X	REFERENCE QUATERNION UPDATE REQUEST	ATT_PROC	LOGICAL	0,1	NA	OD

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
ORB_AL_COMP(1)		IMU ON ORBIT ALIGNMENT COMPLETE FLAG, IMU-1	DISP_SUP	LOGICAL	0,1	NA	OD
ORB_AL_COMP(2)		IMU ON ORBIT ALIGNMENT COMPLETE FLAG, IMU-2	DISP_SUP	LOGICAL	0,1	NA	OD
ORB_AL_COMP(3)		IMU ON ORBIT ALIGNMENT COMPLETE FLAG, IMU-3	DISP_SUP	LOGICAL	0,1	NA	OD
R_PLANE		ROTATING PLANE OPTION FLAG	LAT_FUNC	LOGICAL	0,1	NA	OD
REFER		REFERENCE ALIGN IMU NO.	LAT_FUNC	INTEGER	1,2,3	NA	OD
$T_C^{M50}$	V99U3450C THRU V99U3476C	TRANSFORMATION: CLUSTER TO M50; 1 PER IMU	ACP_TRSF ORB_ATT PROC (4.97) COMPOOL TLM A/E ATT PROC (4.226) ST SOP (4.66) IMU RM (4.72)	MATRIX	+/-1	NA	OD
$T_{PC}^{DC}$		TRANSFORMATION: PRESENT CLUSTER TO DESIRED CLUSTER; 1 PER IMU PAIR	LAT_FUNC	MATRIX	+/-1	NA	OD
X_ANG(1)	V95U0585C	IMU-1 MISALIGNMENT ANGLE ABOUT X AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD
X_ANG(2)	V95U0586C	IMU-2 MISALIGNMENT ANGLE ABOUT X AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD
X_ANG(3)	V95U0587C	IMU-3 MISALIGNMENT ANGLE ABOUT X AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD
Y_ANG(1)	V95U0588C	IMU-1 MISALIGNMENT ANGLE ABOUT Y AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD
Y_ANG(2)	V95U0589C	IMU-2 MISALIGNMENT ANGLE ABOUT Y AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD
Y_ANG(3)	V95U0590C	IMU-3 MISALIGNMENT ANGLE ABOUT Y AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD
Z_ANG(1)	V95U0591C	IMU-1 MISALIGNMENT ANGLE ABOUT Z AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD
Z_ANG(2)	V95U0592C	IMU-2 MISALIGNMENT ANGLE ABOUT Z AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD

Table 4.5.4.7-3. IMU\_ORBITAL\_AL Outputs

Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
Z_ANG(3)	V95U0593C	IMU-3 MISALIGNMENT ANGLE ABOUT Z AXIS	IMU ALIGN (6.26) TLM	SCALAR	+/-180	DEG	OD
LATX		LAT X DIG TORQ RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	OD
LATY		LAT Y DIG TORQ RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	OD
LATZ		LAT Z DIG TORQ RATE; 1 PER IMU	GYO_COMP	SCALAR	+/-80	DEG/HR	OD
ST_AL_COMP	V95X0545X	ST BASED ALIGN COMP	ST_SOP	LOGICAL	0,1	NA	OD
IMU_QUAT_UPD_REQ	V95X0532X	REFERENCE QUATERNION UPDATE REQUEST	A/E ATT PROC (4.226) ORB ATT PROC (4.97)	LOGICAL	0,1	NA	OD
IMU_SLEW(1)	V95X0649X	IMU-1 SLEW FLAG	IMU_RM (4.72)	LOGICAL	0,1	NA	OD
IMU_SLEW(2)	V95X0650X	IMU-2 SLEW FLAG	IMU_RM (4.72)	LOGICAL	0,1	NA	OD
IMU_SLEW(3)	V95X0651X	IMU-3 SLEW FLAG	IMU_RM (4.72)	LOGICAL	0,1	NA	OD
ALIGN_IN_PRO	V95X0583X	ALIGN IN PROGRESS	TLM, IMU_RM (4.72) IMU_ALIGN (6.26)	LOGICAL	0,1	NA	OD

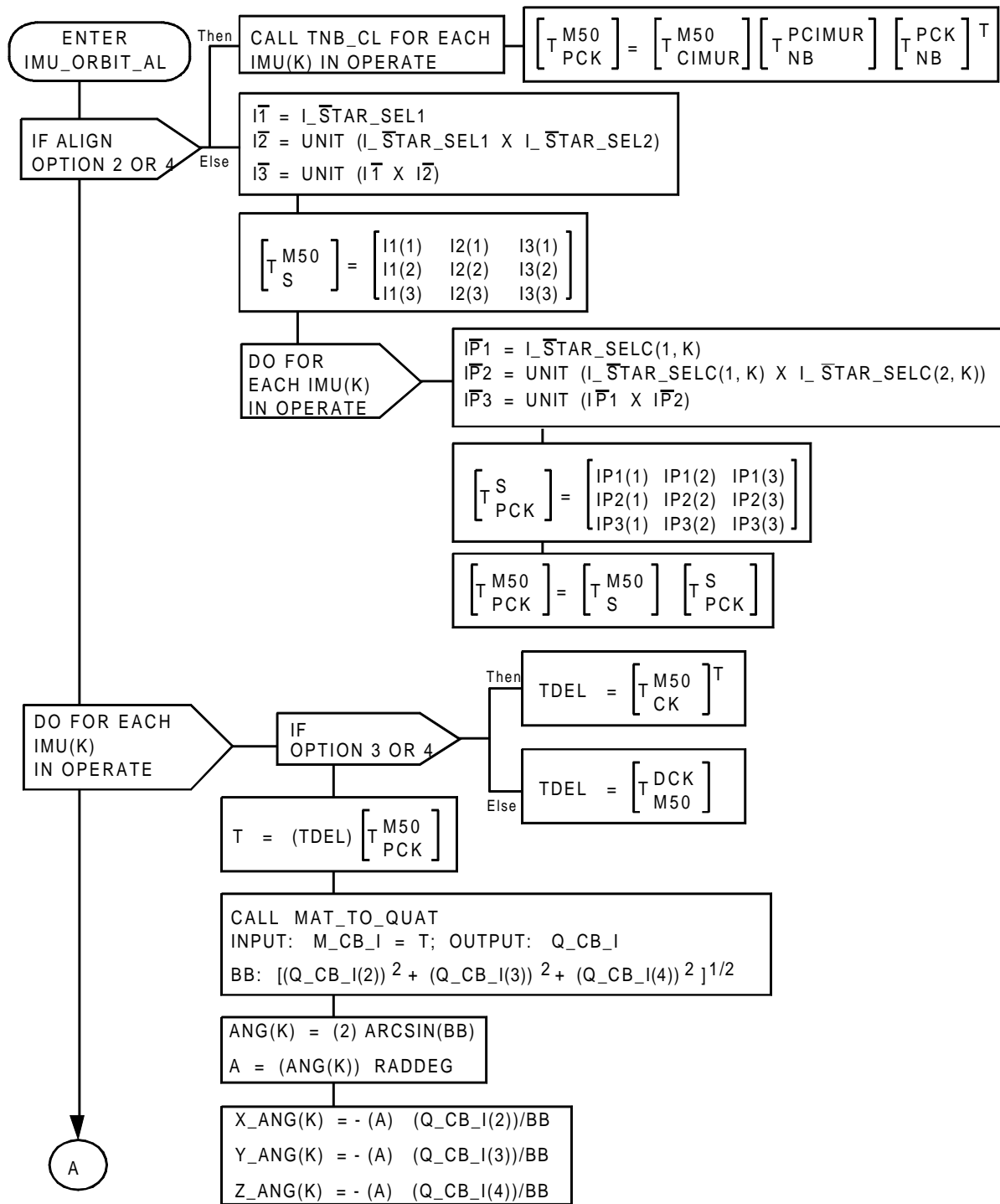


FIGURE 4.5.4.7-1.(1) IMU\_ORBIT\_AL Detailed Flow Diagram (Sheet 1 of 4)



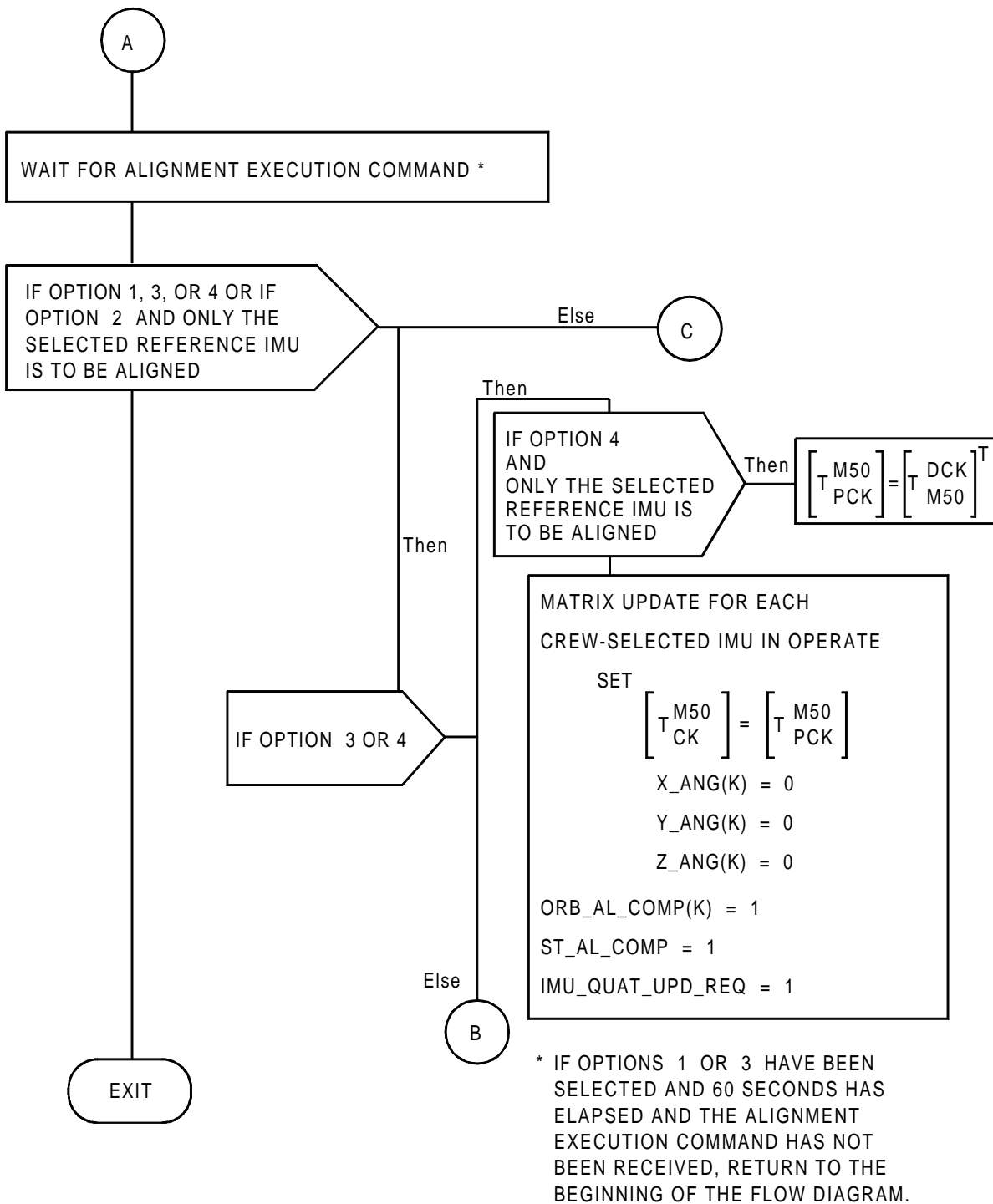


FIGURE 4.5.4.7-1.(2) IMU\_ORBIT\_AL Detailed Flow Diagram (Sheet 2 of 4)

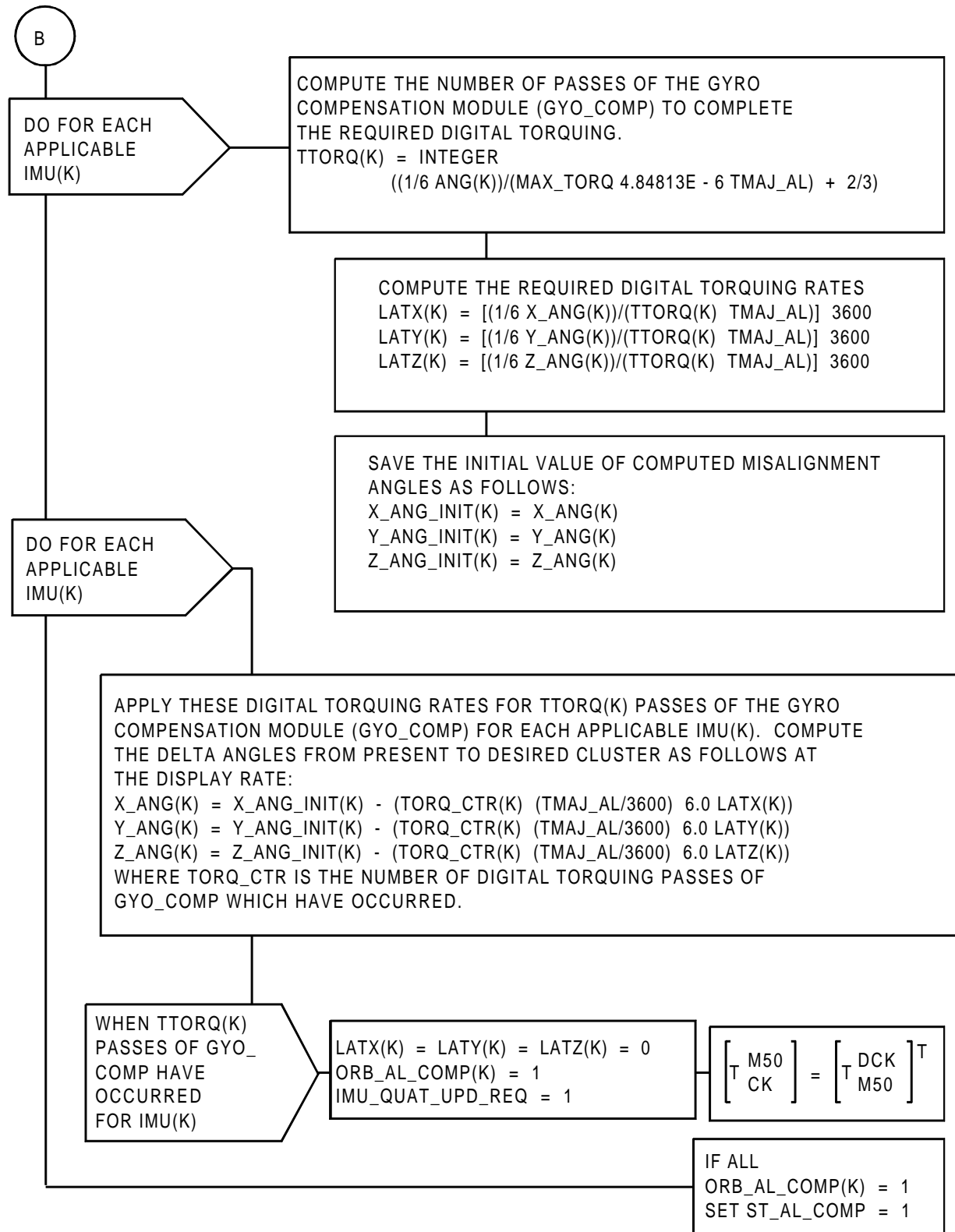


FIGURE 4.5.4.7-1.(3) IMU\_ORBIT\_AL Detailed Flow Diagram (Sheet 3 of 4)

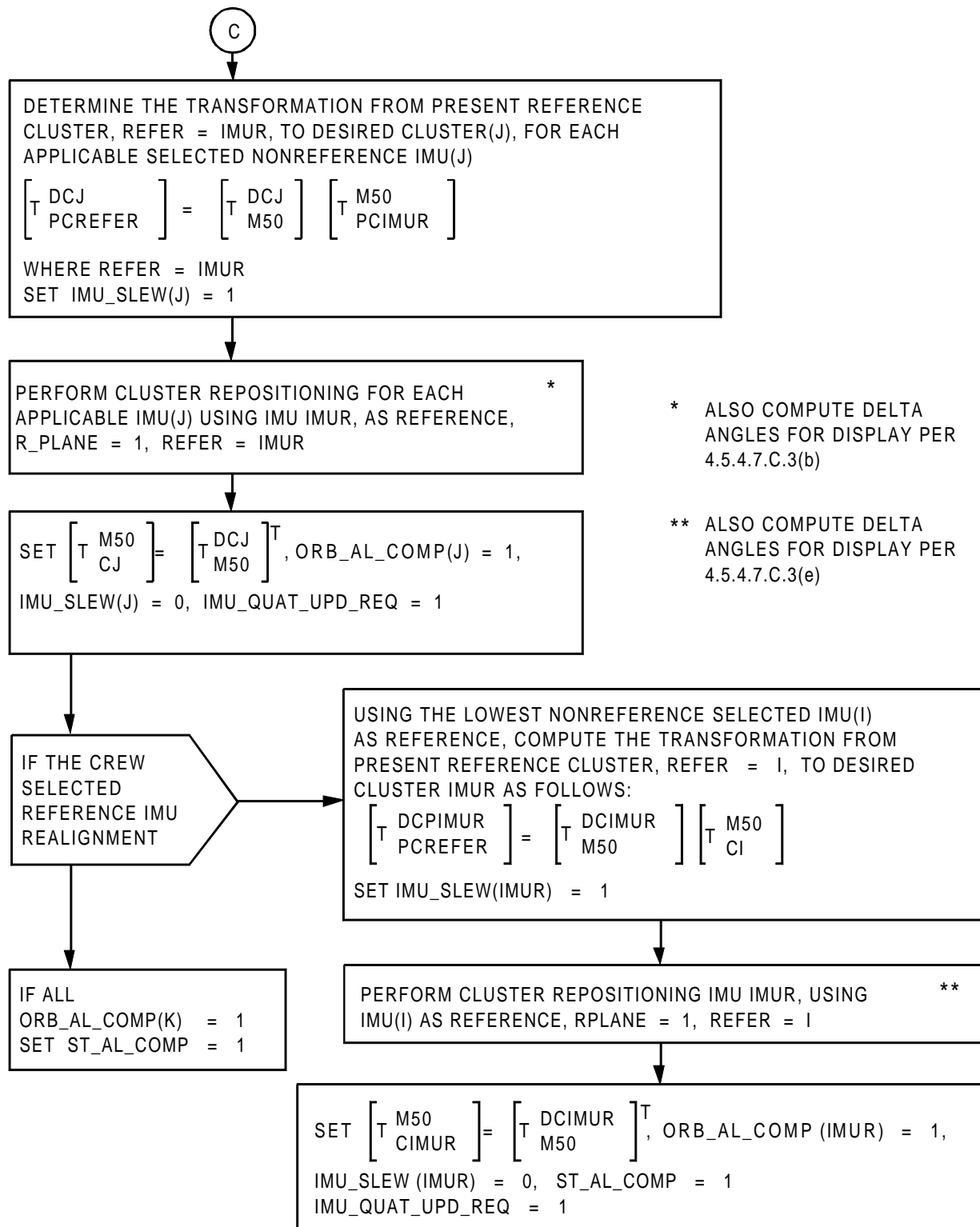


FIGURE 4.5.4.7-1.(4) IMU\_ORBIT\_AL Detailed Flow Diagram (Sheet 4 of 4)

**4.5.4.7.1 Parameter Tables for IMU On-Orbit Alignment.**

The IDD inputs and outputs are listed in Tables 4.5.4.7.1–1 and 4.5.4.7.1–2. In the table it should be noted that the CAPRI TEMP discrettes are set true (=1) when power is applied to the HAINS IMU and some dual discrettes have been designated with dual names dependent upon IMU hardware. The first part of the dual name is for the KT–70 IMU while the second part is for the HAINS IMU. Values for the I–loads are contained in the I–load requirements document (JSC–19350); however, I–load definitions applicable to this principal function are listed in Table 4.5.4.7.1–3. K–loads are listed in Table 4.5.4.7.1–4. Constants are listed in Table 4.5.4.7.1–5. Input variable cross–references are listed in the table below.

IMU On–Orbit Alignment (G4.208) Input Variable Cross–Reference	
Local Name	Source Name
ALIMU	AL IMU
CAPRI_TEMP_RDY	CAP_TEMP_RDY
CAPRI_TEMP_SAFE	CAP_TEMP_SAFE
$T_C^{M50}$	T_CLUSTER_M50

TABLE 4.5.4.7.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TM50_DC_1,1	V96U7185CA	M50 TO DESIRED ORIENT,IMU 1 EL 1,1	IMU INT PROC				92297B	
1TM50_DC_1,2	V96U7186CA	M50 TO DESIRED ORIENT,IMU 1 EL 1,2	IMU INT PROC				92297B	
1TM50_DC_1,3	V96U7187CA	M50 TO DESIRED ORIENT,IMU 1 EL 1,3	IMU INT PROC				92297B	
1TM50_DC_2,1	V96U7188CA	M50 TO DESIRED ORIENT,IMU 1 EL 2,1	IMU INT PROC				92297B	
1TM50_DC_2,2	V96U7189CA	M50 TO DESIRED ORIENT,IMU 1 EL 2,2	IMU INT PROC				92297B	
1TM50_DC_2,3	V96U7190CA	M50 TO DESIRED ORIENT,IMU 1 EL 2,3	IMU INT PROC				92297B	
1TM50_DC_3,1	V96U7191CA	M50 TO DESIRED ORIENT,IMU 1 EL 3,1	IMU INT PROC				92297B	
1TM50_DC_3,2	V96U7192CA	M50 TO DESIRED ORIENT,IMU 1 EL 3,2	IMU INT PROC				92297B	
1TM50_DC_3,3	V96U7193CA	M50 TO DESIRED ORIENT,IMU 1 EL 3,3	IMU INT PROC				92297B	
2TM50_DC_1,1	V96U7194CA	M50 TO DESIRED ORIENT,IMU 2 EL 1,1	IMU INT PROC				92297B	
2TM50_DC_1,2	V96U7195CA	M50 TO DESIRED ORIENT,IMU 2 EL 1,2	IMU INT PROC				92297B	
2TM50_DC_1,3	V96U7196CA	M50 TO DESIRED ORIENT,IMU 2 EL 1,3	IMU INT PROC				92297B	
2TM50_DC_2,1	V96U7197CA	M50 TO DESIRED ORIENT,IMU 2 EL 2,1	IMU INT PROC				92297B	
2TM50_DC_2,2	V96U7198CA	M50 TO DESIRED ORIENT,IMU 2 EL 2,2	IMU INT PROC				92297B	
2TM50_DC_2,3	V96U7199CA	M50 TO DESIRED ORIENT,IMU 2 EL 2,3	IMU INT PROC				92297B	
2TM50_DC_3,1	V96U7200CA	M50 TO DESIRED ORIENT,IMU 2 EL 3,1	IMU INT PROC				92297B	
2TM50_DC_3,2	V96U7201CA	M50 TO DESIRED ORIENT,IMU 2 EL 3,2	IMU INT PROC				92297B	
2TM50_DC_3,3	V96U7202CA	M50 TO DESIRED ORIENT,IMU 2 EL 3,3	IMU INT PROC				92297B	
3TM50_DC_1,1	V96U7203CA	M50 TO DESIRED ORIENT,IMU 3 EL 1,1	IMU INT PROC				92297B	
3TM50_DC_1,2	V96U7204CA	M50 TO DESIRED ORIENT,IMU 3 EL 1,2	IMU INT PROC				92297B	
3TM50_DC_1,3	V96U7205CA	M50 TO DESIRED ORIENT,IMU 3 EL 1,3	IMU INT PROC				92297B	
3TM50_DC_2,1	V96U7206CA	M50 TO DESIRED ORIENT,IMU 3 EL 2,1	IMU INT PROC				92297B	
3TM50_DC_2,2	V96U7207CA	M50 TO DESIRED ORIENT,IMU 3 EL 2,2	IMU INT PROC				92297B	
3TM50_DC_2,3	V96U7208CA	M50 TO DESIRED ORIENT,IMU 3 EL 2,3	IMU INT PROC				92297B	
3TM50_DC_3,1	V96U7209CA	M50 TO DESIRED ORIENT,IMU 3 EL 3,1	IMU INT PROC				92297B	
3TM50_DC_3,2	V96U7210CA	M50 TO DESIRED ORIENT,IMU 3 EL 3,2	IMU INT PROC				92297B	
3TM50_DC_3,3	V96U7211CA	M50 TO DESIRED ORIENT,IMU 3 EL 3,3	IMU INT PROC				92297B	
AD_FAIL(1)	V71X2023B	IMU-1 A/D FAIL	WD1B2	IMU 1	BD		93017G	*
AD_FAIL(2)	V71X3023B	IMU-2 A/D FAIL	WD1B2	IMU 2	BD		93017G	*
AD_FAIL(3)	V71X4023B	IMU-3 A/D FAIL	WD1B2	IMU 3	BD		93017G	*
ALIGN_COMP	V95X4986X	ST BASED ALIGN COMPLETE		STAR TRCK SOP				
AL_IMU(1)	V93X6755X	ALIGN IMU 1		IMU ALIGN DISP	BD		93017G	*
AL_IMU(2)	V93X6756X	ALIGN IMU 2		IMU ALIGN DISP	BD		93017G	*
AL_IMU(3)	V93X6757X	ALIGN IMU 3		IMU ALIGN DISP	BD		93017G	*
AZO(1)	V99H2610CA	AZIMUTH RESOLVER OFFSET(1)		IMU GND CAL	DEG		93017G	*
AZO(2)	V99H2611CA	AZIMUTH RESOLVER OFFSET(2)		IMU GND CAL	DEG		93017G	*
AZO(3)	V99H2612CA	AZIMUTH RESOLVER OFFSET(3)		IMU GND CAL	DEG		93017G	*
BXY(1)	V99H2590CA	X-GYRO MISALIGNMENT TO Y-REF(1)		IMU GND CAL	RAD		93017G	*
BXY(2)	V99H2591CA	X-GYRO MISALIGNMENT TO Y-REF(2)		IMU GND CAL	RAD		93017G	*
BXY(3)	V99H2592CA	X-GYRO MISALIGNMENT TO Y-REF(3)		IMU GND CAL	RAD		93017G	*
BXZ(1)	V99H2593CA	X-GYRO MISALIGNMENT TO Z-REF(1)		IMU GND CAL	RAD		93017G	*
BXZ(2)	V99H2594CA	X-GYRO MISALIGNMENT TO Z-REF(2)		IMU GND CAL	RAD		93017G	*
BXZ(3)	V99H2595CA	X-GYRO MISALIGNMENT TO Z-REF(3)		IMU GND CAL	RAD		93017G	*
BYX(1)	V99H2596CA	Y-GYRO MISALIGNMENT TO X-REF(1)		IMU GND CAL	RAD		93017G	*
BYX(2)	V99H2597CA	Y-GYRO MISALIGNMENT TO X-REF(2)		IMU GND CAL	RAD		93017G	*
BYX(3)	V99H2598CA	Y-GYRO MISALIGNMENT TO X-REF(3)		IMU GND CAL	RAD		93017G	*

TABLE 4.5.4.7.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
BYZ(1)	V99H2599CA	Y-GYRO MISALIGNMENT TO Z-REF(1)	IMU GND CAL	RAD			93017G	*
BYZ(2)	V99H2600CA	Y-GYRO MISALIGNMENT TO Z-REF(2)	IMU GND CAL	RAD			93017G	*
BYZ(3)	V99H2601CA	Y-GYRO MISALIGNMENT TO Z-REF(3)	IMU GND CAL	RAD			93017G	*
BZX(1)	V99H2602CA	Z-GYRO MISALIGNMENT TO X-REF(1)	IMU GND CAL	RAD			93017G	*
BZX(2)	V99H2603CA	Z-GYRO MISALIGNMENT TO X-REF(2)	IMU GND CAL	RAD			93017G	*
BZX(3)	V99H2604CA	Z-GYRO MISALIGNMENT TO X-REF(3)	IMU GND CAL	RAD			93017G	*
BZY(1)	V99H2605CA	Z-GYRO MISALIGNMENT TO Y-REF(1)	IMU GND CAL	RAD			93017G	*
BZY(2)	V99H2606CA	Z-GYRO MISALIGNMENT TO Y-REF(2)	IMU GND CAL	RAD			93017G	*
BZY(3)	V99H2607CA	Z-GYRO MISALIGNMENT TO Y-REF(3)	IMU GND CAL	RAD			93017G	*
CAP_TEMP_RDY(1)	V71X2406X	IMU 1 CAPRI TEMP READY	IMU 1		BD		93017G	*
CAP_TEMP_RDY(2)	V71X3406X	IMU 2 CAPRI TEMP READY	IMU 2		BD		93017G	*
CAP_TEMP_RDY(3)	V71X4406X	IMU 3 CAPRI TEMP READY	IMU 3		BD		93017G	*
CAP_TEMP_SAFE(1)	V71X2407X	IMU 1 CAPRI TEMP SAFE	IMU 1		BD		93017G	*
CAP_TEMP_SAFE(2)	V71X3407X	IMU 2 CAPRI TEMP SAFE	IMU 2		BD		93017G	*
CAP_TEMP_SAFE(3)	V71X4407X	IMU 3 CAPRI TEMP SAFE	IMU 3		BD		93017G	*
CVX(1)	V71L2200B	IMU-1 ACCUMD VX	WD10 IMU 1		HXU		93017G	*
CVX(2)	V71L3200B	IMU-2 ACCUMD VX	WD10 IMU 2		HXU		93017G	*
CVX(3)	V71L4200B	IMU-3 ACCUMD VX	WD10 IMU 3		HXU		93017G	*
CVY(1)	V71L2220B	IMU-1 ACCUMD VY	WD11 IMU 1		HXU		93017G	*
CVY(2)	V71L3220B	IMU-2 ACCUMD VY	WD11 IMU 2		HXU		93017G	*
CVY(3)	V71L4220B	IMU-3 ACCUMD VY	WD11 IMU 3	PULSES	HXU		93017G	*
CVZ(1)	V71L2240B	IMU-1 ACCUMD VZ	WD12 IMU 1		HXU		93017G	*
CVZ(2)	V71L3240B	IMU-2 ACCUMD VZ	WD12 IMU 2		HXU		93017G	*
CVZ(3)	V71L4240B	IMU-3 ACCUMD VZ	WD12 IMU 3	PULSES	HXU		93017G	*
D1/D8_SEQR(1)	V71X2032B	IMU-1 D1/D8 SEQUENCER	WD1B11 IMU 1		BD		93017G	*
D1/D8_SEQR(2)	V71X3032B	IMU-2 D1/D8 SEQUENCER	WD1B11 IMU 2		BD		93017G	*
D1/D8_SEQR(3)	V71X4032B	IMU-3 D1/D8 SEQUENCER	WD1B11 IMU 3		BD		93017G	*
D2_SEQR(1)	V71X2033B	IMU-1 D2 SEQUENCER	WD1B12 IMU 1		BD		93017G	*
D2_SEQR(2)	V71X3033B	IMU-2 D2 SEQUENCER	WD1B12 IMU 2		BD		93017G	*
D2_SEQR(3)	V71X4033B	IMU-3 D2 SEQUENCER	WD1B12 IMU 3		BD		93017G	*
D3_SEQR(1)	V71X2034B	IMU-1 D3 SEQUENCER	WD1B13 IMU 1		BD		93017G	*
D3_SEQR(2)	V71X3034B	IMU-2 D3 SEQUENCER	WD1B13 IMU 2		BD		93017G	*
D3_SEQR(3)	V71X4034B	IMU-3 D3 SEQUENCER	WD1B13 IMU 3		BD		93017G	*
D4_SEQR(1)	V71X2035B	IMU-1 D4 SEQUENCER	WD1B14 IMU 1		BD		93017G	*
D4_SEQR(2)	V71X3035B	IMU-2 D4 SEQUENCER	WD1B14 IMU 2		BD		93017G	*
D4_SEQR(3)	V71X4035B	IMU-3 D4 SEQUENCER	WD1B14 IMU 3		BD		93017G	*
D5_SEQR(1)	V71X2036B	IMU-1 D5 SEQUENCER	WD1B15 IMU 1		BD		93017G	*
D5_SEQR(2)	V71X3036B	IMU-2 D5 SEQUENCER	WD1B15 IMU 2		BD		93017G	*
D5_SEQR(3)	V71X4036B	IMU-3 D5 SEQUENCER	WD1B15 IMU 3		BD		93017G	*
DCDC_1_FAIL(1)	V71X2026B	IMU-1 DC/DC NO 1 FAIL	WD1B5 IMU 1		BD		93017G	*
DCDC_1_FAIL(2)	V71X3026B	IMU-2 DC/DC NO 1 FAIL	WD1B5 IMU 2		BD		93017G	*
DCDC_1_FAIL(3)	V71X4026B	IMU-3 DC/DC NO 1 FAIL	WD1B5 IMU 3		BD		93017G	*
DELTXZ(1)	V99H2552CA	X-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL	RAD			93017G	*
DELTXZ(2)	V99H2553CA	X-ACCEL MISALIGNMENT TO Z-REF(2)	IMU GND CAL	RAD			93017G	*
DELTXZ(3)	V99H2554CA	X-ACCEL MISALIGNMENT TO Z-REF(3)	IMU GND CAL	RAD			93017G	*
DELTYX(1)	V99H2540CA	Y-ACCEL MISALIGNMENT TO X-REF(1)	IMU GND CAL	RAD			93017G	*

TABLE 4.5.4.7.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTXX(2)	V99H2541CA	Y-ACCEL MISALIGNMENT TO X-REF(2)	IMU GND CAL	RAD			93017G	*
DELTXX(3)	V99H2542CA	Y-ACCEL MISALIGNMENT TO X-REF(3)	IMU GND CAL	RAD			93017G	*
DELTZY(1)	V99H2549CA	Y-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL	RAD			93017G	*
DELTZY(2)	V99H2550CA	Y-ACCEL MISALIGNMENT TO Z-REF(2)	IMU GND CAL	RAD			93017G	*
DELTZY(3)	V99H2551CA	Y-ACCEL MISALIGNMENT TO Z-REF(3)	IMU GND CAL	RAD			93017G	*
DELTZX(1)	V99H2543CA	Z-ACCEL MISALIGNMENT TO X-REF(1)	IMU GND CAL	RAD			93017G	*
DELTZX(2)	V99H2544CA	Z-ACCEL MISALIGNMENT TO X-REF(2)	IMU GND CAL	RAD			93017G	*
DELTZX(3)	V99H2545CA	Z-ACCEL MISALIGNMENT TO X-REF(3)	IMU GND CAL	RAD			93017G	*
DELTZY(1)	V99H2546CA	Z-ACCEL MISALIGNMENT TO Y-REF(1)	IMU GND CAL	RAD			93017G	*
DELTZY(2)	V99H2547CA	Z-ACCEL MISALIGNMENT TO Y-REF(2)	IMU GND CAL	RAD			93017G	*
DELTZY(3)	V99H2548CA	Z-ACCEL MISALIGNMENT TO Y-REF(3)	IMU GND CAL	RAD			93017G	*
DFR(1)	V99U5952CA	IMU 1 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR(1)	V99U5952CB	IMU 1 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFR(2)	V99U5953CA	IMU 2 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR(2)	V99U5953CB	IMU 2 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFR(3)	V99U5954CA	IMU 3 REDUNDANT GYRO RESTRAINT	IMU GND CAL	DEG/HR			93017G	*
DFR(3)	V99U5954CB	IMU 3 REDUNDANT GYRO RESTRAINT	MASS MEM	DEG/HR			90525D	
DFX(1)	V99R2560CB	X-GYRO RESTRAINT(1)	IMU GND CAL	DEG/HR			93017G	*
DFX(2)	V99R2561CB	X-GYRO RESTRAINT(2)	IMU GND CAL	DEG/HR			93017G	*
DFX(3)	V99R2562CB	X-GYRO RESTRAINT(3)	IMU GND CAL	DEG/HR			93017G	*
DFY(1)	V99R2563CB	Y-GYRO RESTRAINT(1)	IMU GND CAL	DEG/HR			93017G	*
DFY(2)	V99R2564CB	Y-GYRO RESTRAINT(2)	IMU GND CAL	DEG/HR			93017G	*
DFY(3)	V99R2565CB	Y-GYRO RESTRAINT(3)	IMU GND CAL	DEG/HR			93017G	*
DFZ(1)	V99R2566CB	Z-GYRO RESTRAINT(1)	IMU GND CAL	DEG/HR			93017G	*
DFZ(2)	V99R2567CB	Z-GYRO RESTRAINT(2)	IMU GND CAL	DEG/HR			93017G	*
DFZ(3)	V99R2568CB	Z-GYRO RESTRAINT(3)	IMU GND CAL	DEG/HR			93017G	*
DIR(1)	V99U5955CA	IMU 1 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR(1)	V99U5955CB	IMU 1 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR(2)	V99U5956CA	IMU 2 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR(2)	V99U5956CB	IMU 2 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIR(3)	V99U5957CA	IMU 3 RED GYRO INPUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DIR(3)	V99U5957CB	IMU 3 RED GYRO INPUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DIX(1)	V99U2570CA	X-GYRO IN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DIX(2)	V99U2571CA	X-GYRO IN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DIX(3)	V99U2572CA	X-GYRO IN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(1)	V99U2573CA	Z-GYRO IN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(2)	V99U2574CA	Z-GYRO IN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ(3)	V99U2575CA	Z-GYRO IN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DOR(1)	V99U5958CA	IMU 1 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(1)	V99U5958CB	IMU 1 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR(2)	V99U5959CA	IMU 2 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(2)	V99U5959CB	IMU 2 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOR(3)	V99U5960CA	IMU 3 RED GYRO OUT AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DOR(3)	V99U5960CB	IMU 3 RED GYRO OUT AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DOZ(1)	V99U2582CA	Z-GYRO OUT AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(2)	V99U2583CA	Z-GYRO OUT AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*

TABLE 4.5.4.7.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DOZ(3)	V99U2584CA	Z-GYRO OUT AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DP(1)	V99H2660CA	IMU-1 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(1)	V99H2660CB	IMU 1 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(2)	V99H2661CA	IMU-2 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(2)	V99H2661CB	IMU 2 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(3)	V99H2662CA	IMU-3 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(3)	V99H2662CB	IMU 3 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DSR(1)	V99U5961CA	IMU 1 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(1)	V99U5961CB	IMU 1 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(2)	V99U5962CA	IMU 2 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(2)	V99U5962CB	IMU 2 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSR(3)	V99U5963CA	IMU 3 RED GYRO SPIN AXIS MASS UNB	IMU GND CAL	DEG/HR/G			93017G	*
DSR(3)	V99U5963CB	IMU 3 RED GYRO SPIN AXIS MASS UNB	MASS MEM	DEG/HR/G			90525D	
DSX(1)	V99U2576CA	X-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(2)	V99U2577CA	X-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(3)	V99U2578CA	X-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(1)	V99U2579CA	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(2)	V99U2580CA	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(3)	V99U2581CA	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
ECHO_13(1)	V71M2260P	IMU-1 ECHO 1	WD13 IMU 1		HMD		93017G	*
ECHO_13(2)	V71M3260P	IMU-2 ECHO 1	WD13 IMU 2		HMD		93017G	*
ECHO_13(3)	V71M4260P	IMU-3 ECHO 1	WD13 IMU 3		HMD		93017G	*
ECHO_14(1)	V71M2280P	IMU-1 ECHO 2	WD14 IMU 1		HMD		93017G	*
ECHO_14(2)	V71M3280P	IMU-2 ECHO 2	WD14 IMU 2		HMD		93017G	*
ECHO_14(3)	V71M4280P	IMU-3 ECHO 2	WD14 IMU 3		HMD		93017G	*
EXEC	V93X6770X	EXEC ALIGN OPTION SEL	IMU ALIGN DISP		BD		89813B	
FLTR_DC2/DSCT_PR_SU_FAIL(1)	V71X2027B	IMU 1 FLTR DC2/DSCRET PWR SUP FAIL	IMU 1		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(2)	V71X3027B	IMU 2 FLTR DC2/DSCRET PWR SUP FAIL	IMU 2		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(3)	V71X4027B	IMU 3 FLTR DC2/DSCRET PWR SUP FAIL	IMU 3		BD		93017G	*
IMU_1_FAIL	V90X2601X	IMU 1 FAIL	IMU RM		BD		93017G	*
IMU_2_FAIL	V90X2701X	IMU 2 FAIL	IMU RM		BD		93017G	*
IMU_3_FAIL	V90X2801X	IMU 3 FAIL	IMU RM		BD		93017G	*
IMU_CF(1)	V91X3101X	IMU 1 COMMFAULT	FCOS				92354	
IMU_CF(2)	V91X3131X	IMU 2 COMMFAULT	FCOS				92354	
IMU_CF(3)	V91X3161X	IMU 3 COMMFAULT	FCOS				92354	
IMU_DILEMMA	V90X2552X	IMU DILEMMA INDICATOR	IMU RM		BD		93017G	*
IN_OPERATE(1)	V71X2403XB	IMU-1 IN OPERATE MODE	IMU 1				93017G	*
IN_OPERATE(2)	V71X3403XB	IMU-2 IN OPERATE MODE	IMU 2				93017G	*
IN_OPERATE(3)	V71X4403XB	IMU-3 IN OPERATE MODE	IMU 3				93017G	*
IO/MUX_FAIL(1)	V71X2022B	IMU 1 IO/MUX FAIL	WD1B1 IMU 1		BD		93017G	*
IO/MUX_FAIL(2)	V71X3022B	IMU 2 IO/MUX FAIL	WD1B1 IMU 2		BD		93017G	*
IO/MUX_FAIL(3)	V71X4022B	IMU 3 IO/MUX FAIL	WD1B1 IMU 3		BD		93017G	*
IRO(1)	V99H2615CA	INNER ROLL RESOLVER OFFSET(1)	IMU GND CAL	DEG			93017G	*
IRO(2)	V99H2616CA	INNER ROLL RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
IRO(3)	V99H2617CA	INNER ROLL RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
I_STAR_SEL1(1)	V95H4732C	X-COMP UNIT LOS VECT-SEL STAR1-M50	STAR TRCK SOP					



TABLE 4.5.4.7.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
I_STAR_SEL1(2)	V95H4733C	Y-COMP UNIT LOS VECT-SEL STAR1-M50	STAR TRCK SOP					
I_STAR_SEL1(3)	V95H4734C	Z-COMP UNIT LOS VECT-SEL STAR1-M50	STAR TRCK SOP					
I_STAR_SEL2(1)	V95H4748C	X-COMP UNIT LOS VECT-SEL STAR2-M50	STAR TRCK SOP					
I_STAR_SEL2(2)	V95H4749C	Y-COMP UNIT LOS VECT-SEL STAR2-M50	STAR TRCK SOP					
I_STAR_SEL2(3)	V95H4750C	Z-COMP UNIT LOS VECT-SEL STAR2-M50	STAR TRCK SOP					
I_STAR_SEL1(1,1)X	V95H4721C	X-COMP MEAS LOS VECT STAR 1-IMU 1	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL1(1,1)Y	V95H4722C	Y-COMP MEAS LOS VECT STAR 1-IMU 1	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL1(1,1)Z	V95H4723C	Z-COMP MEAS LOS VECT STAR 1-IMU 1	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL1(1,2)X	V95H4724C	X-COMP MEAS LOS VECT STAR 1-IMU 2	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL1(1,2)Y	V95H4725C	Y-COMP MEAS LOS VECT STAR 1-IMU 2	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL1(1,2)Z	V95H4726C	Z-COMP MEAS LOS VECT STAR 1-IMU 2	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL1(1,3)X	V95H4727C	X-COMP MEAS LOS VECT STAR 1-IMU 3	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL1(1,3)Y	V95H4728C	Y-COMP MEAS LOS VECT STAR 1-IMU 3	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL1(1,3)Z	V95H4729C	Z-COMP MEAS LOS VECT STAR 1-IMU 3	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,1)X	V95H4738C	X-COMP MEAS LOS VECT STAR 2-IMU 1	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,1)Y	V95H4739C	Y-COMP MEAS LOS VECT STAR 2-IMU 1	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,1)Z	V95H4740C	Z-COMP MEAS LOS VECT STAR 2-IMU 1	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,2)X	V95H4741C	X-COMP MEAS LOS VECT STAR 2-IMU 2	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,2)Y	V95H4742C	Y-COMP MEAS LOS VECT STAR 2-IMU 2	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,2)Z	V95H4743C	Z-COMP MEAS LOS VECT STAR 2-IMU 2	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,3)X	V95H4744C	X-COMP MEAS LOS VECT STAR 2-IMU 3	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,3)Y	V95H4745C	Y-COMP MEAS LOS VECT STAR 2-IMU 3	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL2(1,3)Z	V95H4746C	Z-COMP MEAS LOS VECT STAR 2-IMU 3	STAR TRCK SOP		SPL		93017G	*
I_STAR_SEL3(1,1)X	V95H4790C	X-COMP MEAS LOS VECT STAR 3-IMU 1	STAR TRCK SOP				92354	
I_STAR_SEL3(1,1)Y	V95H4791C	Y-COMP MEAS LOS VECT STAR 3-IMU 1	STAR TRCK SOP				92354	
I_STAR_SEL3(1,1)Z	V95H4792C	Z-COMP MEAS LOS VECT STAR 3-IMU 1	STAR TRCK SOP				92354	
I_STAR_SEL3(1,2)X	V95H4793C	X-COMP MEAS LOS VECT STAR 3-IMU 2	STAR TRCK SOP				92354	
I_STAR_SEL3(1,2)Y	V95H4794C	Y-COMP MEAS LOS VECT STAR 3-IMU 2	STAR TRCK SOP				92354	
I_STAR_SEL3(1,2)Z	V95H4795C	Z-COMP MEAS LOS VECT STAR 3-IMU 2	STAR TRCK SOP				92354	
I_STAR_SEL3(1,3)X	V95H4796C	X-COMP MEAS LOS VECT STAR 3-IMU 3	STAR TRCK SOP				92354	
I_STAR_SEL3(1,3)Y	V95H4797C	Y-COMP MEAS LOS VECT STAR 3-IMU 3	STAR TRCK SOP				92354	
I_STAR_SEL3(1,3)Z	V95H4798C	Z-COMP MEAS LOS VECT STAR 3-IMU 3	STAR TRCK SOP				92354	
KIX(1)	V99A2520CA	LOW GAIN X-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIX(2)	V99A2521CA	LOW GAIN X-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIX(3)	V99A2522CA	LOW GAIN X-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KIY(1)	V99A2523CA	LOW GAIN Y-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIY(2)	V99A2524CA	LOW GAIN Y-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIY(3)	V99A2525CA	LOW GAIN Y-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KIZ(1)	V99A2526CA	LOW GAIN Z-ACCEL SCALE FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KIZ(2)	V99A2527CA	LOW GAIN Z-ACCEL SCALE FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KIZ(3)	V99A2528CA	LOW GAIN Z-ACCEL SCALE FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KOX(1)	V99G2530CB	LOW GAIN X ACCELEROMETER BIAS(1)	IMU GND CAL	UG	SPL		93017G	*
KOX(2)	V99G2531CB	LOW GAIN X ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*
KOX(3)	V99G2532CB	LOW GAIN X ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KOY(1)	V99G2533CB	LOW GAIN Y ACCELEROMETER BIAS(1)	IMU GND CAL	UG			93017G	*
KOY(2)	V99G2534CB	LOW GAIN Y ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*

TABLE 4.5.4.7.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOY(3)	V99G2535CB	LOW GAIN Y ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KOZ(1)	V99G2536CB	LOW GAIN Z ACCELEROMETER BIAS(1)	IMU GND CAL	UG			93017G	*
KOZ(2)	V99G2537CB	LOW GAIN Z ACCELEROMETER BIAS(2)	IMU GND CAL	UG			93017G	*
KOZ(3)	V99G2538CB	LOW GAIN Z ACCELEROMETER BIAS(3)	IMU GND CAL	UG			93017G	*
KSX(1)	V99A2510CA	X-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSX(2)	V99A2511CA	X-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KSX(3)	V99A2512CA	X-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KSY(1)	V99A2513CA	Y-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSY(2)	V99A2514CA	Y-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KSY(3)	V99A2515CA	Y-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KSZ(1)	V99A2516CA	Z-ACCELEROMETER SYMMETRY FACTOR(1)	IMU GND CAL	UG/G			93017G	*
KSZ(2)	V99A2517CA	Z-ACCELEROMETER SYMMETRY FACTOR(2)	IMU GND CAL	UG/G			93017G	*
KSZ(3)	V99A2518CA	Z-ACCELEROMETER SYMMETRY FACTOR(3)	IMU GND CAL	UG/G			93017G	*
KT70/HAINS_GOOD(1)	V71X2021B	IMU 1 KT70/HAINS GOOD	WD1B0 IMU 1		BD		93017G	*
KT70/HAINS_GOOD(2)	V71X3021B	IMU 2 KT70/HAINS GOOD	WD1B0 IMU 2		BD		93017G	*
KT70/HAINS_GOOD(3)	V71X4021B	IMU 3 KT70/HAINS GOOD	WD1B0 IMU 3		BD		93017G	*
KTX(1)	V99G2500CA	X-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(2)	V99G2501CA	X-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(3)	V99G2502CA	X-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(1)	V99G2503CA	Y-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(2)	V99G2504CA	Y-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(3)	V99G2505CA	Y-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(1)	V99G2506CA	Z-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(2)	V99G2507CA	Z-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(3)	V99G2508CA	Z-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
MODE_BITE(1)	V71M2020P	IMU 1 MODE STATUS WD1	IMU 1		HMD		93017G	*
MODE_BITE(2)	V71M3020P	IMU 2 MODE STATUS WD1	IMU 2		HMD		93017G	*
MODE_BITE(3)	V71M4020P	IMU 3 MODE STATUS WD1	IMU 3		HMD		93017G	*
OMEGA_R(1)	V71R2040B	IMU-1 OMEGA R	WD2 IMU 1	DEG/HR	HFS		93017G	*
OMEGA_R(2)	V71R3040B	IMU-2 OMEGA R	WD2 IMU 2	DEG/HR	HFS		93017G	*
OMEGA_R(3)	V71R4040B	IMU-3 OMEGA R	WD2 IMU 3	DEG/HR	HFS		93017G	*
PC/CRCT_CRD_OVRTMP(1)	V71X2029B	IMU 1 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 1		BD		93017G	*
PC/CRCT_CRD_OVRTMP(2)	V71X3029B	IMU 2 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 2		BD		93017G	*
PC/CRCT_CRD_OVRTMP(3)	V71X4029B	IMU 3 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 3		BD		93017G	*
PLAT_FAIL(1)	V71X2024B	IMU-1 PLATFORM FAIL	WD1B3 IMU 1		BD		93017G	*
PLAT_FAIL(2)	V71X3024B	IMU-2 PLATFORM FAIL	WD1B3 IMU 2		BD		93017G	*
PLAT_FAIL(3)	V71X4024B	IMU-3 PLATFORM FAIL	WD1B3 IMU 3		BD		93017G	*
PLAT_TEMP_RDY(1)	V71X2404X	IMU 1 PLATFORM TEMP READY	IMU 1		BD		93017G	*
PLAT_TEMP_RDY(2)	V71X3404X	IMU 2 PLATFORM TEMP READY	IMU 2		BD		93017G	*
PLAT_TEMP_RDY(3)	V71X4404X	IMU 3 PLATFORM TEMP READY	IMU 3		BD		93017G	*
PLAT_TEMP_SAFE(1)	V71X2405X	IMU 1 PLATFORM TEMP SAFE	IMU 1		BD		93017G	*
PLAT_TEMP_SAFE(2)	V71X3405X	IMU 2 PLATFORM TEMP SAFE	IMU 2		BD		93017G	*
PLAT_TEMP_SAFE(3)	V71X4405X	IMU 3 PLATFORM TEMP SAFE	IMU 3		BD		93017G	*
PO(1)	V99H2620CA	PITCH RESOLVER OFFSET(1)	IMU GND CAL	DEG			93017G	*
PO(2)	V99H2621CA	PITCH RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
PO(3)	V99H2622CA	PITCH RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*

TABLE 4.5.4.7.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PRESS/COMM_GOOD(1)	V71X2401X	IMU 1 PRESSURE/COMMUNICATION GOOD	IMU 1		BD		93017G	*
PRESS/COMM_GOOD(2)	V71X3401X	IMU 2 PRESSURE/COMMUNICATION GOOD	IMU 2		BD		93017G	*
PRESS/COMM_GOOD(3)	V71X4401X	IMU 3 PRESSURE/COMMUNICATION GOOD	IMU 3		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(1)	V71X2025B	IMU 1 PWR CNTRLR/DGITAL SBSY FAIL	IMU 1		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(2)	V71X3025B	IMU 2 PWR CNTRLR/DGITAL SBSY FAIL	IMU 2		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(3)	V71X4025B	IMU 3 PWR CNTRLR/DGITAL SBSY FAIL	IMU 3		BD		93017G	*
RX_CUR/RX_FAIL(1)	V71X2028B	IMU 1 RESLVR CURRENT/RESLVR FAIL	IMU 1		BD		93017G	*
RX_CUR/RX_FAIL(2)	V71X3028B	IMU 2 RESLVR CURRENT/RESLVR FAIL	IMU 2		BD		93017G	*
RX_CUR/RX_FAIL(3)	V71X4028B	IMU 3 RESLVR CURRENT/RESLVR FAIL	IMU 3		BD		93017G	*
SEL_IMU_ID	V90J2560C	SELECTED IMU ID	IMU RM		HXS		93017G	*
THETARL(1)	V71H2060B	IMU-1 THETA R 8X	WD3 IMU 1	DEG	BSU		93017G	*
THETARL(2)	V71H3060B	IMU-2 THETA R 8X	WD3 IMU 2	DEG	BSU		93017G	*
THETARL(3)	V71H4060B	IMU-3 THETA R 8X	WD3 IMU 3	DEG	BSU		93017G	*
THETAXL(1)	V71H2100B	IMU-1 THETA X 8X	WD5 IMU 1	DEG	BSU		93017G	*
THETAXL(2)	V71H3100B	IMU-2 THETA X 8X	WD5 IMU 2	DEG	BSU		93017G	*
THETAXL(3)	V71H4100B	IMU-3 THETA X 8X	WD5 IMU 3	DEG	BSU		93017G	*
THETAXM(1)	V71H2080B	IMU-1 THETA X 1X	WD4 IMU 1	DEG	BSU		93017G	*
THETAXM(2)	V71H3080B	IMU-2 THETA X 1X	WD4 IMU 2	DEG	BSU		93017G	*
THETAXM(3)	V71H4080B	IMU-3 THETA X 1X	WD4 IMU 3	DEG	BSU		93017G	*
THETAYL(1)	V71H2140B	IMU-1 THETA Y 8X	WD7 IMU 1	DEG	BSU		93017G	*
THETAYL(2)	V71H3140B	IMU-2 THETA Y 8X	WD7 IMU 2	DEG	BSU		93017G	*
THETAYL(3)	V71H4140B	IMU-3 THETA Y 8X	WD7 IMU 3	DEG	BSU		93017G	*
THETAYM(1)	V71H2120B	IMU-1 THETA Y 1X	WD6 IMU 1	DEG	BSU		93017G	*
THETAYM(2)	V71H3120B	IMU-2 THETA Y 1X	WD6 IMU 2	DEG	BSU		93017G	*
THETAYM(3)	V71H4120B	IMU-3 THETA Y 1X	WD6 IMU 3	DEG	BSU		93017G	*
THETAZL(1)	V71H2180B	IMU-1 THETA Z 8X	WD9 IMU 1	DEG	BSU		93017G	*
THETAZL(2)	V71H3180B	IMU-2 THETA Z 8X	WD9 IMU 2	DEG	BSU		93017G	*
THETAZL(3)	V71H4180B	IMU-3 THETA Z 8X	WD9 IMU 3	DEG	BSU		93017G	*
THETAZM(1)	V71H2160B	IMU-1 THETA Z 1X	WD8 IMU 1	DEG	BSU		93017G	*
THETAZM(2)	V71H3160B	IMU-2 THETA Z 1X	WD8 IMU 2	DEG	BSU		93017G	*
THETAZM(3)	V71H4160B	IMU-3 THETA Z 1X	WD8 IMU 3	DEG	BSU		93017G	*
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL	WD1B9 IMU 1		BD		93017G	*
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL	WD1B9 IMU 2		BD		93017G	*
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL	WD1B9 IMU 3		BD		93017G	*
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL	WD1B10 IMU 1		BD		93017G	*
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL	WD1B10 IMU 2		BD		93017G	*
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL	WD1B10 IMU 3		BD		93017G	*
T_CLUSTER_M50(1,1,1)	V99U3450CB	CLUSTER TO M50/IMU-1 COMPONENT 1,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(1,1,2)	V99U3453CB	CLUSTER TO M50/IMU-1 COMPONENT 1,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(1,1,3)	V99U3456CB	CLUSTER TO M50/IMU-1 COMPONENT 1,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(1,2,1)	V99U3459CB	CLUSTER TO M50/IMU 1 COMPONENT 2,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(1,2,2)	V99U3462CB	CLUSTER TO M50/IMU-1 COMPONENT 2,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(1,2,3)	V99U3465CB	CLUSTER TO M50/IMU-1 COMPONENT 2,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(1,3,1)	V99U3468CB	CLUSTER TO M50/IMU-1 COMPONENT 3,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(1,3,2)	V99U3471CB	CLUSTER TO M50/IMU-1 COMPONENT 3,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(1,3,3)	V99U3474CB	CLUSTER TO M50/IMU-1 COMPONENT 3,3	IMU GC ALIGN				93017G	*

TABLE 4.5.4.7.1-1. INPUT FUNCTIONAL PARAMETERS FOR INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(2,1,1)	V99U3451CB	CLUSTER TO M50/IMU-2 COMPONENT 1,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(2,1,2)	V99U3454CB	CLUSTER TO M50/IMU-2 COMPONENT 1,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(2,1,3)	V99U3457CB	CLUSTER TO M50/IMU-2 COMPONENT 1,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(2,2,1)	V99U3460CB	CLUSTER TO M50/IMU-2 COMPONENT 2,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(2,2,2)	V99U3463CB	CLUSTER TO M50/IMU-2 COMPONENT 2,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(2,2,3)	V99U3466CB	CLUSTER TO M50/IMU-2 COMPONENT 2,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(2,3,1)	V99U3469CB	CLUSTER TO M50/IMU-2 COMPONENT 3,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(2,3,2)	V99U3472CB	CLUSTER TO M50/IMU-2 COMPONENT 3,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(2,3,3)	V99U3475CB	CLUSTER TO M50/IMU-2 COMPONENT 3,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,1,1)	V99U3452CB	CLUSTER TO M50/IMU-3 COMPONENT 1,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,1,2)	V99U3455CB	CLUSTER TO M50/IMU-3 COMPONENT 1,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,1,3)	V99U3458CB	CLUSTER TO M50/IMU-3 COMPONENT 1,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,2,1)	V99U3461CB	CLUSTER TO M50/IMU-3 COMPONENT 2,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,2,2)	V99U3464CB	CLUSTER TO M50/IMU-3 COMPONENT 2,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,2,3)	V99U3467CB	CLUSTER TO M50/IMU-3 COMPONENT 2,3	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,3,1)	V99U3470CB	CLUSTER TO M50/IMU-3 COMPONENT 3,1	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,3,2)	V99U3473CB	CLUSTER TO M50/IMU-3 COMPONENT 3,2	IMU GC ALIGN				93017G	*
T_CLUSTER_M50(3,3,3)	V99U3476CB	CLUSTER TO M50/IMU-3 COMPONENT 3,3	IMU GC ALIGN				93017G	*
V93J6767C		IMU/IMU ALIGN OPTION	IMU ALIGN DISP		VAR			
V93X6701X		IMU 1 STANDBY CMD	IMU ALIGN DISP		BD			
V93X6702X		IMU 2 STANDBY CMD	IMU ALIGN DISP		BD			
V93X6703X		IMU 3 STANDBY CMD	IMU ALIGN DISP		BD			
V93X6705X		IMU 1 OPERATE CMD	IMU ALIGN DISP		BD			
V93X6706X		IMU 2 OPERATE CMD	IMU ALIGN DISP		BD			
V93X6707X		IMU 3 OPERATE CMD	IMU ALIGN DISP		BD			
V93X6765X		STAR ALIGN OPTION	IMU ALIGN DISP		BD			
V93X6771X		MATRIX ALIGN OPTION	IMU ALIGN DISP		BD			
V93X6773X		TERMINATE ALIGN IN PROGRESS CMD	IMU ALIGN DISP		BD			

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

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
ACCEL_SF(1)	V71K2541BB	IMU 1 CAPRI SC FAC CMD	WD2 B0 IMU 1					
			TLM					
ACCEL_SF(2)	V71K3541BB	IMU 2 CAPRI SC FAC CMD	WD2 B0 IMU 2					
			TLM					
ACCEL_SF(3)	V71K4541BB	IMU 3 CAPRI SC FAC CMD	WD2 B0 IMU 3					
			TLM					
ALIGN_IN_PRO	V95X0583X	ALIGN IN PROGRESS	DL FMT 22/1		BD		93017G	*
			DL FMT 23/1					
			IMU ALIGN DISP					
			IMU RM					
CMD_WD1(1)	V71M2520PB	IMU 1 COMMAND WORD 1	DL FMT 22/A				93017G	*
			DL FMT 23/1					
			IMU 1					
CMD_WD1(2)	V71M3520PB	IMU 2 COMMAND WORD 1	DL FMT 22/A				93017G	*
			DL FMT 23/1					
			IMU 2					
CMD_WD1(3)	V71M4520PB	IMU 3 COMMAND WORD 1	DL FMT 22/A				93017G	*
			DL FMT 23/1					
			IMU 3					
CMD_WD2(1)	V71M2540PB	IMU 1 COMMAND WORD 2	DL FMT 22/A				93017G	*
			DL FMT 23/1					
			IMU 1					
CMD_WD2(2)	V71M3540PB	IMU 2 COMMAND WORD 2	DL FMT 22/A				93017G	*
			DL FMT 23/1					
			IMU 2					
CMD_WD2(3)	V71M4540PB	IMU 3 COMMAND WORD 2	DL FMT 22/A				93017G	*
			DL FMT 23/1					
			IMU 3					
DFX(1)	V99R2560CA	X-GYRO RESTRAINT(1)	DL FMT 22/1	DEG/HR			93017G	*
			IMU INT PROC					
DFX(2)	V99R2561CA	X-GYRO RESTRAINT(2)	DL FMT 22/1	DEG/HR			93017G	*
			IMU INT PROC					
DFX(3)	V99R2562CA	X-GYRO RESTRAINT(3)	DL FMT 22/1	DEG/HR			93017G	*
			IMU INT PROC					
DFY(1)	V99R2563CA	Y-GYRO RESTRAINT(1)	DL FMT 22/1	DEG/HR			93017G	*
			IMU INT PROC					
DFY(2)	V99R2564CA	Y-GYRO RESTRAINT(2)	DL FMT 22/1	DEG/HR			93017G	*
			IMU INT PROC					
DFY(3)	V99R2565CA	Y-GYRO RESTRAINT(3)	DL FMT 22/1	DEG/HR			93017G	*
			IMU INT PROC					
DFZ(1)	V99R2566CA	Z-GYRO RESTRAINT(1)	DL FMT 22/1	DEG/HR			93017G	*
			IMU INT PROC					
DFZ(2)	V99R2567CA	Z-GYRO RESTRAINT(2)	DL FMT 22/1	DEG/HR			93017G	*
			IMU INT PROC					

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DFZ(3)	V99R2568CA	Z-GYRO RESTRAINT(3)	DL FMT 22/1 IMU INT PROC	DEG/HR			93017G	*
DVM50X(1)	V95L0631C	IMU 1 M50 X AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
DVM50X(2)	V95L0632C	IMU 2 M50 X AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
DVM50X(3)	V95L0633C	IMU 3 M50 X AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
DVM50Y(1)	V95L0634C	IMU 1 M50 Y AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
DVM50Y(2)	V95L0635C	IMU 2 M50 Y AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
DVM50Y(3)	V95L0636C	IMU 3 M50 Y AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
DVM50Z(1)	V95L0637C	IMU 1 M50 Z AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
DVM50Z(2)	V95L0638C	IMU 2 M50 Z AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
DVM50Z(3)	V95L0639C	IMU 3 M50 Z AXIS DEL V OVER 1 SEC	IMU ALIGN DISP TLM	FT/S2	VAR			
IMUR	V95U0603C	IMU/IMU OPTION SELECTED	DL FMT 22/1 IMU ALIGN DISP		HXS		93017G	*
IMU_1_STAT	V95J0615C	IMU 1 PWR/BITE STATUS	IMU ALIGN DISP		VAR			
IMU_2_STAT	V95J0616C	IMU 2 PWR/BITE STATUS	IMU ALIGN DISP		VAR			
IMU_3_STAT	V95J0617C	IMU 3 PWR/BITE STATUS	IMU ALIGN DISP		VAR			
IMU_QUAT_UPD_REQ	V95X0532X	IMU REFERENCE QUAT UPDATE REQUEST	A/E ATT PROC ORB ATT PROC				89986H	
IMU_SLEW(1)	V95X0649X	IMU-1 SLEW FLAG	IMU RM					
IMU_SLEW(2)	V95X0650X	IMU-2 SLEW FLAG	IMU RM					
IMU_SLEW(3)	V95X0651X	IMU-3 SLEW FLAG	IMU RM					
KOX(1)	V99G2530CA	LOW GAIN X ACCELEROMETER BIAS(1)	DL FMT 22/1 IMU INT PROC	UG			93017G	*
KOX(2)	V99G2531CA	LOW GAIN X ACCELEROMETER BIAS(2)	DL FMT 22/1 IMU INT PROC	UG			93017G	*
KOX(3)	V99G2532CA	LOW GAIN X ACCELEROMETER BIAS(3)	DL FMT 22/1 IMU INT PROC	UG			93017G	*
KOY(1)	V99G2533CA	LOW GAIN Y ACCELEROMETER BIAS(1)	DL FMT 22/1 IMU INT PROC	UG			93017G	*
KOY(2)	V99G2534CA	LOW GAIN Y ACCELEROMETER BIAS(2)	DL FMT 22/1 IMU INT PROC	UG			93017G	*
KOY(3)	V99G2535CA	LOW GAIN Y ACCELEROMETER BIAS(3)	DL FMT 22/1 IMU INT PROC	UG			93017G	*
KOZ(1)	V99G2536CA	LOW GAIN Z ACCELEROMETER BIAS(1)	DL FMT 22/1 IMU INT PROC	UG			93017G	*

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KOZ(2)	V99G2537CA	LOW GAIN Z ACCELEROMETER BIAS(2)	DL FMT 22/1 IMU INT PROC	UG			93017G	*
KOZ(3)	V99G2538CA	LOW GAIN Z ACCELEROMETER BIAS(3)	DL FMT 22/1 IMU INT PROC	UG			93017G	*
LATCOMP(1)	V95X0085XA	IMU 1 LARGE ANGLE TORQ COMPLETE	DL FMT 22/1 DL FMT 23/A				93017G	*
LATCOMP(2)	V95X1085XA	IMU 2 LARGE ANGLE TORQ COMPLETE	DL FMT 22/1 DL FMT 23/A				93017G	*
LATCOMP(3)	V95X2085XA	IMU 3 LARGE ANGLE TORQ COMPLETE	DL FMT 22/1 DL FMT 23/A				93017G	*
MATRIX_UPDATE	V95X0645X	MATRIX UPDATE OPTION SELECTED	DL FMT 22/1 DL FMT 23/1 IMU ALIGN DISP		BD		93017G	*
OPER_CMD(1)	V71K2576XB	IMU-1 OPERATE MODE CMD	DL FMT 22/A DL FMT 23/A IMU 1				93017G	*
OPER_CMD(2)	V71K3576XB	IMU-2 OPERATE MODE CMD	DL FMT 22/A DL FMT 23/A IMU 2				93017G	*
OPER_CMD(3)	V71K4576XB	IMU-3 OPERATE MODE CMD	DL FMT 22/A DL FMT 23/A IMU 3				93017G	*
PX(1)	V71K2521BB	IMU-1 TORQUE X CMD	WD1B0-4 DL FMT 22/A DL FMT 23/1 IMU 1	ARCS			93017G	*
PX(2)	V71K3521BB	IMU-2 TORQUE X CMD	WD1B0-4 DL FMT 22/A DL FMT 23/1 IMU 2	ARCS			93017G	*
PX(3)	V71K4521BB	IMU-3 TORQUE X CMD	WD1B0-4 DL FMT 22/A DL FMT 23/1 IMU 3	ARCS			93017G	*
PY(1)	V71K2526BB	IMU-1 TORQUE Y CMD	WD1B5-9 DL FMT 22/A DL FMT 23/1 IMU 1	ARCS			93017G	*
PY(2)	V71K3526BB	IMU-2 TORQUE Y CMD	WD1B5-9 DL FMT 22/A DL FMT 23/1 IMU 2	ARCS			93017G	*
PY(3)	V71K4526BB	IMU-3 TORQUE Y CMD	WD1B5-9 DL FMT 22/A DL FMT 23/1 IMU 3	ARCS			93017G	*
PZ(1)	V71K2531BB	IMU-1 TORQUE Z CMD	WD1B10-14 DL FMT 22/A DL FMT 23/1 IMU 1	ARCS			93017G	*

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PZ(2)	V71K3531BB	IMU-2 TORQUE Z CMD	WD1B10-14	DL FMT 22/A DL FMT 23/1 IMU 2	ARCS		93017G	*
PZ(3)	V71K4531BB	IMU-3 TORQUE Z CMD	WD1B10-14	DL FMT 22/A DL FMT 23/1 IMU 3	ARCS		93017G	*
SLEW_X_NEG(1)	V71K2543BB	IMU-1 SLEW X NEG	WD2B2	DL FMT 22/A DL FMT 23/1 IMU 1	DEG/S		93017G	*
SLEW_X_NEG(2)	V71K3543BB	IMU-2 SLEW X NEG	WD2B2	DL FMT 22/A DL FMT 23/1 IMU 2	DEG/S		93017G	*
SLEW_X_NEG(3)	V71K4543BB	IMU-3 SLEW X NEG	WD2B2	DL FMT 22/A DL FMT 23/1 IMU 3	DEG/S		93017G	*
SLEW_X_POS(1)	V71K2542BB	IMU-1 SLEW X POS	WD2B1	DL FMT 22/A DL FMT 23/1 IMU 1	DEG/S		93017G	*
SLEW_X_POS(2)	V71K3542BB	IMU-2 SLEW X POS	WD2B1	DL FMT 22/A DL FMT 23/1 IMU 2	DEG/S		93017G	*
SLEW_X_POS(3)	V71K4542BB	IMU-3 SLEW X POS	WD2B1	DL FMT 22/A DL FMT 23/1 IMU 3	DEG/S		93017G	*
SLEW_Y_NEG(1)	V71K2545BB	IMU-1 SLEW Y NEG	WD2B4	DL FMT 22/A DL FMT 23/1 IMU 1	DEG/S		93017G	*
SLEW_Y_NEG(2)	V71K3545BB	IMU-2 SLEW Y NEG	WD2B4	DL FMT 22/A DL FMT 23/1 IMU 2	DEG/S		93017G	*
SLEW_Y_NEG(3)	V71K4545BB	IMU-3 SLEW Y NEG	WD2B4	DL FMT 22/A DL FMT 23/1 IMU 3	DEG/S		93017G	*
SLEW_Y_POS(1)	V71K2544BB	IMU-1 SLEW Y POS	WD2B3	DL FMT 22/A DL FMT 23/1 IMU 1	DEG/S		93017G	*
SLEW_Y_POS(2)	V71K3544BB	IMU-2 SLEW Y POS	WD2B3	DL FMT 22/A DL FMT 23/1 IMU 2	DEG/S		93017G	*
SLEW_Y_POS(3)	V71K4544BB	IMU-3 SLEW Y POS	WD2B3	DL FMT 22/A DL FMT 23/1 IMU 3	DEG/S		93017G	*
SLEW_Z_NEG(1)	V71K2547BB	IMU-1 SLEW Z NEG	WD2B6	DL FMT 22/A DL FMT 23/1 IMU 1	DEG/S		93017G	*



TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Z_NEG(2)	V71K3547BB	IMU-2 SLEW Z NEG	WD2B6	DL FMT 22/A DL FMT 23/1 IMU 2	DEG/S		93017G	*
SLEW_Z_NEG(3)	V71K4547BB	IMU-3 SLEW Z NEG	WD2B6	DL FMT 22/A DL FMT 23/1 IMU 3	DEG/S		93017G	*
SLEW_Z_POS(1)	V71K2546BB	IMU-1 SLEW Z POS	WD2B5	DL FMT 22/A DL FMT 23/1 IMU 1	DEG/S		93017G	*
SLEW_Z_POS(2)	V71K3546BB	IMU-2 SLEW Z POS	WD2B5	DL FMT 22/A DL FMT 23/1 IMU 2	DEG/S		93017G	*
SLEW_Z_POS(3)	V71K4546BB	IMU-3 SLEW Z POS	WD2B5	DL FMT 22/A DL FMT 23/1 IMU 3	DEG/S		93017G	*
STAR_ALIGN	V95X0600X	STAR ALIGN OPTION SELECTED		DL FMT 22/1 DL FMT 23/1 IMU ALIGN DISP STAR TRCK SOP		BD	93017G	*
ST_AL_COMP	V95X0545X	ST BASED ALIGN COMPLETE		IMU ALIGN DISP STAR TRCK SOP				
TEMP_STATUS(1)	V95J0621C	IMU 1 TEMP STATUS		IMU ALIGN DISP TLM		VAR		
TEMP_STATUS(2)	V95J0622C	IMU 2 TEMP STATUS		IMU ALIGN DISP TLM		VAR		
TEMP_STATUS(3)	V95J0623C	IMU 3 TEMP STATUS		IMU ALIGN DISP TLM		VAR		
T_CLUSTER_M50(1,1,1)	V99U3450CA	CLUSTER TO M50/IMU-1 COMPONENT 1,1		A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP			93017G	*
T_CLUSTER_M50(1,1,2)	V99U3453CA	CLUSTER TO M50/IMU-1 COMPONENT 1,2		A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP			93017G	*

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(1,1,3)	V99U3456CA	CLUSTER TO M50/IMU-1 COMPONENT 1,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,2,1)	V99U3459CA	CLUSTER TO M50/IMU 1 COMPONENT 2,1	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,2,2)	V99U3462CA	CLUSTER TO M50/IMU-1 COMPONENT 2,2	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,2,3)	V99U3465CA	CLUSTER TO M50/IMU-1 COMPONENT 2,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,3,1)	V99U3468CA	CLUSTER TO M50/IMU-1 COMPONENT 3,1	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(1,3,2)	V99U3471CA	CLUSTER TO M50/IMU-1 COMPONENT 3,2	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(1,3,3)	V99U3474CA	CLUSTER TO M50/IMU-1 COMPONENT 3,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,1,1)	V99U3451CA	CLUSTER TO M50/IMU-2 COMPONENT 1,1	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,1,2)	V99U3454CA	CLUSTER TO M50/IMU-2 COMPONENT 1,2	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,1,3)	V99U3457CA	CLUSTER TO M50/IMU-2 COMPONENT 1,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,2,1)	V99U3460CA	CLUSTER TO M50/IMU-2 COMPONENT 2,1	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,2,2)	V99U3463CA	CLUSTER TO M50/IMU-2 COMPONENT 2,2	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(2,2,3)	V99U3466CA	CLUSTER TO M50/IMU-2 COMPONENT 2,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,3,1)	V99U3469CA	CLUSTER TO M50/IMU-2 COMPONENT 3,1	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,3,2)	V99U3472CA	CLUSTER TO M50/IMU-2 COMPONENT 3,2	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(2,3,3)	V99U3475CA	CLUSTER TO M50/IMU-2 COMPONENT 3,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,1,1)	V99U3452CA	CLUSTER TO M50/IMU-3 COMPONENT 1,1	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,1,2)	V99U3455CA	CLUSTER TO M50/IMU-3 COMPONENT 1,2	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(3,1,3)	V99U3458CA	CLUSTER TO M50/IMU-3 COMPONENT 1,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,2,1)	V99U3461CA	CLUSTER TO M50/IMU-3 COMPONENT 2,1	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,2,2)	V99U3464CA	CLUSTER TO M50/IMU-3 COMPONENT 2,2	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,2,3)	V99U3467CA	CLUSTER TO M50/IMU-3 COMPONENT 2,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,3,1)	V99U3470CA	CLUSTER TO M50/IMU-3 COMPONENT 3,1	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
T_CLUSTER_M50(3,3,2)	V99U3473CA	CLUSTER TO M50/IMU-3 COMPONENT 3,2	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT  
(G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
T_CLUSTER_M50(3,3,3)	V99U3476CA	CLUSTER TO M50/IMU-3 COMPONENT 3,3	A/E ATT PROC DL FMT 22/A DL FMT 23/A IMU INT PROC IMU RM ORB ATT PROC STAR TRCK SOP				93017G	*
WRCF(1)	V95R0660CB	IMU 1 COMP AND FLTRD RED AXIS RATE	DL FMT 22/1 DL FMT 23/1	DEG/HR			93017G	*
WRCF(2)	V95R0661CB	IMU 2 COMP AND FLTRD RED AXIS RATE	DL FMT 22/1 DL FMT 23/1	DEG/HR			93017G	*
WRCF(3)	V95R0662CB	IMU 3 COMP AND FLTRD RED AXIS RATE	DL FMT 22/1 DL FMT 23/1	DEG/HR			93017G	*
X_ANG(1)	V95U0585C	IMU 1 MISALIGN ANG ABOUT X-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
X_ANG(2)	V95U0586C	IMU 2 MISALIGN ANG ABOUT X-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
X_ANG(3)	V95U0587C	IMU 3 MISALIGN ANG ABOUT X-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
Y_ANG(1)	V95U0588C	IMU 1 MISALIGN ANG ABOUT Y-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
Y_ANG(2)	V95U0589C	IMU 2 MISALIGN ANG ABOUT Y-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
Y_ANG(3)	V95U0590C	IMU 3 MISALIGN ANG ABOUT Y-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
Z_ANG(1)	V95U0591C	IMU 1 MISALIGN ANG ABOUT Z-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
Z_ANG(2)	V95U0592C	IMU 2 MISALIGN ANG ABOUT Z-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
Z_ANG(3)	V95U0593C	IMU 3 MISALIGN ANG ABOUT Z-AXIS	DL FMT 22/A DL FMT 23/1 IMU ALIGN DISP	DEG	SPL		93017G	*
	V72M6633PI	MDM FF01 DSCR OUT SET CD 13 CH 0	DL FMT 22/A DL FMT 23/A				93017G	*
	V72M6683PI	MDM FF02 DSCR OUT SET CD 13 CH 0	DL FMT 22/A DL FMT 23/A				93017G	*

TABLE 4.5.4.7.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
	V72M6733PI	MDM FF03 DSCR OUT SET	CD 13 CH 0	DL FMT 22/A			93017G	*
				DL FMT 23/A				
	V95M2846PA	CGMB_POS_COMP		DL FMT 22/1			93017G	*
				DL FMT 23/A				
	V95M2860P	CGZB_IN_ALIGN		DL FMT 22/1			93017G	*
				DL FMT 23/1				
	V95M2863P	CGZB_ALGN_OPT		DL FMT 22/1			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

This page intentionally left blank.



TABLE 4.5.4.7.1-3. INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) 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 4.5.4.7.1-4. INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) 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 4.5.4.7.1-5. INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
DEG_PER_RAD RADIAN TO DEGREE CONVERSION FACTOR	V97U0112C	00	+5.72957795131E+01	DEG/RAD	F		S	C A6.9 G4.10 G4.126 G4.127 G4.128 G4.175 G4.20 G4.201 G4.204 G4.208 G4.21 G4.213 G4.220 G4.226 G4.227 G4.23 G4.234 G4.237 G4.24 G4.25 G4.35 G4.36 G4.5 G4.6 G4.66 G4.8 G4.9 G4.97 G5.26 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
GIM_FLIP_B1 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-I	V90H7625C	00	+8.0	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B2 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-II	V90H7626C	00	+1.0	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	

TABLE 4.5.4.7.1-5. INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
GIM_FLIP_B3 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-III	V90H7627C	00	+2.60	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B4 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-IV	V90H7628C	00	+2.80	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GO EARTH GRAV ACCEL CONSTANT	V90A7622C	00	+3.2174049	E+01 FT/SEC**2	F		S	P A6.9 G4.10 G4.105 G4.126 G4.204 G4.208 G4.22 G4.220 G4.227 G4.234 G4.237 G4.36 G4.8 G4.9 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
IRL1 INNER ROLL NULL LIMIT 1	V90H7633C	00	+2.40	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
IRL2 INNER ROLL NULL LIMIT 2	V90H7634C	00	+3.360	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
KTN NOMINAL GYRO TORQUER SCALE FACTOR	V90G7621C	00	-5.0	E-01 ARC-SEC/PULSE	F		S	P G4.208 V4.10 V4.11 V4.11B	90374C	

TABLE 4.5.4.7.1-5. INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
RAD RADIAN TO ARC-SEC CONVERSION	V97U6133C	00	+2.0626481	E+05	ARC-SEC/RAD	F	S	P A6.9 G4.208 G4.38 V4.10 V4.11 V4.9A	90374C	
RESLAGT APPROXIMATE MAXIMUM DATA SKEW TIME	V90W7642C	00	+7.0	E-03	SEC	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
RESLIMO RESOLVER LIMIT	V90H7640C	00	+1.0	E+00	DEG	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
SFH NOMINAL ACCELEROMETER SCALE FACTOR HIGH-GAIN	V96U7004C	00	+3.444880	E-03	FT/SEC/PULSE	F	S	P G4.208 V4.10 V4.11B V4.11C	90374C	
SFL NOMINAL ACCELEROMETER SCALE FACTOR LOW-GAIN	V90A7644C	00	+3.444880	E-02	FT/SEC/PULSE	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
T_OP_LIMIT TIME IN OPERATE TEST LIMIT	V90W7623C	00	+3.00	E+02	SEC	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
VCMAX VELOCITY COUNTER OVER-FLOW FACTOR EQUALS MSB OF COUNTER	V90Q7637C	00	+2.0	E+15	PULSES	F	S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
VELSUMM50X(1) IMU-1 ACUM SENSED CHANGE X VEL	V95L0065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50X(2) IMU-2 ACUM SENSED CHANGE X VEL	V95L1065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50X(3) IMU-3 ACUM SENSED CHANGE X VEL	V95L2065C	00	+0.0	E+00	FT/SEC	F	S	P G4.208 V4.10 V4.11	90374C	

TABLE 4.5.4.7.1-5. INERTIAL MEASUREMENT UNIT ONORBIT ALIGNMENT (G4.208) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
VELSUMM50Y(1) IMU-1 ACUM SENSED CHANGE Y VEL	V95L0066C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Y(2) IMU-2 ACUM SENSED CHANGE Y VEL	V95L1066C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Y(3) IMU-3 ACUM SENSED CHANGE Y VEL	V95L2066C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(1) IMU-1 ACUM SENSED CHANGE Z VEL	V95L0067C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(2) IMU-2 ACUM SENSED CHANGE Z VEL	V95L1067C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	
VELSUMM50Z(3) IMU-3 ACUM SENSED CHANGE Z VEL	V95L2067C	00	+0.0	E+00 FT/SEC	F		S	P G4.208 V4.10 V4.11	90374C	

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

#### 4.5.4.8 Platform Positioning (PLAT\_POS).

The purpose of the PLAT\_POS module is to provide a means of orienting the cluster-to-specific orientations relative to the navigation base for ground checkout use only.

A. Functional Requirement. The PLAT\_POS module performs the following function:

Reposition each cluster to the position defined by the crew inputs X, Y, Z and hold at that position until this submode is terminated.

B. Interface Requirements. The input/output interfaces associated with the PLAT\_POS function are listed in Tables 4.5.4.8-1 and 4.5.4.8-2.

C. Detailed Requirements. The following sequence of operations is required for each IMU in the OPERATE mode.

1. Set accelerometer loops to high-gain.
2. Compute the desired navigation base-to-cluster orientation from the specified X, Y, Z angles as follows:

$$[T_{NB}^{DC(i)}] = \begin{bmatrix} \cos iZ & -\sin iZ & 0 \\ \sin iZ & \cos iZ & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos iY & 0 & \sin iY \\ 0 & 1 & 0 \\ -\sin iY & 0 & \cos iY \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos iX & -\sin iX \\ 0 & \sin iX & \cos iX \end{bmatrix}$$

for  $i = \text{IMU } 1, 2, 3$

3. Perform the cluster repositioning sequence to achieve the above defined cluster orientation for each applicable IMU.

The PLAT\_POS submode will be executed upon request by the user interface.

In addition to the foregoing requirements, a PLATFORM POSITIONING IN PROGRESS flag shall be set and be made available to DISPLAYS.

Table 4.5.4.8-1. PLAT_POS Inputs							
Name	MSID	Description	Input Source	Signal Type	Range	Units	Rate (Hz)
X1	V93H6001C	IMU-1 DESIRED CLUSTER TO NB ROLL ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE
Y1	V93H6002C	IMU-1 DESIRED CLUSTER TO NB PITCH ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE
Z1	V93H6003C	IMU-1 DESIRED CLUSTER TO NB AZIMUTH ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE
X2	V93H6007C	IMU-2 DESIRED CLUSTER TO NB ROLL ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE
Y2	V93H6008C	IMU-2 DESIRED CLUSTER TO NB PITCH ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE
Z2	V93H6009C	IMU-2 DESIRED CLUSTER TO NB AZIMUTH ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE
X3	V93H6013C	IMU-3 DESIRED CLUSTER TO NB ROLL ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE
Y3	V93H6014C	IMU-3 DESIRED CLUSTER TO NB PITCH ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE
Z3	V93H6015C	IMU-3 DESIRED CLUSTER TO NB AZIMUTH ANGLE	DISPLAYS	SCALAR	0-360	DEG	ONCE

Table 4.5.4.8-2. PLAT_POS Outputs							
Name	MSID	Description	Output Destination	Signal Type	Range	Units	Rate (Hz)
PLAT_POS	V99X2709X	PLATFORM POSITIONING IN PROGRESS FLAG	DISPLAYS TLM	LOGICAL	0,1	NA	OD
$T_{NB}^{DC}$	V99U3350C THRU V99U3376C	TRANSFORMATION: NAVIGATION BASE TO DESIRED CLUSTER; 1 PER IMU	LAT_FUNC	MATRIX	+/-1	NA	OD
ACCEL_SF(1)	V71K2541B	IMU-1 CAPRI SF WD2 BO CMD	IMU-1 TLM	LOGICAL	0,1	NA	OD
ACCEL_SF(2)	V71K3451B	IMU-2 CAPRI SF WD2 BO CMD	IMU-2 TLM	LOGICAL	0,1	NA	OD
ACCEL_SF(3)	V71K4541B	IMU-3 CAPRI SF WD2 BO CMD	IMU-3 TLM	LOGICAL	0,1	NA	OD

#### 4.5.4.8.1 Parameter Tables for IMU Platform Positioning.

The IDD inputs and outputs are listed in Tables 4.5.4.8.1-1 and 4.5.4.8.1-2. In the table it should be noted that the CAPRI TEMP discrettes are set true (=1) when power is applied to the HAINS IMU and some dual discrettes have been designated with dual names dependent upon IMU hardware. The first part of the dual name is for the KT-70 IMU while the second part is for the HAINS IMU. Values for the I-loads are contained in the I-load requirements document (JSC-19350); however, I-load definitions applicable to this principal function are listed in Table 4.5.4.8.1-3. K-loads are listed in Table 4.5.4.8.1-4. Constants are listed in Table 4.5.4.8.1-5.



TABLE 4.5.4.8.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
AD_FAIL(1)	V71X2023B	IMU-1 A/D FAIL	WD1B2	IMU 1	BD		93017G	*
AD_FAIL(2)	V71X3023B	IMU-2 A/D FAIL	WD1B2	IMU 2	BD		93017G	*
AD_FAIL(3)	V71X4023B	IMU-3 A/D FAIL	WD1B2	IMU 3	BD		93017G	*
AZO(1)	V99H2610CA	AZIMUTH RESOLVER OFFSET(1)		IMU GND CAL	DEG		93017G	*
AZO(1)	V99H2610CB	AZIMUTH RESOLVER OFFSET(1)		MASS MEM	DEG			
AZO(2)	V99H2611CA	AZIMUTH RESOLVER OFFSET(2)		IMU GND CAL	DEG		93017G	*
AZO(2)	V99H2611CB	AZIMUTH RESOLVER OFFSET(2)		MASS MEM	DEG			
AZO(3)	V99H2612CA	AZIMUTH RESOLVER OFFSET(3)		IMU GND CAL	DEG		93017G	*
AZO(3)	V99H2612CB	AZIMUTH RESOLVER OFFSET(3)		MASS MEM	DEG			
BXY(1)	V99H2590CA	X-GYRO MISALIGNMENT TO Y-REF(1)		IMU GND CAL	RAD		93017G	*
BXY(1)	V99H2590CB	X-GYRO MISALIGNMENT TO Y-REF(1)		MASS MEM	RAD		90525D	
BXY(2)	V99H2591CA	X-GYRO MISALIGNMENT TO Y-REF(2)		IMU GND CAL	RAD		93017G	*
BXY(2)	V99H2591CB	X-GYRO MISALIGNMENT TO Y-REF(2)		MASS MEM	RAD		90525D	
BXY(3)	V99H2592CA	X-GYRO MISALIGNMENT TO Y-REF(3)		IMU GND CAL	RAD		93017G	*
BXY(3)	V99H2592CB	X-GYRO MISALIGNMENT TO Y-REF(3)		MASS MEM	RAD		90525D	
BXZ(1)	V99H2593CA	X-GYRO MISALIGNMENT TO Z-REF(1)		IMU GND CAL	RAD		93017G	*
BXZ(1)	V99H2593CB	X-GYRO MISALIGNMENT TO Z-REF(1)		MASS MEM	RAD		90525D	
BXZ(2)	V99H2594CA	X-GYRO MISALIGNMENT TO Z-REF(2)		IMU GND CAL	RAD		93017G	*
BXZ(2)	V99H2594CB	X-GYRO MISALIGNMENT TO Z-REF(2)		MASS MEM	RAD		90525D	
BXZ(3)	V99H2595CA	X-GYRO MISALIGNMENT TO Z-REF(3)		IMU GND CAL	RAD		93017G	*
BXZ(3)	V99H2595CB	X-GYRO MISALIGNMENT TO Z-REF(3)		MASS MEM	RAD		90525D	
BYX(1)	V99H2596CA	Y-GYRO MISALIGNMENT TO X-REF(1)		IMU GND CAL	RAD		93017G	*
BYX(1)	V99H2596CB	Y-GYRO MISALIGNMENT TO X-REF(1)		MASS MEM	RAD		90525D	
BYX(2)	V99H2597CA	Y-GYRO MISALIGNMENT TO X-REF(2)		IMU GND CAL	RAD		93017G	*
BYX(2)	V99H2597CB	Y-GYRO MISALIGNMENT TO X-REF(2)		MASS MEM	RAD		90525D	
BYX(3)	V99H2598CA	Y-GYRO MISALIGNMENT TO X-REF(3)		IMU GND CAL	RAD		93017G	*
BYX(3)	V99H2598CB	Y-GYRO MISALIGNMENT TO X-REF(3)		MASS MEM	RAD		90525D	
BYZ(1)	V99H2599CA	Y-GYRO MISALIGNMENT TO Z-REF(1)		IMU GND CAL	RAD		93017G	*
BYZ(1)	V99H2599CB	Y-GYRO MISALIGNMENT TO Z-REF(1)		MASS MEM	RAD		90525D	
BYZ(2)	V99H2600CA	Y-GYRO MISALIGNMENT TO Z-REF(2)		IMU GND CAL	RAD		93017G	*
BYZ(2)	V99H2600CB	Y-GYRO MISALIGNMENT TO Z-REF(2)		MASS MEM	RAD		90525D	
BYZ(3)	V99H2601CA	Y-GYRO MISALIGNMENT TO Z-REF(3)		IMU GND CAL	RAD		93017G	*
BYZ(3)	V99H2601CB	Y-GYRO MISALIGNMENT TO Z-REF(3)		MASS MEM	RAD		90525D	
BZX(1)	V99H2602CA	Z-GYRO MISALIGNMENT TO X-REF(1)		IMU GND CAL	RAD		93017G	*
BZX(1)	V99H2602CB	Z-GYRO MISALIGNMENT TO X-REF(1)		MASS MEM	RAD		90525D	
BZX(2)	V99H2603CA	Z-GYRO MISALIGNMENT TO X-REF(2)		IMU GND CAL	RAD		93017G	*
BZX(2)	V99H2603CB	Z-GYRO MISALIGNMENT TO X-REF(2)		MASS MEM	RAD		90525D	
BZX(3)	V99H2604CA	Z-GYRO MISALIGNMENT TO X-REF(3)		IMU GND CAL	RAD		93017G	*
BZX(3)	V99H2604CB	Z-GYRO MISALIGNMENT TO X-REF(3)		MASS MEM	RAD		90525D	
BZY(1)	V99H2605CA	Z-GYRO MISALIGNMENT TO Y-REF(1)		IMU GND CAL	RAD		93017G	*
BZY(1)	V99H2605CB	Z-GYRO MISALIGNMENT TO Y-REF(1)		MASS MEM	RAD		90525D	
BZY(2)	V99H2606CA	Z-GYRO MISALIGNMENT TO Y-REF(2)		IMU GND CAL	RAD		93017G	*
BZY(2)	V99H2606CB	Z-GYRO MISALIGNMENT TO Y-REF(2)		MASS MEM	RAD		90525D	
BZY(3)	V99H2607CA	Z-GYRO MISALIGNMENT TO Y-REF(3)		IMU GND CAL	RAD		93017G	*
BZY(3)	V99H2607CB	Z-GYRO MISALIGNMENT TO Y-REF(3)		MASS MEM	RAD		90525D	
CAP_TEMP_RDY(1)	V71X2406X	IMU 1 CAPRI TEMP READY		IMU 1	BD		93017G	*

TABLE 4.5.4.8.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
CAP_TEMP_RDY(2)	V71X3406X	IMU 2 CAPRI TEMP READY	IMU 2		BD		93017G	*
CAP_TEMP_RDY(3)	V71X4406X	IMU 3 CAPRI TEMP READY	IMU 3		BD		93017G	*
CAP_TEMP_SAFE(1)	V71X2407X	IMU 1 CAPRI TEMP SAFE	IMU 1		BD		93017G	*
CAP_TEMP_SAFE(2)	V71X3407X	IMU 2 CAPRI TEMP SAFE	IMU 2		BD		93017G	*
CAP_TEMP_SAFE(3)	V71X4407X	IMU 3 CAPRI TEMP SAFE	IMU 3		BD		93017G	*
CVX(1)	V71L2200B	IMU-1 ACCUMD VX	WD10 IMU 1		HXU		93017G	*
CVX(2)	V71L3200B	IMU-2 ACCUMD VX	WD10 IMU 2		HXU		93017G	*
CVX(3)	V71L4200B	IMU-3 ACCUMD VX	WD10 IMU 3		HXU		93017G	*
CVY(1)	V71L2220B	IMU-1 ACCUMD VY	WD11 IMU 1		HXU		93017G	*
CVY(2)	V71L3220B	IMU-2 ACCUMD VY	WD11 IMU 2		HXU		93017G	*
CVY(3)	V71L4220B	IMU-3 ACCUMD VY	WD11 IMU 3	PULSES	HXU		93017G	*
CVZ(1)	V71L2240B	IMU-1 ACCUMD VZ	WD12 IMU 1		HXU		93017G	*
CVZ(2)	V71L3240B	IMU-2 ACCUMD VZ	WD12 IMU 2		HXU		93017G	*
CVZ(3)	V71L4240B	IMU-3 ACCUMD VZ	WD12 IMU 3	PULSES	HXU		93017G	*
D1/D8_SEQR(1)	V71X2032B	IMU-1 D1/D8 SEQUENCER	WD1B11 IMU 1		BD		93017G	*
D1/D8_SEQR(2)	V71X3032B	IMU-2 D1/D8 SEQUENCER	WD1B11 IMU 2		BD		93017G	*
D1/D8_SEQR(3)	V71X4032B	IMU-3 D1/D8 SEQUENCER	WD1B11 IMU 3		BD		93017G	*
D2_SEQR(1)	V71X2033B	IMU-1 D2 SEQUENCER	WD1B12 IMU 1		BD		93017G	*
D2_SEQR(2)	V71X3033B	IMU-2 D2 SEQUENCER	WD1B12 IMU 2		BD		93017G	*
D2_SEQR(3)	V71X4033B	IMU-3 D2 SEQUENCER	WD1B12 IMU 3		BD		93017G	*
D3_SEQR(1)	V71X2034B	IMU-1 D3 SEQUENCER	WD1B13 IMU 1		BD		93017G	*
D3_SEQR(2)	V71X3034B	IMU-2 D3 SEQUENCER	WD1B13 IMU 2		BD		93017G	*
D3_SEQR(3)	V71X4034B	IMU-3 D3 SEQUENCER	WD1B13 IMU 3		BD		93017G	*
D4_SEQR(1)	V71X2035B	IMU-1 D4 SEQUENCER	WD1B14 IMU 1		BD		93017G	*
D4_SEQR(2)	V71X3035B	IMU-2 D4 SEQUENCER	WD1B14 IMU 2		BD		93017G	*
D4_SEQR(3)	V71X4035B	IMU-3 D4 SEQUENCER	WD1B14 IMU 3		BD		93017G	*
D5_SEQR(1)	V71X2036B	IMU-1 D5 SEQUENCER	WD1B15 IMU 1		BD		93017G	*
D5_SEQR(2)	V71X3036B	IMU-2 D5 SEQUENCER	WD1B15 IMU 2		BD		93017G	*
D5_SEQR(3)	V71X4036B	IMU-3 D5 SEQUENCER	WD1B15 IMU 3		BD		93017G	*
DCDC_1_FAIL(1)	V71X2026B	IMU-1 DC/DC NO 1 FAIL	WD1B5 IMU 1		BD		93017G	*
DCDC_1_FAIL(2)	V71X3026B	IMU-2 DC/DC NO 1 FAIL	WD1B5 IMU 2		BD		93017G	*
DCDC_1_FAIL(3)	V71X4026B	IMU-3 DC/DC NO 1 FAIL	WD1B5 IMU 3		BD		93017G	*
DELTXZ(1)	V99H2552CA	X-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL	RAD			93017G	*
DELTXZ(1)	V99H2552CB	X-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD				
DELTXZ(2)	V99H2553CA	X-ACCEL MISALIGNMENT TO Z-REF(2)	IMU GND CAL	RAD			93017G	*
DELTXZ(2)	V99H2553CB	X-ACCEL MISALIGNMENT TO Z-REF(2)	MASS MEM	RAD				
DELTXZ(3)	V99H2554CA	X-ACCEL MISALIGNMENT TO Z-REF(3)	IMU GND CAL	RAD			93017G	*
DELTXZ(3)	V99H2554CB	X-ACCEL MISALIGNMENT TO Z-REF(3)	MASS MEM	RAD				
DELTYX(1)	V99H2540CA	Y-ACCEL MISALIGNMENT TO X-REF(1)	IMU GND CAL	RAD			93017G	*
DELTYX(1)	V99H2540CB	Y-ACCEL MISALIGNMENT TO X-REF(1)	MASS MEM	RAD			90525D	
DELTYX(2)	V99H2541CA	Y-ACCEL MISALIGNMENT TO X-REF(2)	IMU GND CAL	RAD			93017G	*
DELTYX(2)	V99H2541CB	Y-ACCEL MISALIGNMENT TO X-REF(2)	MASS MEM	RAD			90525D	
DELTYX(3)	V99H2542CA	Y-ACCEL MISALIGNMENT TO X-REF(3)	IMU GND CAL	RAD			93017G	*
DELTYX(3)	V99H2542CB	Y-ACCEL MISALIGNMENT TO X-REF(3)	MASS MEM	RAD			90525D	
DELTYZ(1)	V99H2549CA	Y-ACCEL MISALIGNMENT TO Z-REF(1)	IMU GND CAL	RAD			93017G	*
DELTYZ(1)	V99H2549CB	Y-ACCEL MISALIGNMENT TO Z-REF(1)	MASS MEM	RAD				

TABLE 4.5.4.8.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DELTYZ (2)	V99H2550CA	Y-ACCEL MISALIGNMENT TO Z-REF (2)	IMU GND CAL	RAD			93017G	*
DELTYZ (2)	V99H2550CB	Y-ACCEL MISALIGNMENT TO Z-REF (2)	MASS MEM	RAD				
DELTYZ (3)	V99H2551CA	Y-ACCEL MISALIGNMENT TO Z-REF (3)	IMU GND CAL	RAD			93017G	*
DELTYZ (3)	V99H2551CB	Y-ACCEL MISALIGNMENT TO Z-REF (3)	MASS MEM	RAD				
DELTZX (1)	V99H2543CA	Z-ACCEL MISALIGNMENT TO X-REF (1)	IMU GND CAL	RAD			93017G	*
DELTZX (1)	V99H2543CB	Z-ACCEL MISALIGNMENT TO X-REF (1)	MASS MEM	RAD			90525D	
DELTZX (2)	V99H2544CA	Z-ACCEL MISALIGNMENT TO X-REF (2)	IMU GND CAL	RAD			93017G	*
DELTZX (2)	V99H2544CB	Z-ACCEL MISALIGNMENT TO X-REF (2)	MASS MEM	RAD			90525D	
DELTZX (3)	V99H2545CA	Z-ACCEL MISALIGNMENT TO X-REF (3)	IMU GND CAL	RAD			93017G	*
DELTZX (3)	V99H2545CB	Z-ACCEL MISALIGNMENT TO X-REF (3)	MASS MEM	RAD			90525D	
DELTZY (1)	V99H2546CA	Z-ACCEL MISALIGNMENT TO Y-REF (1)	IMU GND CAL	RAD			93017G	*
DELTZY (1)	V99H2546CB	Z-ACCEL MISALIGNMENT TO Y-REF (1)	MASS MEM	RAD			90525D	
DELTZY (2)	V99H2547CA	Z-ACCEL MISALIGNMENT TO Y-REF (2)	IMU GND CAL	RAD			93017G	*
DELTZY (2)	V99H2547CB	Z-ACCEL MISALIGNMENT TO Y-REF (2)	MASS MEM	RAD			90525D	
DELTZY (3)	V99H2548CA	Z-ACCEL MISALIGNMENT TO Y-REF (3)	IMU GND CAL	RAD			93017G	*
DELTZY (3)	V99H2548CB	Z-ACCEL MISALIGNMENT TO Y-REF (3)	MASS MEM	RAD			90525D	
DFX (1)	V99R2560CB	X-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFX (1)	V99R2560CC	X-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFX (2)	V99R2561CB	X-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFX (2)	V99R2561CC	X-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFX (3)	V99R2562CB	X-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFX (3)	V99R2562CC	X-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DFY (1)	V99R2563CB	Y-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFY (1)	V99R2563CC	Y-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFY (2)	V99R2564CB	Y-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFY (2)	V99R2564CC	Y-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFY (3)	V99R2565CB	Y-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFY (3)	V99R2565CC	Y-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DFZ (1)	V99R2566CB	Z-GYRO RESTRAINT (1)	IMU GND CAL	DEG/HR			93017G	*
DFZ (1)	V99R2566CC	Z-GYRO RESTRAINT (1)	MASS MEM	DEG/HR			90525D	
DFZ (2)	V99R2567CB	Z-GYRO RESTRAINT (2)	IMU GND CAL	DEG/HR			93017G	*
DFZ (2)	V99R2567CC	Z-GYRO RESTRAINT (2)	MASS MEM	DEG/HR			90525D	
DFZ (3)	V99R2568CB	Z-GYRO RESTRAINT (3)	IMU GND CAL	DEG/HR			93017G	*
DFZ (3)	V99R2568CC	Z-GYRO RESTRAINT (3)	MASS MEM	DEG/HR			90525D	
DIX (1)	V99U2570CA	X-GYRO IN AXIS MASS UNBALANCE (1)	IMU GND CAL	DEG/HR/G			93017G	*
DIX (1)	V99U2570CB	X-GYRO IN AXIS MASS UNBALANCE (1)	MASS MEM	DEG/HR/G			90525D	
DIX (2)	V99U2571CA	X-GYRO IN AXIS MASS UNBALANCE (2)	IMU GND CAL	DEG/HR/G			93017G	*
DIX (2)	V99U2571CB	X-GYRO IN AXIS MASS UNBALANCE (2)	MASS MEM	DEG/HR/G			90525D	
DIX (3)	V99U2572CA	X-GYRO IN AXIS MASS UNBALANCE (3)	IMU GND CAL	DEG/HR/G			93017G	*
DIX (3)	V99U2572CB	X-GYRO IN AXIS MASS UNBALANCE (3)	MASS MEM	DEG/HR/G			90525D	
DIZ (1)	V99U2573CA	Z-GYRO IN AXIS MASS UNBALANCE (1)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ (1)	V99U2573CB	Z-GYRO IN AXIS MASS UNBALANCE (1)	MASS MEM	DEG/HR/G			90525D	
DIZ (2)	V99U2574CA	Z-GYRO IN AXIS MASS UNBALANCE (2)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ (2)	V99U2574CB	Z-GYRO IN AXIS MASS UNBALANCE (2)	MASS MEM	DEG/HR/G			90525D	
DIZ (3)	V99U2575CA	Z-GYRO IN AXIS MASS UNBALANCE (3)	IMU GND CAL	DEG/HR/G			93017G	*
DIZ (3)	V99U2575CB	Z-GYRO IN AXIS MASS UNBALANCE (3)	MASS MEM	DEG/HR/G			90525D	

TABLE 4.5.4.8.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DOZ(1)	V99U2582CA	Z-GYRO OUT AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(1)	V99U2582CB	Z-GYRO OUT AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DOZ(2)	V99U2583CA	Z-GYRO OUT AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(2)	V99U2583CB	Z-GYRO OUT AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DOZ(3)	V99U2584CA	Z-GYRO OUT AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DOZ(3)	V99U2584CB	Z-GYRO OUT AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DP(1)	V99H2660CA	IMU-1 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(1)	V99H2660CB	IMU 1 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(2)	V99H2661CA	IMU-2 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(2)	V99H2661CB	IMU 2 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DP(3)	V99H2662CA	IMU-3 ROLL/PITCH NONORTHOGONALITY	IMU GND CAL	RAD			93017G	*
DP(3)	V99H2662CB	IMU 3 ROLL/PITCH NONORTHOGONALITY	MASS MEM	RAD				
DSX(1)	V99U2576CA	X-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(1)	V99U2576CB	X-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSX(2)	V99U2577CA	X-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(2)	V99U2577CB	X-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSX(3)	V99U2578CA	X-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSX(3)	V99U2578CB	X-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
DSZ(1)	V99U2579CA	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(1)	V99U2579CB	Z-GYRO SPIN AXIS MASS UNBALANCE(1)	MASS MEM	DEG/HR/G			90525D	
DSZ(2)	V99U2580CA	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(2)	V99U2580CB	Z-GYRO SPIN AXIS MASS UNBALANCE(2)	MASS MEM	DEG/HR/G			90525D	
DSZ(3)	V99U2581CA	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	IMU GND CAL	DEG/HR/G			93017G	*
DSZ(3)	V99U2581CB	Z-GYRO SPIN AXIS MASS UNBALANCE(3)	MASS MEM	DEG/HR/G			90525D	
ECHO_13(1)	V71M2260P	IMU-1 ECHO 1	WD13 IMU 1		HMD		93017G	*
ECHO_13(2)	V71M3260P	IMU-2 ECHO 1	WD13 IMU 2		HMD		93017G	*
ECHO_13(3)	V71M4260P	IMU-3 ECHO 1	WD13 IMU 3		HMD		93017G	*
ECHO_14(1)	V71M2280P	IMU-1 ECHO 2	WD14 IMU 1		HMD		93017G	*
ECHO_14(2)	V71M3280P	IMU-2 ECHO 2	WD14 IMU 2		HMD		93017G	*
ECHO_14(3)	V71M4280P	IMU-3 ECHO 2	WD14 IMU 3		HMD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(1)	V71X2027B	IMU 1 FLTR DC2/DSCRET PWR SUP FAIL	IMU 1		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(2)	V71X3027B	IMU 2 FLTR DC2/DSCRET PWR SUP FAIL	IMU 2		BD		93017G	*
FLTR_DC2/DSCT_PR_SU_FAIL(3)	V71X4027B	IMU 3 FLTR DC2/DSCRET PWR SUP FAIL	IMU 3		BD		93017G	*
IMU_CF(1)	V91X3101X	IMU 1 COMMFault	FCOS				92354	
IMU_CF(2)	V91X3131X	IMU 2 COMMFault	FCOS				92354	
IMU_CF(3)	V91X3161X	IMU 3 COMMFault	FCOS				92354	
IN_OPERATE(1)	V71X2403XB	IMU-1 IN OPERATE MODE	IMU 1				93017G	*
IN_OPERATE(2)	V71X3403XB	IMU-2 IN OPERATE MODE	IMU 2				93017G	*
IN_OPERATE(3)	V71X4403XB	IMU-3 IN OPERATE MODE	IMU 3				93017G	*
IO/MUX_FAIL(1)	V71X2022B	IMU 1 IO/MUX FAIL	WD1B1 IMU 1		BD		93017G	*
IO/MUX_FAIL(2)	V71X3022B	IMU 2 IO/MUX FAIL	WD1B1 IMU 2		BD		93017G	*
IO/MUX_FAIL(3)	V71X4022B	IMU 3 IO/MUX FAIL	WD1B1 IMU 3		BD		93017G	*
IRO(1)	V99H2615CA	INNER ROLL RESOLVER OFFSET(1)	IMU GND CAL	DEG			93017G	*
IRO(1)	V99H2615CB	INNER ROLL RESOLVER OFFSET(1)	MASS MEM	DEG				
IRO(2)	V99H2616CA	INNER ROLL RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
IRO(2)	V99H2616CB	INNER ROLL RESOLVER OFFSET(2)	MASS MEM	DEG				

TABLE 4.5.4.8.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
IRO(3)	V99H2617CA	INNER ROLL RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
IRO(3)	V99H2617CB	INNER ROLL RESOLVER OFFSET(3)	MASS MEM	DEG				
KIXH(1)	V99A2681CA	IMU-1 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(1)	V99A2681CB	HIGH-GAIN X-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIXH(2)	V99A2682CA	IMU-2 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(2)	V99A2682CB	HIGH-GAIN X-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIXH(3)	V99A2683CA	IMU-3 HI GAIN X ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIXH(3)	V99A2683CB	HIGH-GAIN X-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIYH(1)	V99A2684CA	IMU-1 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(1)	V99A2684CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIYH(2)	V99A2685CA	IMU-2 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(2)	V99A2685CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIYH(3)	V99A2686CA	IMU-3 HI GAIN Y ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIYH(3)	V99A2686CB	HIGH-GAIN Y-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KIZH(1)	V99A2687CA	IMU-1 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(1)	V99A2687CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-1	MASS MEM	UG/G			90525D	
KIZH(2)	V99A2688CA	IMU-2 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(2)	V99A2688CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-2	MASS MEM	UG/G			90525D	
KIZH(3)	V99A2689CA	IMU-3 HI GAIN Z ACCEL SCALE FACTOR	IMU GND CAL	UG/G			93017G	*
KIZH(3)	V99A2689CB	HIGH-GAIN Z-ACC SCALE FAC/IMU-3	MASS MEM	UG/G			90525D	
KOXH(1)	V99G2670CA	IMU-1 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(1)	V99G2670CB	HIGH-GAIN X-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOXH(2)	V99G2671CA	IMU-2 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(2)	V99G2671CB	HIGH-GAIN X-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOXH(3)	V99G2672CA	IMU-3 HI GAIN X ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOXH(3)	V99G2672CB	HIGH-GAIN X-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOYH(1)	V99G2673CA	IMU-1 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(1)	V99G2673CB	HIGH-GAIN Y-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOYH(2)	V99G2674CA	IMU-2 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(2)	V99G2674CB	HIGH-GAIN Y-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOYH(3)	V99G2675CA	IMU-3 HI GAIN Y ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOYH(3)	V99G2675CB	HIGH-GAIN Y-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KOZH(1)	V99G2676CA	IMU-1 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(1)	V99G2676CB	HIGH-GAIN Z-ACCEL BIAS/IMU-1	MASS MEM	UG			90525D	
KOZH(2)	V99G2677CA	IMU-2 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(2)	V99G2677CB	HIGH-GAIN Z-ACCEL BIAS/IMU-2	MASS MEM	UG			90525D	
KOZH(3)	V99G2678CA	IMU-3 HI GAIN Z ACCEL BIAS	IMU GND CAL	UG			93017G	*
KOZH(3)	V99G2678CB	HIGH-GAIN Z-ACCEL BIAS/IMU-3	MASS MEM	UG			90525D	
KT70/HAINS_GOOD(1)	V71X2021B	IMU 1 KT70/HAINS GOOD	WD1B0	IMU 1	BD		93017G	*
KT70/HAINS_GOOD(2)	V71X3021B	IMU 2 KT70/HAINS GOOD	WD1B0	IMU 2	BD		93017G	*
KT70/HAINS_GOOD(3)	V71X4021B	IMU 3 KT70/HAINS GOOD	WD1B0	IMU 3	BD		93017G	*
KTX(1)	V99G2500CA	X-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(1)	V99G2500CB	X-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(2)	V99G2501CA	X-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTX(2)	V99G2501CB	X-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTX(3)	V99G2502CA	X-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*

TABLE 4.5.4.8.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
KTX(3)	V99G2502CB	X-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(1)	V99G2503CA	Y-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(1)	V99G2503CB	Y-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(2)	V99G2504CA	Y-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(2)	V99G2504CB	Y-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTY(3)	V99G2505CA	Y-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTY(3)	V99G2505CB	Y-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(1)	V99G2506CA	Z-GYRO TORQUER SCALE FACTOR (1)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(1)	V99G2506CB	Z-GYRO TORQUER SCALE FACTOR (1)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(2)	V99G2507CA	Z-GYRO TORQUER SCALE FACTOR (2)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(2)	V99G2507CB	Z-GYRO TORQUER SCALE FACTOR (2)	MASS MEM	DEG/HR/DEG/HR			90525D	
KTZ(3)	V99G2508CA	Z-GYRO TORQUER SCALE FACTOR (3)	IMU GND CAL	DEG/HR/DEG/HR			93017G	*
KTZ(3)	V99G2508CB	Z-GYRO TORQUER SCALE FACTOR (3)	MASS MEM	DEG/HR/DEG/HR			90185A	
MODE_BITE(1)	V71M2020P	IMU 1 MODE STATUS WD1	IMU 1		HMD		93017G	*
MODE_BITE(2)	V71M3020P	IMU 2 MODE STATUS WD1	IMU 2		HMD		93017G	*
MODE_BITE(3)	V71M4020P	IMU 3 MODE STATUS WD1	IMU 3		HMD		93017G	*
OMEGA_R(1)	V71R2040B	IMU-1 OMEGA R	WD2	IMU 1	DEG/HR	HFS	93017G	*
OMEGA_R(2)	V71R3040B	IMU-2 OMEGA R	WD2	IMU 2	DEG/HR	HFS	93017G	*
OMEGA_R(3)	V71R4040B	IMU-3 OMEGA R	WD2	IMU 3	DEG/HR	HFS	93017G	*
OPER/STBY(1)	V93X6020X	IMU 1 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(2)	V93X6021X	IMU 2 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
OPER/STBY(3)	V93X6022X	IMU 3 OPERATE/STBY REQUEST	GROUND IMU DISP	EVENT	BD			
PC/CRCT_CRD_OVRTMP(1)	V71X2029B	IMU 1 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 1		BD		93017G	*
PC/CRCT_CRD_OVRTMP(2)	V71X3029B	IMU 2 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 2		BD		93017G	*
PC/CRCT_CRD_OVRTMP(3)	V71X4029B	IMU 3 PWR CNDTNR/CRCT CARD OVRTEMP	IMU 3		BD		93017G	*
PLAT_FAIL(1)	V71X2024B	IMU-1 PLATFORM FAIL	WD1B3	IMU 1	BD		93017G	*
PLAT_FAIL(2)	V71X3024B	IMU-2 PLATFORM FAIL	WD1B3	IMU 2	BD		93017G	*
PLAT_FAIL(3)	V71X4024B	IMU-3 PLATFORM FAIL	WD1B3	IMU 3	BD		93017G	*
PLAT_TEMP_RDY(1)	V71X2404X	IMU 1 PLATFORM TEMP READY	IMU 1		BD		93017G	*
PLAT_TEMP_RDY(2)	V71X3404X	IMU 2 PLATFORM TEMP READY	IMU 2		BD		93017G	*
PLAT_TEMP_RDY(3)	V71X4404X	IMU 3 PLATFORM TEMP READY	IMU 3		BD		93017G	*
PLAT_TEMP_SAFE(1)	V71X2405X	IMU 1 PLATFORM TEMP SAFE	IMU 1		BD		93017G	*
PLAT_TEMP_SAFE(2)	V71X3405X	IMU 2 PLATFORM TEMP SAFE	IMU 2		BD		93017G	*
PLAT_TEMP_SAFE(3)	V71X4405X	IMU 3 PLATFORM TEMP SAFE	IMU 3		BD		93017G	*
PO(1)	V99H2620CA	PITCH RESOLVER OFFSET(1)	IMU GND CAL	DEG			93017G	*
PO(1)	V99H2620CB	PITCH RESOLVER OFFSET(1)	MASS MEM	DEG				
PO(2)	V99H2621CA	PITCH RESOLVER OFFSET(2)	IMU GND CAL	DEG			93017G	*
PO(2)	V99H2621CB	PITCH RESOLVER OFFSET(2)	MASS MEM	DEG				
PO(3)	V99H2622CA	PITCH RESOLVER OFFSET(3)	IMU GND CAL	DEG			93017G	*
PO(3)	V99H2622CB	PITCH RESOLVER OFFSET(3)	MASS MEM	DEG				
PRESS/COMM_GOOD(1)	V71X2401X	IMU 1 PRESSURE/COMMUNICATION GOOD	IMU 1		BD		93017G	*
PRESS/COMM_GOOD(2)	V71X3401X	IMU 2 PRESSURE/COMMUNICATION GOOD	IMU 2		BD		93017G	*
PRESS/COMM_GOOD(3)	V71X4401X	IMU 3 PRESSURE/COMMUNICATION GOOD	IMU 3		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(1)	V71X2025B	IMU 1 PWR CNTRLR/DGITAL SBSY FAIL	IMU 1		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(2)	V71X3025B	IMU 2 PWR CNTRLR/DGITAL SBSY FAIL	IMU 2		BD		93017G	*
PWR_CNTRLR/DGTL_SBSY_FAIL(3)	V71X4025B	IMU 3 PWR CNTRLR/DGITAL SBSY FAIL	IMU 3		BD		93017G	*

TABLE 4.5.4.8.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	SOURCE	UNITS	DATA TYPE	P R E C	LAST CR	R E V
RX_CUR/RX_FAIL(1)	V71X2028B	IMU 1 RESLVR CURRENT/RESLVR FAIL	IMU 1		BD		93017G	*
RX_CUR/RX_FAIL(2)	V71X3028B	IMU 2 RESLVR CURRENT/RESLVR FAIL	IMU 2		BD		93017G	*
RX_CUR/RX_FAIL(3)	V71X4028B	IMU 3 RESLVR CURRENT/RESLVR FAIL	IMU 3		BD		93017G	*
THETARL(1)	V71H2060B	IMU-1 THETA R 8X	WD3	IMU 1	DEG	BSU	93017G	*
THETARL(2)	V71H3060B	IMU-2 THETA R 8X	WD3	IMU 2	DEG	BSU	93017G	*
THETARL(3)	V71H4060B	IMU-3 THETA R 8X	WD3	IMU 3	DEG	BSU	93017G	*
THETAXL(1)	V71H2100B	IMU-1 THETA X 8X	WD5	IMU 1	DEG	BSU	93017G	*
THETAXL(2)	V71H3100B	IMU-2 THETA X 8X	WD5	IMU 2	DEG	BSU	93017G	*
THETAXL(3)	V71H4100B	IMU-3 THETA X 8X	WD5	IMU 3	DEG	BSU	93017G	*
THETAXM(1)	V71H2080B	IMU-1 THETA X 1X	WD4	IMU 1	DEG	BSU	93017G	*
THETAXM(2)	V71H3080B	IMU-2 THETA X 1X	WD4	IMU 2	DEG	BSU	93017G	*
THETAXM(3)	V71H4080B	IMU-3 THETA X 1X	WD4	IMU 3	DEG	BSU	93017G	*
THETAYL(1)	V71H2140B	IMU-1 THETA Y 8X	WD7	IMU 1	DEG	BSU	93017G	*
THETAYL(2)	V71H3140B	IMU-2 THETA Y 8X	WD7	IMU 2	DEG	BSU	93017G	*
THETAYL(3)	V71H4140B	IMU-3 THETA Y 8X	WD7	IMU 3	DEG	BSU	93017G	*
THETAYM(1)	V71H2120B	IMU-1 THETA Y 1X	WD6	IMU 1	DEG	BSU	93017G	*
THETAYM(2)	V71H3120B	IMU-2 THETA Y 1X	WD6	IMU 2	DEG	BSU	93017G	*
THETAYM(3)	V71H4120B	IMU-3 THETA Y 1X	WD6	IMU 3	DEG	BSU	93017G	*
THETAZL(1)	V71H2180B	IMU-1 THETA Z 8X	WD9	IMU 1	DEG	BSU	93017G	*
THETAZL(2)	V71H3180B	IMU-2 THETA Z 8X	WD9	IMU 2	DEG	BSU	93017G	*
THETAZL(3)	V71H4180B	IMU-3 THETA Z 8X	WD9	IMU 3	DEG	BSU	93017G	*
THETAZM(1)	V71H2160B	IMU-1 THETA Z 1X	WD8	IMU 1	DEG	BSU	93017G	*
THETAZM(2)	V71H3160B	IMU-2 THETA Z 1X	WD8	IMU 2	DEG	BSU	93017G	*
THETAZM(3)	V71H4160B	IMU-3 THETA Z 1X	WD8	IMU 3	DEG	BSU	93017G	*
TRANS_1_FAIL(1)	V71X2030B	IMU-1 TRANS WD1 FAIL	WD1B9	IMU 1	BD		93017G	*
TRANS_1_FAIL(2)	V71X3030B	IMU-2 TRANS WD1 FAIL	WD1B9	IMU 2	BD		93017G	*
TRANS_1_FAIL(3)	V71X4030B	IMU-3 TRANS WD1 FAIL	WD1B9	IMU 3	BD		93017G	*
TRANS_2_FAIL(1)	V71X2031B	IMU-1 TRANS WD2 FAIL	WD1B10	IMU 1	BD		93017G	*
TRANS_2_FAIL(2)	V71X3031B	IMU-2 TRANS WD2 FAIL	WD1B10	IMU 2	BD		93017G	*
TRANS_2_FAIL(3)	V71X4031B	IMU-3 TRANS WD2 FAIL	WD1B10	IMU 3	BD		93017G	*
X1	V93H6001C	IMU 1 DSRD CLSTR TO NB ROLL ANGLE	GROUND	IMU DISP	DEG	VAR		
X2	V93H6007C	IMU 2 DSRD CLSTR TO NB ROLL ANGLE	GROUND	IMU DISP	DEG	VAR		
X3	V93H6013C	IMU 3 DSRD CLSTR TO NB ROLL ANGLE	GROUND	IMU DISP	DEG	VAR		
Y1	V93H6002C	IMU 1 DSRD CLSTR TO NB PITCH ANGLE	GROUND	IMU DISP	DEG	VAR		
Y2	V93H6008C	IMU 2 DSRD CLSTR TO NB PITCH ANGLE	GROUND	IMU DISP	DEG	VAR		
Y3	V93H6014C	IMU 3 DSRD CLSTR TO NB PITCH ANGLE	GROUND	IMU DISP	DEG	VAR		
Z1	V93H6003C	IMU 1 DSRD CLSTR TO NB AZMTH ANGLE	GROUND	IMU DISP	DEG	VAR		
Z2	V93H6009C	IMU 2 DSRD CLSTR TO NB AZMTH ANGLE	GROUND	IMU DISP	DEG	VAR		
Z3	V93H6015C	IMU 3 DSRD CLSTR TO NB AZMTH ANGLE	GROUND	IMU DISP	DEG	VAR		
	V93X6026X	IMU 1 SELECT	GROUND	IMU DISP	EVENT	BD		
	V93X6027X	IMU 2 SELECT	GROUND	IMU DISP	EVENT	BD		
	V93X6028X	IMU 3 SELECT	GROUND	IMU DISP	EVENT	BD		
	V93X6055X	TERM/IDLE COMMAND	GROUND	IMU DISP	EVENT	BD		

TABLE 4.5.4.8.1-1. INPUT FUNCTIONAL PARAMETERS FOR IMU PLATFORM POSITIONING (V4.11B)

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

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



TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
1TNB_PC_1,1	V99U3405CD	XFMTN NAV BASE-PRES CL (1) ELEM1,1	DL FMT 53/1				93017G	*
1TNB_PC_1,2	V99U3408CD	XFMTN NAV BASE-PRES CL (1) ELEM1,2	DL FMT 53/1				93017G	*
1TNB_PC_1,3	V99U3411CD	XFMTN NAV BASE-PRES CL (1) ELEM1,3	DL FMT 53/1				93017G	*
1TNB_PC_2,1	V99U3414CD	XFMTN NAV BASE-PRES CL (1) ELEM2,1	DL FMT 53/1				93017G	*
1TNB_PC_2,2	V99U3417CD	XFMTN NAV BASE-PRES CL (1) ELEM2,2	DL FMT 53/1				93017G	*
1TNB_PC_2,3	V99U3420CD	XFMTN NAV BASE-PRES CL (1) ELEM2,3	DL FMT 53/1				93017G	*
1TNB_PC_3,1	V99U3423CD	XFMTN NAV BASE-PRES CL (1) ELEM3,1	DL FMT 53/1				93017G	*
1TNB_PC_3,2	V99U3426CD	XFMTN NAV BASE-PRES CL (1) ELEM3,2	DL FMT 53/1				93017G	*
1TNB_PC_3,3	V99U3429CD	XFMTN NAV BASE-PRES CL (1) ELEM3,3	DL FMT 53/1				93017G	*
2TNB_PC_1,1	V99U3406CD	XFMTN NAV BASE-PRES CL (2) ELEM1,1	DL FMT 53/1				93017G	*
2TNB_PC_1,2	V99U3409CD	XFMTN NAV BASE-PRES CL (2) ELEM1,2	DL FMT 53/1				93017G	*
2TNB_PC_1,3	V99U3412CD	XFMTN NAV BASE-PRES CL (2) ELEM1,3	DL FMT 53/1				93017G	*
2TNB_PC_2,1	V99U3415CD	XFMTN NAV BASE-PRES CL (2) ELEM2,1	DL FMT 53/1				93017G	*
2TNB_PC_2,2	V99U3418CD	XFMTN NAV BASE-PRES CL (2) ELEM2,2	DL FMT 53/1				93017G	*
2TNB_PC_2,3	V99U3421CD	XFMTN NAV BASE-PRES CL (2) ELEM2,3	DL FMT 53/1				93017G	*
2TNB_PC_3,1	V99U3424CD	XFMTN NAV BASE-PRES CL (2) ELEM3,1	DL FMT 53/1				93017G	*
2TNB_PC_3,2	V99U3427CD	XFMTN NAV BASE-PRES CL (2) ELEM3,2	DL FMT 53/1				93017G	*
2TNB_PC_3,3	V99U3430CD	XFMTN NAV BASE-PRES CL (2) ELEM3,3	DL FMT 53/1				93017G	*
3TNB_PC_1,1	V99U3407CD	XFMTN NAV BASE-PRES CL (3) ELEM1,1	DL FMT 53/1				93017G	*
3TNB_PC_1,2	V99U3410CD	XFMTN NAV BASE-PRES CL (3) ELEM1,2	DL FMT 53/1				93017G	*
3TNB_PC_1,3	V99U3413CD	XFMTN NAV BASE-PRES CL (3) ELEM1,3	DL FMT 53/1				93017G	*
3TNB_PC_2,1	V99U3416CD	XFMTN NAV BASE-PRES CL (3) ELEM2,1	DL FMT 53/1				93017G	*
3TNB_PC_2,2	V99U3419CD	XFMTN NAV BASE-PRES CL (3) ELEM2,2	DL FMT 53/1				93017G	*
3TNB_PC_2,3	V99U3422CD	XFMTN NAV BASE-PRES CL (3) ELEM2,3	DL FMT 53/1				93017G	*
3TNB_PC_3,1	V99U3425CD	XFMTN NAV BASE-PRES CL (3) ELEM3,1	DL FMT 53/1				93017G	*
3TNB_PC_3,2	V99U3428CD	XFMTN NAV BASE-PRES CL (3) ELEM3,2	DL FMT 53/1				93017G	*
3TNB_PC_3,3	V99U3431CD	XFMTN NAV BASE-PRES CL (3) ELEM3,3	DL FMT 53/1				93017G	*
ACCEL_SF(1)	V71K2541BF	IMU 1 CAPRI SC FAC CMD	WD2 B0	IMU 1				
				TLM				
ACCEL_SF(2)	V71K3541BF	IMU 2 CAPRI SC FAC CMD	WD2 B0	IMU 2				
				TLM				
ACCEL_SF(3)	V71K4541BF	IMU 3 CAPRI SC FAC CMD	WD2 B0	IMU 3				
				TLM				
AZANG(1)	V95H0051CE	IMU 1 COMP AZIMUTH RES ANGLE	DL FMT 44/2	DEG			93017G	*
			DL FMT 45/2					
			DL FMT 60/2					
			GROUND IMU DISP					
AZANG(2)	V95H1051CE	IMU 2 COMP AZIMUTH RES ANGLE	DL FMT 44/2	DEG			93017G	*
			DL FMT 45/2					
			DL FMT 60/2					
			GROUND IMU DISP					
AZANG(3)	V95H2051CE	IMU 3 COMP AZIMUTH RES ANGLE	DL FMT 44/2	DEG			93017G	*
			DL FMT 45/2					
			DL FMT 60/2					
			GROUND IMU DISP					

TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
CMD_WD1(1)	V71M2520PF	IMU 1 COMMAND WORD 1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD1(2)	V71M3520PF	IMU 2 COMMAND WORD 1	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD1(3)	V71M4520PF	IMU 3 COMMAND WORD 1	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD2(1)	V71M2540PF	IMU 1 COMMAND WORD 2	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
CMD_WD2(2)	V71M3540PF	IMU 2 COMMAND WORD 2	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
CMD_WD2(3)	V71M4540PF	IMU 3 COMMAND WORD 2	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
DVX(1)	V99U2860CE	IMU-1 X-AXIS DELTA VEL MAJ CYC	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX(2)	V99U2861CE	IMU-2 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX(3)	V99U2862CE	IMU-3 X-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVX_1SEC(1)	V95L0056CE	IMU 1 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(2)	V95L1056CE	IMU 2 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVX_1SEC(3)	V95L2056CE	IMU 3 X AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY(1)	V99U2863CE	IMU-1 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY(2)	V99U2864CE	IMU-2 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*

TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
DVY(3)	V99U2865CE	IMU-3 Y-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVY_1SEC(1)	V95L0057CE	IMU 1 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY_1SEC(2)	V95L1057CE	IMU 2 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVY_1SEC(3)	V95L2057CE	IMU 3 Y AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ(1)	V99U2866CE	IMU-1 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(2)	V99U2867CE	IMU-2 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ(3)	V99U2868CE	IMU-3 Z-AXIS DELTA VEL MAJ CYC	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S			93017G	*
DVZ_1SEC(1)	V95L0058CE	IMU 1 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ_1SEC(2)	V95L1058CE	IMU 2 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
DVZ_1SEC(3)	V95L2058CE	IMU 3 Z AXIS DEL VEL OVER 1 SEC	GROUND IMU DISP TLM	FT/S2				
FAIL_ACCEL_SF(1)	V95X0081XE	IMU 1 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ACCEL_SF(2)	V95X1081XE	IMU 2 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ACCEL_SF(3)	V95X2081XE	IMU 3 ACC/CAPRI SF FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(1)	V95X0030XE	IMU 1 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(2)	V95X1030XE	IMU 2 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_1(3)	V95X2030XE	IMU 3 WORD 13 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(1)	V95X0031XE	IMU 1 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
FAIL_ECHO_2(2)	V95X1031XE	IMU 2 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_ECHO_2(3)	V95X2031XE	IMU 3 WORD 14 ECHO FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(1)	V95X0034XE	IMU 1 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(2)	V95X1034XE	IMU 2 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_IR_NULL(3)	V95X2034XE	IMU 3 INNER RESOLVER NULL FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(1)	V95X0037XE	IMU 1 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(2)	V95X1037XE	IMU 2 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_RES_LIM(3)	V95X2037XE	IMU 3 RESOLVER LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(1)	V95X0035XE	IMU 1 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(2)	V95X1035XE	IMU 2 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
FAIL_VEL_LIM(3)	V95X2035XE	IMU 3 VELOCITY LIMIT FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(1)	V95Q0076CE	IMU 1 HEX DISCRETE WORD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(2)	V95Q1076CE	IMU 2 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
HDW_BITE1(3)	V95Q2076CE	IMU 3 HEX DISCRETE WORD	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP				93017G	*

TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
HDW_BITE2(1)	V95Q0077CE	IMU 1 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
HDW_BITE2(2)	V95Q1077CE	IMU 2 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
HDW_BITE2(3)	V95Q2077CE	IMU 3 HEX MODE/BITE STATUS WORD	GROUND IMU DISP TLM					
IMU_1_SEL_STATUS	V95X0021XE	IMU 1 SELECT STATUS	GROUND IMU DISP TLM					
IMU_2_SEL_STATUS	V95X1021XE	IMU 2 SELECT STATUS	GROUND IMU DISP TLM					
IMU_3_SEL_STATUS	V95X2021XE	IMU 3 SELECT STATUS	GROUND IMU DISP TLM					
IMU_FAIL_IND(1)	V95X0023XE	IMU 1 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IMU_FAIL_IND(2)	V95X1023XE	IMU 2 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IMU_FAIL_IND(3)	V95X2023XE	IMU 3 FAILURE INDICATOR	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
IRANG(1)	V95H0053CE	IMU 1 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
IRANG(2)	V95H1053CE	IMU 2 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
IRANG(3)	V95H2053CE	IMU 3 COMP INNER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2 GROUND IMU DISP	DEG			93017G	*
LATCOMP(1)	V95X0085XE	IMU 1 LARGE ANGLE TORQ COMPLETE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
LATCOMP(2)	V95X1085XE	IMU 2 LARGE ANGLE TORQ COMPLETE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
LATCOMP(3)	V95X2085XE	IMU 3 LARGE ANGLE TORQ COMPLETE	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
OPER_CMD(1)	V71K2576XF	IMU-1 OPERATE MODE CMD	GROUND IMU DISP IMU 1				93017G	*
OPER_CMD(1)	V95X0655XD	IMU 1 OPERATE MODE CMD	TLM DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
OPER_CMD(2)	V71K3576XF	IMU-2 OPERATE MODE CMD	GROUND IMU DISP IMU 2				93017G	*
OPER_CMD(2)	V95X0656XD	IMU 2 OPERATE MODE CMD	TLM DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
OPER_CMD(3)	V95X0657XD	IMU 3 OPERATE MODE CMD	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
ORANG(1)	V95H0054CE	IMU 1 COMP OUTER ROLL RES ANGLE	DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
ORANG(2)	V95H1054CE	IMU 2 COMP OUTER ROLL RES ANGLE	GROUND IMU DISP DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
ORANG(3)	V95H2054CE	IMU 3 COMP OUTER ROLL RES ANGLE	GROUND IMU DISP DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
PANG(1)	V95H0050CE	IMU 1 COMP PITCH RES ANGLE	GROUND IMU DISP DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
PANG(2)	V95H1050CE	IMU 2 COMP PITCH RES ANGLE	GROUND IMU DISP DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
PANG(3)	V95H2050CE	IMU 3 COMP PITCH RES ANGLE	GROUND IMU DISP DL FMT 44/2 DL FMT 45/2 DL FMT 60/2	DEG			93017G	*
PLAT_POS	V99X2709X	PLATFORM POSITIONING IN PROGRESS	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1		BD		93017G	*
			GROUND IMU DISP					

TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE		DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PWR_ON(1)	V95X0020XE	IMU 1 POWER ON		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PWR_ON(2)	V95X1020XE	IMU 2 POWER ON		GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PWR_ON(3)	V95X2020XE	IMU 3 POWER ON		GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
PX(1)	V71K2521BF	IMU-1 TORQUE X CMD	WD1B0-4	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PX(2)	V71K3521BF	IMU-2 TORQUE X CMD	WD1B0-4	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PX(3)	V71K4521BF	IMU-3 TORQUE X CMD	WD1B0-4	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PY(1)	V71K2526BF	IMU-1 TORQUE Y CMD	WD1B5-9	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PY(2)	V71K3526BF	IMU-2 TORQUE Y CMD	WD1B5-9	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PY(3)	V71K4526BF	IMU-3 TORQUE Y CMD	WD1B5-9	IMU 2 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PZ(1)	V71K2531BF	IMU-1 TORQUE Z CMD	WD1B10-14	IMU 3 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
PZ(2)	V71K3531BF	IMU-2 TORQUE Z CMD	WD1B10-14	IMU 1 DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	ARCS			93017G	*
				IMU 2					

TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
PZ(3)	V71K4531BF	IMU-3 TORQUE Z CMD	WD1B10-14	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	ARCS		93017G	*
S/W_BITE(1)	V95X0046XE	IMU 1 SW BITE STATUS		GROUND IMU DISP			92297B	
S/W_BITE(2)	V95X1046XE	IMU 2 SW BITE STATUS		GROUND IMU DISP			92297B	
S/W_BITE(3)	V95X2046XE	IMU 3 SW BITE STATUS		GROUND IMU DISP			92297B	
SLEW_X_NEG(1)	V71K2543BF	IMU-1 SLEW X NEG	WD2B2	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_X_NEG(2)	V71K3543BF	IMU-2 SLEW X NEG	WD2B2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_X_NEG(3)	V71K4543BF	IMU-3 SLEW X NEG	WD2B2	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_X_POS(1)	V71K2542BF	IMU-1 SLEW X POS	WD2B1	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_X_POS(2)	V71K3542BF	IMU-2 SLEW X POS	WD2B1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_X_POS(3)	V71K4542BF	IMU-3 SLEW X POS	WD2B1	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Y_NEG(1)	V71K2545BF	IMU-1 SLEW Y NEG	WD2B4	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Y_NEG(2)	V71K3545BF	IMU-2 SLEW Y NEG	WD2B4	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Y_NEG(3)	V71K4545BF	IMU-3 SLEW Y NEG	WD2B4	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*



TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
SLEW_Y_POS(1)	V71K2544BF	IMU-1 SLEW Y POS	WD2B3	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Y_POS(2)	V71K3544BF	IMU-2 SLEW Y POS	WD2B3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Y_POS(3)	V71K4544BF	IMU-3 SLEW Y POS	WD2B3	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Z_NEG(1)	V71K2547BF	IMU-1 SLEW Z NEG	WD2B6	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Z_NEG(2)	V71K3547BF	IMU-2 SLEW Z NEG	WD2B6	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Z_NEG(3)	V71K4547BF	IMU-3 SLEW Z NEG	WD2B6	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
SLEW_Z_POS(1)	V71K2546BF	IMU-1 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1 IMU 1	DEG/S		93017G	*
SLEW_Z_POS(2)	V71K3546BF	IMU-2 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 2	DEG/S		93017G	*
SLEW_Z_POS(3)	V71K4546BF	IMU-3 SLEW Z POS	WD2B5	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 IMU 3	DEG/S		93017G	*
VRSS(1)	V95L0060CE	IMU 1 SENSED CHANGE IN VEL(1 SEC)		DL FMT 44/1 DL FMT 45/1 DL FMT 60/1 GROUND IMU DISP	FT/S2		93017G	*

TABLE 4.5.4.8.1-2. OUTPUT FUNCTIONAL PARAMETERS FROM IMU PLATFORM POSITIONING (V4.11B)

FSSR NAME	M/S ID	NOMENCLATURE	DESTINATION	UNITS	DATA TYPE	P R E C	LAST CR	R E V
VRSS(2)	V95L1060CE	IMU 2 SENSED CHANGE IN VEL(1 SEC)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S2			93017G	*
VRSS(3)	V95L2060CE	IMU 3 SENSED CHANGE IN VEL(1 SEC)	GROUND IMU DISP DL FMT 44/1 DL FMT 45/1 DL FMT 60/1	FT/S2			93017G	*
	V71K4576XF	IMU-3 OPERATE MODE CMD	GROUND IMU DISP IMU 3 TLM				93017G	*
	V72M6683PF	MDM FF02 DSCR OUT SET CD 13 CH 0	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2842PE	CGMB_IMU_FAIL	DL FMT 44/1 DL FMT 45/1 DL FMT 53/1 DL FMT 60/1				93017G	*
	V95M2843PE	CGMB_PWR_ON_DFG	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2845PA	CGMB_SUBM_ACT_IP7	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2846PE	CGMB_POS_COMP	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2850PE	CGMB_SW_BITE\$(1:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2851PE	CGMB_SW_BITE\$(2:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*
	V95M2852PE	CGMB_SW_BITE\$(3:)	DL FMT 44/1 DL FMT 45/1 DL FMT 60/1				93017G	*

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

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

TABLE 4.5.4.8.1-3. IMU PLATFORM POSITIONING (V4.11B) 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 4.5.4.8.1-4. IMU PLATFORM POSITIONING (V4.11B) 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 4.5.4.8.1-5. IMU PLATFORM POSITIONING (V4.11B) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
DEG_PER_RAD RADIAN TO DEGREE CONVERSION FACTOR	V97U0112C	00	+5.72957795131E+01	DEG/RAD	F		S	C A6.9 G4.10 G4.126 G4.127 G4.128 G4.175 G4.20 G4.201 G4.204 G4.208 G4.21 G4.213 G4.220 G4.226 G4.227 G4.23 G4.234 G4.237 G4.24 G4.25 G4.35 G4.36 G4.5 G4.6 G4.66 G4.8 G4.9 G4.97 G5.26 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
GIM_FLIP_B1 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-I	V90H7625C	00	+8.0	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B2 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-II	V90H7626C	00	+1.0	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	

TABLE 4.5.4.8.1-5. IMU PLATFORM POSITIONING (V4.11B) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
GIM_FLIP_B3 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-III	V90H7627C	00	+2.60	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GIM_FLIP_B4 GIMBAL FLIP REGION DEFINITION BOUNDARY QUAD-IV	V90H7628C	00	+2.80	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
GO EARTH GRAV ACCEL CONSTANT	V90A7622C	00	+3.2174049	E+01 FT/SEC**2	F		S	P A6.9 G4.10 G4.105 G4.126 G4.204 G4.208 G4.22 G4.220 G4.227 G4.234 G4.237 G4.36 G4.8 G4.9 G5.27 V4.10 V4.11 V4.11B V4.11C V4.9A	93090E	
IRL1 INNER ROLL NULL LIMIT 1	V90H7633C	00	+2.40	E+01 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
IRL2 INNER ROLL NULL LIMIT 2	V90H7634C	00	+3.360	E+02 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
KTN NOMINAL GYRO TORQUER SCALE FACTOR	V90G7621C	00	-5.0	E-01 ARC-SEC/PULSE	F		S	P G4.208 V4.10 V4.11 V4.11B	90374C	

TABLE 4.5.4.8.1-5. IMU PLATFORM POSITIONING (V4.11B) CONSTANTS

FSSR NAME DESCRIPTION	MSID	MC	CONSTANT VALUE	ENG UNITS	DT	P R	S	PR FCTN	LAST CR	R E V
RESLAGT APPROXIMATE MAXIMUM DATA SKEW TIME	V90W7642C	00	+7.0	E-03 SEC	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
RESLIMO RESOLVER LIMIT	V90H7640C	00	+1.0	E+00 DEG	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
SFH NOMINAL ACCELEROMETER SCALE FACTOR HIGH-GAIN	V96U7004C	00	+3.444880	E-03 FT/SEC/PULSE	F		S	P G4.208 V4.10 V4.11B V4.11C	90374C	
SFL NOMINAL ACCELEROMETER SCALE FACTOR LOW-GAIN	V90A7644C	00	+3.444880	E-02 FT/SEC/PULSE	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
T_OP_LIMIT TIME IN OPERATE TEST LIMIT	V90W7623C	00	+3.00	E+02 SEC	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	
VCMAX VELOCITY COUNTER OVER-FLOW FACTOR EQUALS MSB OF COUNTER	V90Q7637C	00	+2.0	E+15 PULSES	F		S	P G4.208 V4.10 V4.11 V4.11B V4.11C	90374C	

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

This page intentionally left blank.



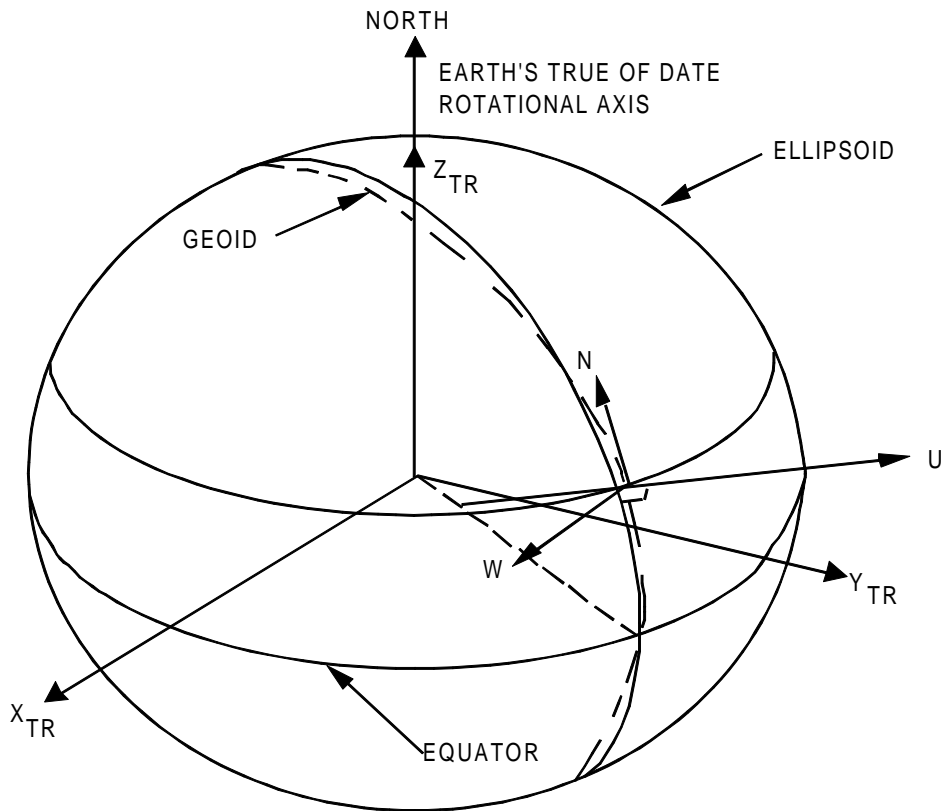
## 5.0 SUPPLEMENTARY MATERIAL

### 5.1 COORDINATE SYSTEM SUMMARY

This section defines the coordinate systems applicable to the IMU software formulations.

The coordinate systems utilized in the IMU formulations are defined as follows:

- A. NWU Geographic Coordinate System (Figure 5.1-1).
- B. Body Axis Coordinate System (Figure 5.1-2).
- C. Navigation Base Coordinate System (Figure 5.1-3).
- D. Stable Member (IMU Cluster) Coordinate System (Figure 5.1-4).
- E. Earth-Fixed Coordinate System (Figure 5.1-5).
- F. Topodetic Coordinate System (Figure 5.1-6).
- G. Aries Mean-of-1950 Coordinate System (Figure 5.1-7).



NAME: NWU GEOGRAPHIC COORDINATE SYSTEM

ORIGIN: POINT OF INTEREST

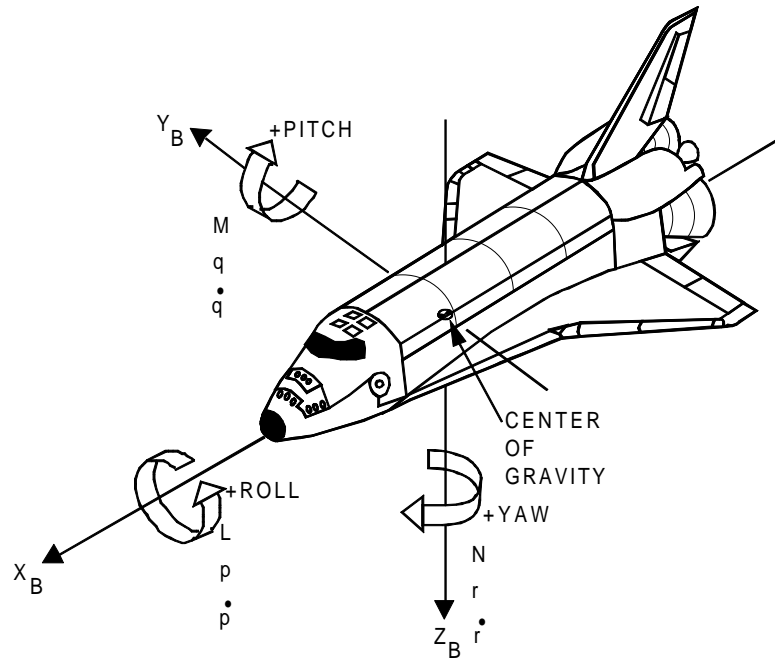
ORIENTATION: U IS POSITIVE UP ALONG THE EARTH'S ASTRONOMIC OR PLUMB-BOB VERTICAL

W IS POSITIVE ALONG THE CROSS PRODUCT OF U AND THE EARTH'S SPIN AXIS

N COMPLETES THE RIGHT-HANDED ORTHOGONAL SYSTEM

CHARACTERISTICS: ROTATING, RIGHT-HANDED, EARTH-REFERENCED COORDINATE SYSTEM

FIGURE 5.1-1. NWU Geographic Coordinate System



NAME: Body axis coordinate system.

ORIGIN: Center of mass.

ORIENTATION:  $X_B$  axis is parallel to the orbiter structural body  $X_o$  axis; positive toward the nose.

$Z_B$  axis is parallel to the orbiter plane of symmetry and is perpendicular to  $X_B$ , positive down with respect to the orbiter fuselage.

$Y_B$  axis completes the right-handed orthogonal system.

CHARACTERISTICS: Rotating, right-handed, Cartesian system.

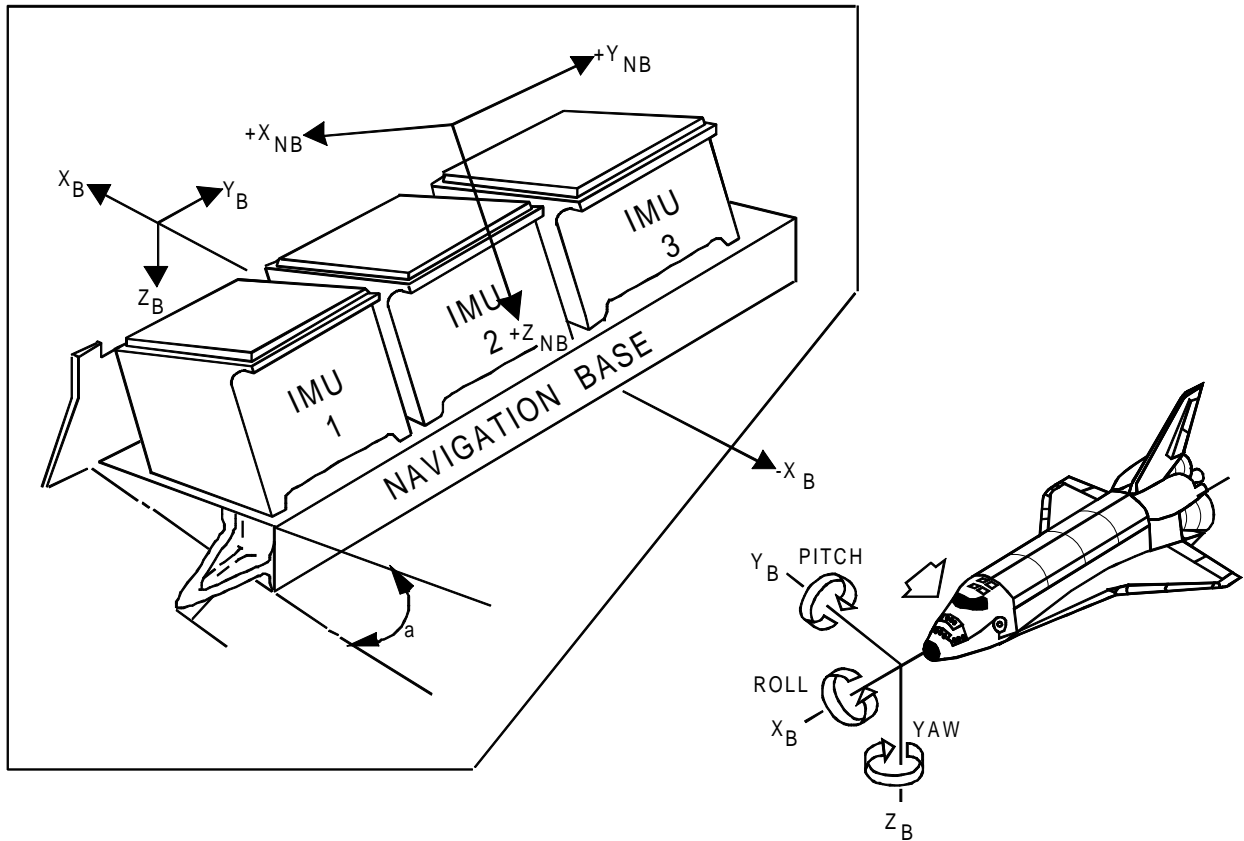
$L, M, N$  : Moments about  $X_B, Y_B,$  and  $Z_B$  axes, respectively.

$p, q, r$  : Body rates about  $X_B, Y_B,$  and  $Z_B$  axes, respectively.

$\dot{p}, \dot{q}, \dot{r}$  : Angular body acceleration about  $X_B, Y_B,$  and  $Z_B$  axes, respectively.

The Euler sequence that is commonly associated with this system is a yaw, pitch, roll sequence, where  $\psi$  = yaw,  $\theta$  = pitch, and  $\phi$  = roll or bank. This attitude sequence is yaw, pitch, and roll around the  $Z_B, Y_B,$  and  $X_B$  axes, respectively.

FIGURE 5.1-2. Body Axis Coordinate System



NAME: NAVIGATION BASE SYSTEM

ORIGIN: AT THE MUTUAL INTERSECTION OF:

(A) A PLANE PARALLEL TO THE ORBITER PLANE OF SYMMETRY, 14 INCHES LEFT OF CENTER

\*(B) PLANE OF TOP SURFACES OF MOUNTING PADS FOR IMU 1 (LEFT)

\*(C) PLANE OF VERTICAL SURFACES OF AFT PADS FOR IMU 1

ORIENTATION:  $Y_{NB}$  LIES ALONG THE INTERSECTION OF PLANES (B) AND (C), POSITIVE OUT THE ORBITER RIGHT WING.

$X_{NB}$  LIES IN PLANE (B), PERPENDICULAR TO  $Y_{NB}$  AND POSITIVE FORWARD.

$Z_{NB}$  COMPLETES THE RIGHT-HANDED SYSTEM

CHARACTERISTICS: ROTATING, RIGHT-HANDED CARTESIAN

\*AS DETERMINED BY AN ALIGNMENT FIXTURE

FIGURE 5.1-3. Navigation Base Coordinate System

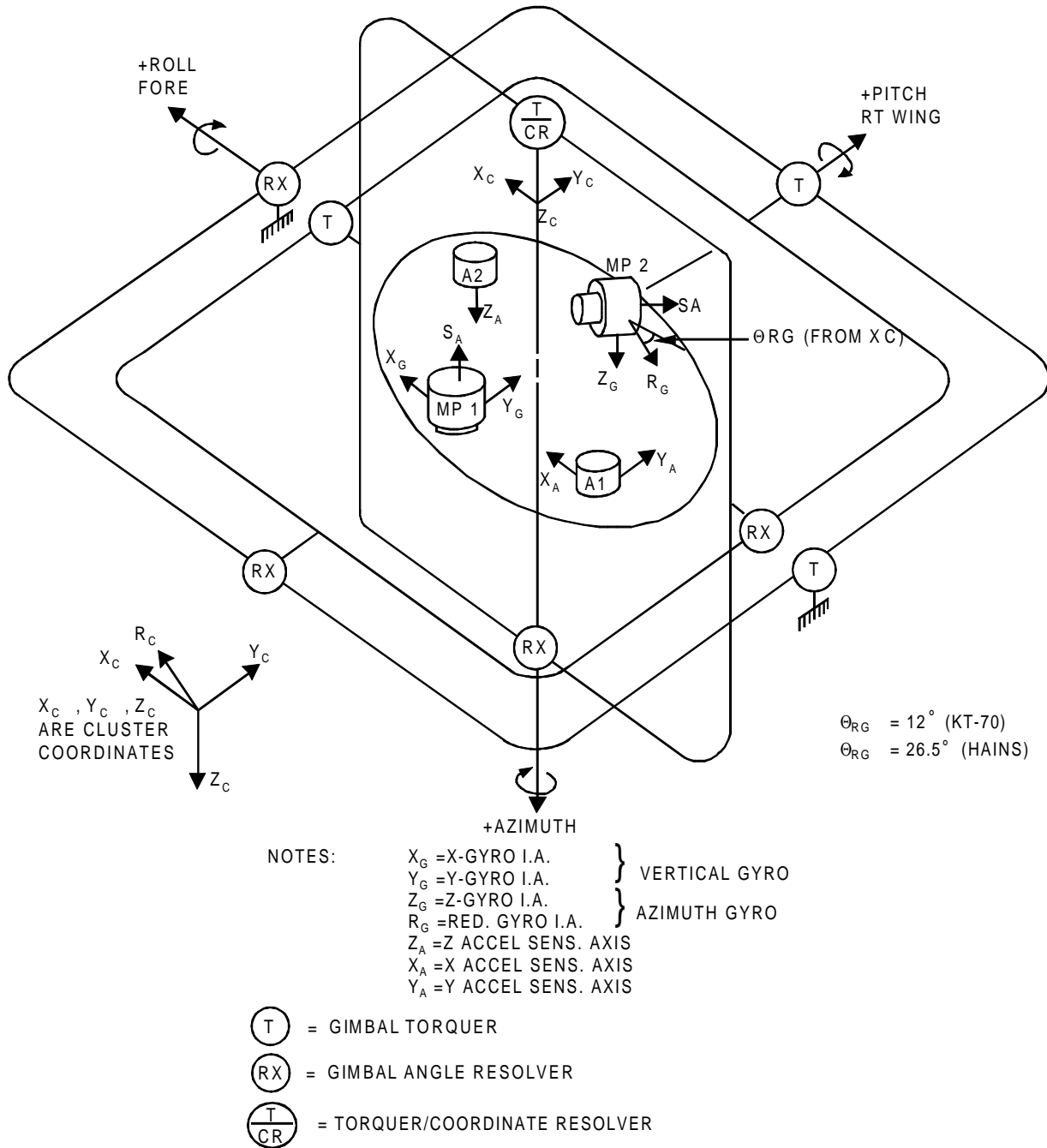


FIGURE 5.1-4.(1) Stable Member (IMU Cluster) Coordinate System (Sheet 1 of 2)

**STS 83-0013-34**  
**December 14, 2007**

NAME: STABLE MEMBER (IMU)

ORIGIN: THE INTERSECTION OF THE INNERMOST GIMBAL AXIS AND THE MEASUREMENT PLANE OF THE XY TWO AXIS ACCELEROMETER.

ORIENTATION: THE  $Z_C$  AXIS IS COINCIDENT WITH THE INNERMOST GIMBAL AXIS.

THE  $X_C$  AXIS IS DETERMINED BY THE PROJECTION OF THE X ACCELEROMETER INPUT AXIS (IA) ONTO A PLANE ORTHOGONAL TO  $Z_C$ .  $Y_C$  COMPLETES A RIGHT-HANDED TRIAD.

IN A PERFECT IMU, WITH ALL MISALIGNMENTS ZERO, THESE RELATIONSHIPS HOLD:

THE X ACCELEROMETER AND X GYRO IAS ARE PARALLEL TO THE  $X_I$  AXIS.

THE Y ACCELEROMETER AND Y GYRO IAS ARE PARALLEL TO THE  $Y_I$  AXIS.

THE Z ACCELEROMETER AND Z GYRO IAS ARE PARALLEL TO THE  $Z_I$  AXIS.

CHARACTERISTICS: NONROTATING, RIGHT-HANDED, CARTESIAN SYSTEM.

THE REFERENCE ALIGNMENT FOR THE GIMBAL CASE SHALL BE DEFINED WITH THE FOUR GIMBAL ANGLES AT ZERO AND WITH THE VEHICLE IN A HORIZONTAL POSITION. IN A PERFECT IMU, WITH ALL MISALIGNMENTS ZERO AND WITH ALL GIMBAL ANGLES AT ZERO, THE FOLLOWING RELATIONSHIPS HOLD.

THE OUTER ROLL AXIS AND THE  $X_C$  AXIS WILL BE PARALLEL TO  $X_{NB}$ . POSITIVE  $X_C$  WILL BE IN THE FORWARD DIRECTION. POSITIVE ROLL GIMBAL ANGLES WILL BE IN THE SENSE OF A RIGHT-HANDED ROTATION OF THE GIMBAL CASE RELATIVE TO THE PLATFORM ABOUT THE PLUS OUTER ROLL AXIS.

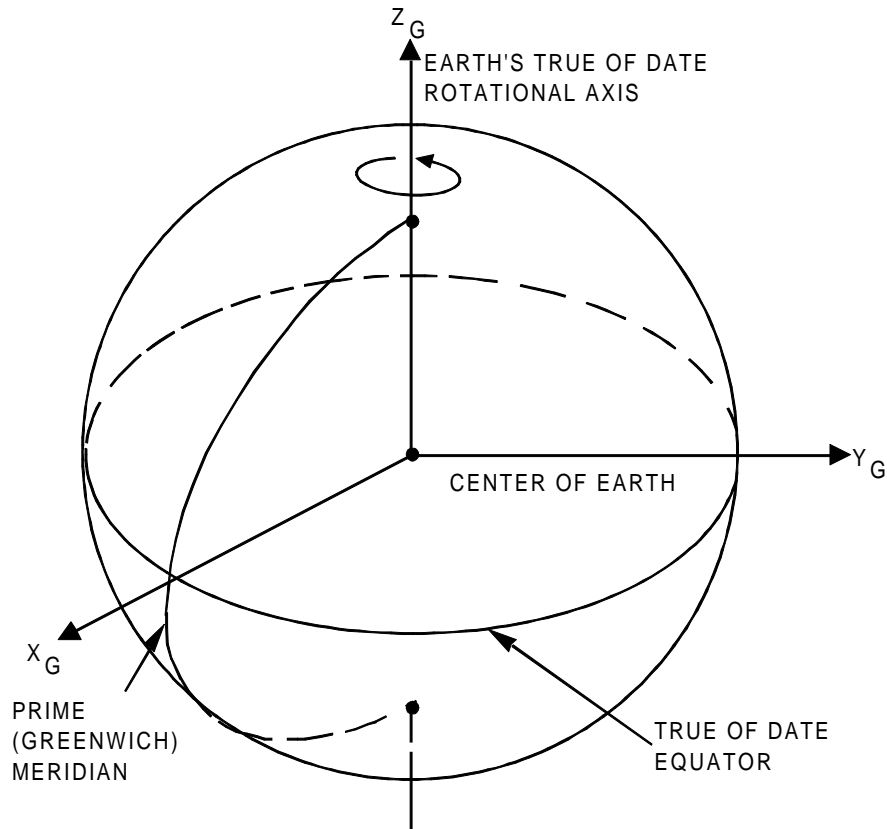
THE PITCH AXIS AND  $Y_C$  WILL BE PARALLEL TO  $Y_{NB}$ . POSITIVE  $Y_C$  WILL BE TO THE RIGHT OF AN OBSERVER LOOKING FORWARD IN THE VEHICLE. POSITIVE PITCH GIMBAL ANGLES WILL BE IN THE SENSE OF A RIGHT-HANDED ROTATION OF THE GIMBAL CASE RELATIVE TO THE PLATFORM ABOUT THE PLUS PITCH AXIS.

THE INNER ROLL AXIS WILL BE PARALLEL TO THE OUTER ROLL AXIS, WITH THE SENSE OF ROTATION THE SAME AS FOR THE OUTER ROLL AXIS.

THE AZIMUTH AXIS AND  $Z_C$  WILL BE PARALLEL TO  $Z_{NB}$ . POSITIVE  $Z_C$  WILL BE DOWN RELATIVE TO AN OBSERVER STANDING IN THE VEHICLE. POSITIVE AZIMUTH GIMBAL ANGLES WILL BE IN THE SENSE OF A RIGHT-HANDED ROTATION OF THE GIMBAL CASE RELATIVE TO THE PLATFORM ABOUT THE PLUS AZIMUTH AXIS.

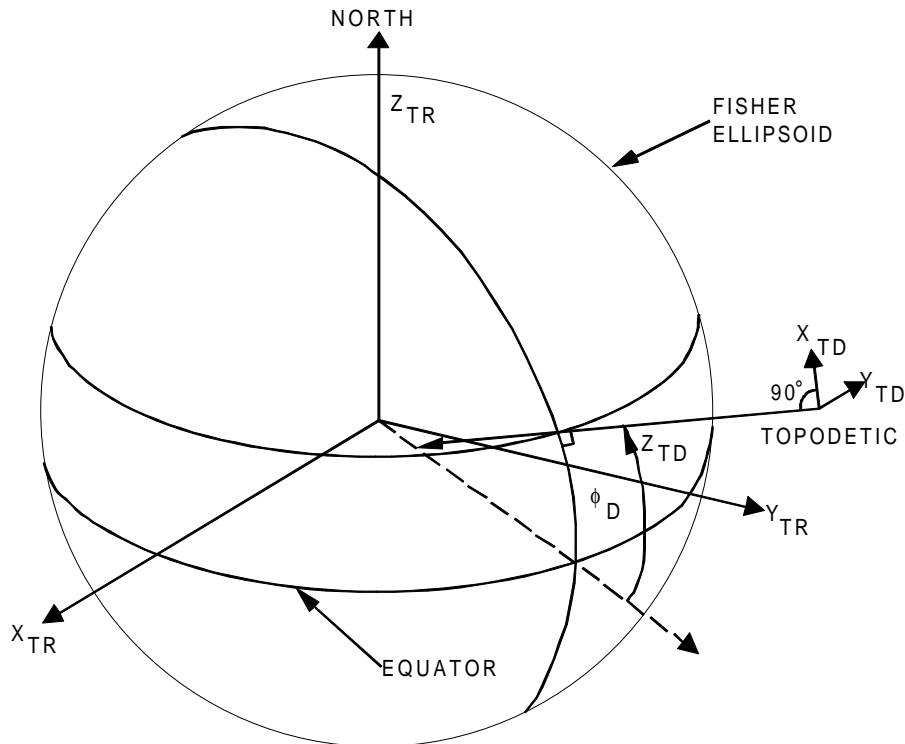
$X_{NB}$ ,  $Y_{NB}$ ,  $Z_{NB}$  ARE CARTESIAN COMPONENTS OF THE NAVIGATION BASE COORDINATE SYSTEM.

FIGURE 5.1-4.(2) Stable Member (IMU Cluster) Coordinate System (Sheet 2 of 2)



- NAME: EARTH-FIXED (GREENWICH TRUE OF DATE) COORDINATE SYSTEM
- ORIGIN: THE CENTER OF THE EARTH
- ORIENTATION: THE  $X_G$ - $Y_G$  PLANE IS THE EARTH'S TRUE OF DATE EQUATOR.
- THE  $Z_G$  AXIS IS DIRECTED ALONG THE EARTH'S TRUE OF DATE ROTATIONAL AXIS AND IS POSITIVE NORTH.
- THE  $+X_G$  AXIS IS DIRECTED TOWARD THE PRIME MERIDIAN.
- THE  $Y_G$  AXIS COMPLETES A RIGHT-HANDED SYSTEM.
- CHARACTERISTICS: ROTATING, RIGHT-HANDED CARTESIAN. VELOCITY VECTORS EXPRESSED IN THIS SYSTEM ARE RELATIVE TO A ROTATING REFERENCE FRAME FIXED TO THE EARTH, WHOSE ROTATION RATES ARE EXPRESSED RELATIVE TO THE ARIES MEAN OF 1950 SYSTEM.

FIGURE 5.1-5. Earth-Fixed, Greenwich True-of-Date Coordinate System



NAME: TOPODETIC COORDINATE SYSTEM

ORIGIN: ORBITER CENTER OF MASS\*

ORIENTATION:  $Z_{TD}$  IS NORMAL TO A GEODETIC LOCAL TANGENT PLANE AND IS POSITIVE TOWARD THE EARTH'S CENTER.

$X_{TD}$  IS PERPENDICULAR TO  $Z_{TD}$  AXIS AND IS POSITIVE NORTHWARD ALONG THE MERIDIAN PLANE CONTAINING THE ORBITER.

$Y_{TD}$  COMPLETES THE RIGHT-HANDED ORTHOGONAL SYSTEM

CHARACTERISTICS: ROTATING, RIGHT-HANDED CARTESIAN SYSTEM. VELOCITY VECTORS ARE EXPRESSIBLE IN THIS SYSTEM FOR THE ORBITER, GIVEN RELATIVE VELOCITY  $\bar{V}_{TD}$  IN THIS SYSTEM.

$$\gamma_{TD} = \sin^{-1} \left( \frac{\dot{Z}_{TD}}{V_{TD}} \right)$$

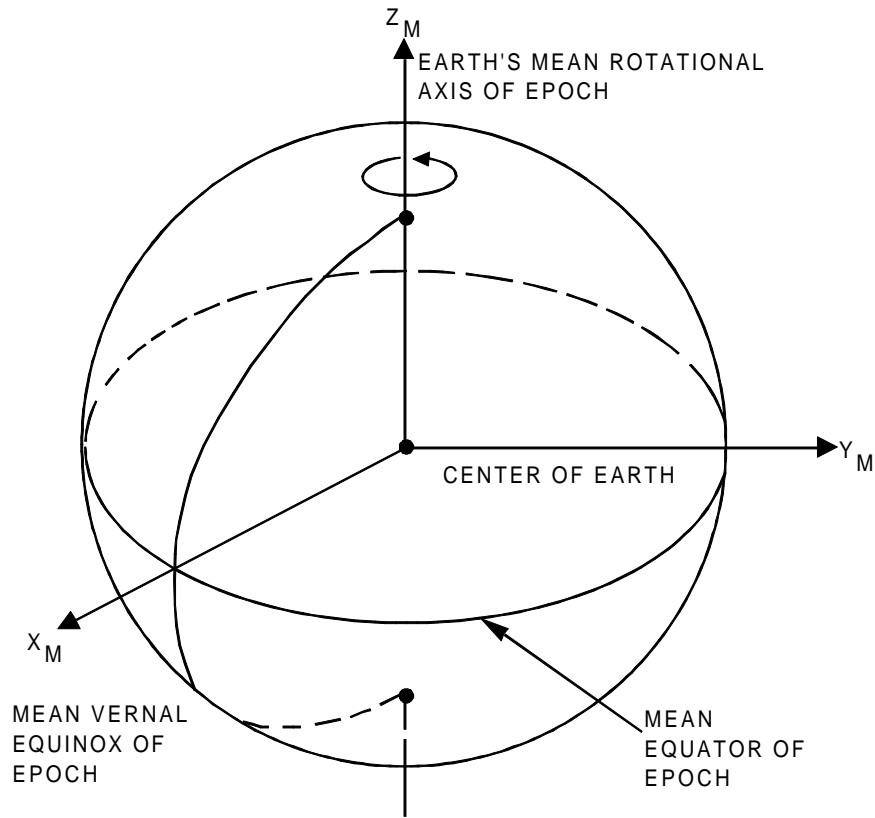
$$\psi_{TD} = \tan^{-1} \left( \frac{\dot{Y}_{TD}}{\dot{X}_{TD}} \right)$$

$\phi_D$  = GEODETIC LATITUDE

\*A SIMILAR SYSTEM MAY BE DEFINED FOR ANY POINT OF INTEREST

FIGURE 5.1-6. Topodetic Coordinate System





NAME: ARIES MEAN-OF-1950, CARTESIAN, COORDINATE SYSTEM

ORIGIN: THE CENTER OF THE EARTH

ORIENTATION: THE EPOCH IS THE BEGINNING OF BESSELIAN YEAR 1950 OR JULIAN EPHEMERIS DATE 2433282.423357

THE  $X_M - Y_M$  PLANE IS THE MEAN EARTH'S EQUATOR OF EPOCH.

THE  $X_M$  AXIS IS DIRECTED TOWARD THE MEAN VERNAL EQUINOX OF EPOCH.

THE  $Z_M$  AXIS IS DIRECTED ALONG THE EARTH'S MEAN ROTATIONAL AXIS OF EPOCH AND IS POSITIVE NORTH.

THE  $Y_M$  AXIS COMPLETES A RIGHT-HANDED SYSTEM.

CHARACTERISTICS: INERTIAL, RIGHT-HANDED CARTESIAN SYSTEM.

FIGURE 5.1-7. Aries Mean-of-1950 Cartesian Coordinate System

This page intentionally left blank.

**APPENDIX R CHANGE AUTHORIZATION REFERENCES**

**R.1 CR REFERENCE SUMMARY**

Table R.1-1. lists the paragraphs, tables (T), and figures (F) that have been changed as a result of approved change requests commencing with OI-26 up to the current OI. Changes incorporated prior to OI-26 are listed in the Historical Change Request Summary.

Table R.1-1. CR Reference Summary			
Paragraph	CR No.	OI	CR Title
N/A	92307	29	FSSR Format Change - Documentation Only
1.3-1 (T)	92103A	26B	FSSR Parameter Table Upgrade
4.5.1.1	92141A	27	IMU Software Documentation Update
4.5.1.1-1 (T)	90870	26	Flt Critical & P/L MDM Single Port Device ID Protection
	92009	26	OI26 Correction To Single Port Device ID Protection (CR90870)
4.5.1.1-1 (F)	92141A	27	IMU Software Documentation Update
	92141A	27	IMU Software Documentation Update
4.5.1.3	91004	26	Require IMU BITE to Run with Display Inactive
4.5.1.5	92141A	27	IMU Software Documentation Update
4.5.2.11-2 (T)	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.3.1	90870	26	Flight Critical and Payload MDM Single Port Device ID Protection
	91004	26	Require IMU BITE to Run with Display Inactive
	92009	26	OI26 Correction to Single Port Device ID Protection (CR 90870)
	92141A	27	IMU Software Documentation Update
4.5.3.1-1. (T)	92665C	32	Upgrade IMU/IMU Alignment
	92665C	32	Upgrade IMU/IMU Alignment
4.5.3.1-2 (T)	91004	26	Require IMU BITE to Run with Display Inactive
	92141A	27	IMU Software Documentation Update
	92665C	32	Upgrade IMU/IMU Alignment
4.5.4.1.1-1 (T)	92354	27	Delete Erroneous TLM Destinations
4.5.4.1.1-2 (T)	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.1.1-5 (T)	90870	26	Flight Critical and Payload MDM Single Port Device ID Protection
	92009	26	OI26 Correction to Single Port Device ID Protection (CR 90870)
	91051K	26B	Streamlined Shuttle GPS Capability
	92395F	28	Incorporate G on MEDS Displays
	92389C	29	Spiral HAC in TAEM Area Navigation
	92522D	30	Overhaul MEDS Composite Flight Instrument Display

Table R.1-1. CR Reference Summary			
Paragraph	CR No.	OI	CR Title
	93090E	33	Bearing Displays
4.5.4.2.2-1 (T)	92354	27	Delete Erroneous TLM Destinations
4.5.4.2.2-2 (T)	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.2.2-5 (T)	91051K	26B	Streamlined Shuttle GPS Capability
	92395F	28	Incorporate G on MEDS Displays
	92389C	29	Spiral HAC in TAEM Area Navigation
	92522D	30	Overhaul MEDS Composite Flight Instrument Display
	93090E	33	Bearing Displays
4.5.4.3	92068A	29	Spare IMU Tape Requirements Deletion
4.5.4.3.2-2 (T)	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.3.4-1 (T)	92354	27	Delete Erroneous TLM Destinations
4.5.4.3.4-2 (T)	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.3.4-4 (T)	92068A	29	Spare IMU Tape Requirements Deletion
4.5.4.3.4-5 (T)	91051K	26B	Streamlined Shuttle GPS Capability
	92395F	28	Incorporate G on MEDS Displays
	92389C	29	Spiral HAC in TAEM Area Navigation
	92522D	30	Overhaul MEDS Composite Flight Instrument Display
	93090E	33	Bearing Displays
4.5.4.5.1-2 (T)	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.5.1.1-1 (T)	92067D	27	Three String GPS Capability
	92354	27	Delete Erroneous TLM Destinations
	92157	28	IDD Clarification to Remove Blanks from FSSR Names
	92329E	29	Onboard Calculation of RNP Matrix
	92392C	29	Doc-Only Corrections for OI-29 CRs 92329E, 92364D, and 92369B
	92522D	30	Overhaul MEDS Composite Flight Instrument Display
	93090E	33	Bearing Displays
4.5.4.5.1.1-2 (T)	92067D	27	Three String GPS Capability
	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.5.1.1-5 (T)	92395F	28	Incorporate G on MEDS Displays
	92389C	29	Spiral HAC in TAEM Area Navigation
	92522D	30	Overhaul MEDS Composite Flight Instrument Display
	93090E	33	Bearing Displays
4.5.4.5.2	92329E	29	Onboard Calculation of RNP Matrix
4.5.4.5.2-1 (T)	92329E	29	Onboard Calculation of RNP Matrix
4.5.4.6.1-1 (T)	92067D	27	Three String GPS Capability
	92354	27	Delete Erroneous TLM Destinations
	92522D	30	Overhaul MEDS Composite Flight Instrument Display
	93090E	33	Bearing Displays
4.5.4.6.1-2 (T)	92067D	27	Three String GPS Capability
	92141A	27	IMU Software Documentation Update

Table R.1-1. CR Reference Summary			
Paragraph	CR No.	OI	CR Title
	92297B	27	Delete Erroneous TLM Destinations for NAV
	92369B	29	PASS GPS Operational Enhancements
	92392C	29	Doc-Only Corrections for OI-29 CRs 92329E, 92364D, and 92369B
4.5.4.7	92665C	32	Upgrade IMU/IMU Alignment
4.5.4.7-1. (T)	92665C	32	Upgrade IMU/IMU Alignment
4.5.4.7-1.(1)(F)	92665C	32	Upgrade IMU/IMU Alignment
4.5.4.7-1.(2)(F)	92665C	32	Upgrade IMU/IMU Alignment
4.5.4.7.1-1 (T)	92067D	27	Three String GPS Capability
	92297B	27	Delete Erroneous TLM Destinations for NAV
	92354	27	Delete Erroneous TLM Destinations
	92187	28	IDD Clarification to Remove Blanks from FSSR Names
	90662F	29	Automatic Reanchoring of an Upmoded IMU
4.5.4.7.1-2 (T)	90525D	20	IMU FSSR Changes for HAINS IMU and Update
	89986H	22	OPS-1 IMU Alignment
	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.7.1-5 (T)	91051K	26B	Streamlined Shuttle GPS Capability
	92395F	28	Incorporate G on MEDS Displays
	92389C	29	Spiral HAC in TAEM Area Navigation
	92522D	30	Overhaul MEDS Composite Flight Instrument Display
	93090E	33	Bearing Displays
4.5.4.7-2. (T)	92665C	32	Upgrade IMU/IMU Alignment
4.5.4.8-2 (T)	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.8.1-1 (T)	91051K	26B	Streamlined Shuttle GPS Capability
	92354	27	Delete Erroneous TLM Destinations
4.5.4.8.1-2 (T)	92297B	27	Delete Erroneous TLM Destinations for NAV
4.5.4.8.1-5 (T)	92395F	28	Incorporate G on MEDS Displays
	92389C	29	Spiral HAC in TAEM Area Navigation
	92522D	30	Overhaul MEDS Composite Flight Instrument Display
	93090E	33	Bearing Displays

## 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
1922A		Mass Memory Read/Write of IMU CAL Data
2166		Entry Interface Table Update (IDD)
2237		Reduce On-Orbit Align Torque Rate to 6.25 Hz
2265B		Add IMU Align Capability to MM301
2385A		IMU Interface Table Update (IDD)
2414		Unitary Transformation for GCA and VTI
2415		ATT_DET and HCA Error Corrections
2426		PFLT_CALA Changes for DI, DS, and DO
2514		RED Rate Test Disable for On-Orbit Align
2515		IMU Data Time Tag Requirement
2536A		13 Pos HCA With ACC Att SEN Comp
2585A		Misc Corrections and Clarifications
2593A		Typos – No Requirement Changes
12019		FSSR Format Change – Append IDD Tables
12058A		Resolver Data Time Tag for ATT_PROC
12080A		Add STBY CMD to IMU GND CNTR/MON
12097		Add CL_CLRATE Outputs to GN&C 9 TLM
12118		Update IDD to Reflect CR 2536A
12120		Update IDD to Reflect PCN No. 2
12131A		Deselect IMU Cal If Removed From Read Chain
12182		Add HCC Data to I-Load and TLM
12214A		ST SOP Interface Table Update (IDD)
12225B		IMU_UPLINK Module
12234A		I-Load to Support VU
12269		MSID Corrections to IDD Tables
12296		2-Pass HANG_CALA and PFLT_CALA
12310		Combine HCA and PFCA Pos Indicator
12336		OFT-1 Baseline I-Load – LRU Dependent
12337		OFT-1 Baseline I-Load – Design Dependent
12338		OFT-1 Baseline I-Load – Constants
12339		OFT-1 Baseline I-Load – Removal From I-Load
12370		Correct Level Hold Error in CR 2585A

Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
12371		I-Load Change for Tilt Limit
12390A		RM Sensor Select
12442A		OFT-1 Interface Requirements (IDD)
12443		Entry Faci I-Load
12474C		Reduce IMU Velocity Processing Rate
12487		I-Loads Release 5
12503A		MSID Changes (IDD Only)
12509		IMU/ST/COAS FSSR Corrections
12556A		Increase RES PROC Rate to 6.25 Hz for ATT PROC
12559B		Delete IMU On-Orbit CAL Software
19908		MSID Correction to CR 19663
19949A		Downlist Requirements for STS-2
19956		IMU ACP TRSF Requirement Clarification
19963D		IMU Alignment Display Changes
19991A		IMU Fault Isolation Using RGM RATE
29039A		Adding IMU Redundant Gyro Monitor
29057		Commfault Compensation for RGM_COMP
29091		IMU BITE Mask Capability
29092B		IMU Calibration Terms Read/Write Capability
29149B		Add Program Interrupt Handling
29169		IMU Message Simplification
29374B		RGM Calibration and Compensation
29389A		RGM Threshold Change
29345G		Ground IMU Control/Monitor Display (Ref only)
29460B		Modification to STD Math Model IMU I-Load
29463		IMU-to-IMU Align I-Load
29471B		HFE Overrun Definition
29513A		Torque Angle Signal Error
29514B		IMU Flip Effect on Star Tracker SOP
29581A		IMU BITE
29687		IMU I-Load Reorganization
29762A		ATT_PROC IDD Cleanup
29794		IMU Site Dependent Parameter at the VAB
29795		IMU Site Dependent Parameter at the OPF
29796		IMU Site Dependent Parameter at Pad 39A
29824		Simplification of Star Tracking
29909A		I-Load for IMU Vertical GCA

Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
29924		IMU BITE-Vel Under Limit
39086B		IMU I-Load Corrections (Ref only)
39098		IMU RM Attitude Threshold (Ref only)
39118		IMU Site Dependent Constants
39291A		IMU Low-Gain Vel Limit Change (STS-3)
39369		IMU Low-Gain Velocity Limit-Release 19
39414		IMU GCA Test Limits – Horizontal
39415		IMU GCA Test Limits – Vertical
39467A		DR Closeout – Documentation Cleanup
39514		Horizontal I-Load—IMU and Elevon (Ref only)
39747B		IMU to Star Delta Angle Rate (STS-3)
39787		RGM Filter Gain (STS-3)
39973		Redundant Gyro Processing Rate (STS-3)
59123B		IMU Up-Axis Drift Compensation
59227B		Star TRKR/IMU FLP Protect
59244A		Reinstate IMU I-Loads (STS-6)
59263		Modification to STD Math Model IMU I-Load
59327		Catch-up Gyro Torquing
59584E		BTU Test/I U Interference
59864		Change to IMU Resolver Limit
59872		IMU Algorithm Modification
59922		IMU Cal I-Load to Pass Unique (Ref only)
59952		I-Load Scrub: IMU OI7
69279A		IMU Outer Roll Gimbal Effects
69385A		Clarify Requirements in CR 59584E
69797A		IH2 Category Update (Ref only)
69890B		ASC ENT ATT PROC Doc Cleanup (IDD only)
79334C		IMU Site I-Loads WTR and 39B
79362		Removal of GNTRA from OPS 1/6
79590A		Pad 39B ISPO I/L OI5 to OI7
79658		IMU NAV Base I/L OV-104
79965E		IMU I-Load Spare Tape Cleanup
79990D		Errata STS 83-0013A
89374C		OPS 1 Gyro Bias Uplink, OI-8C
89490B		FSSR STS 83-0009B OI-8B Errata
89545A		FSSR STS 83-0013B 8B Errata/Baseline
89599C		Cleanup Level B GN&C Document



Table R.2-1. Historical Change Request Summary		
CR No.	OI	CR Title
89644A		FSSR STS 83-0013B OI-8B PCN-1 Errata
89786C	22	IMU High-Gain Pos 8-13 Elimination
89813B	20	IMU BITE Mask via Spec 21
89823C	20	Uplink IMU/RGA/AA Constants
89867A		Delete First Pass Gain Change Requirement
89922		Reduce MEAS Error/IMU GYRO Mass Unbalance
89986H	22	OPS-1 IMU Alignment
90182	21	SCM Scrub Completion
90185A	20	Add CR Field to FSSR I/O Tables
90225B	21	KT - 70/HAINS IMU Press Good Discrete Change
90374C	20	Automated FSSR Constants
90485A	22	Initialization of Inertial Mode for CR 89986H Cleanup
90525D	20	IMU FSSR Changes for HAINS IMU and Update
90690A	24	Deletion of EQTN MSID Column from K-Load FSSR Tables
90705H	25	3 Engines Out Auto Contingency
90708C	24	Orbit DAP Onboard I-Load Calculation and Notch Filter Uplink
90790	24	Add Memory Configuration to the FSSR I-Load Tables
90814C	24	Add Description of Database Generated FSSR Parameter Tables
90863A	23	Calibration Position Index Calculation Requirements
90902A	24	FSSR Doc Only Changes, IMU SOP
90966A	24	Deletion of the Qualifier from the FSSR I-Load Tables
91066D	25	Standardize the FSSR Correlation Tables
92027B	25	TDMS-2 Required FSSR Changes

This page intentionally left blank.