319-CD-001-003
402-CD-004-001

EOSDIS Core System Project

Flight Operations Segment (FOS) System and Segment Integration and Test Plan for the ECS Project

October 1995

Hughes Information Technology Corporation
Upper Marlboro, Maryland

Flight Operations Segment (FOS) System and Segment Integration and Test Plan for the ECS Project

October 1995

Prepared Under Contract NAS5-60000
CDRL Items 054 & 064

APPROVED BY

Cal E. Moore /s/	10/2/95
Calvin Moore, FOS CCB Chairman EOSDIS Core System Project	Date

Hughes Information Technology Corporation
Upper Marlboro, Maryland

319-CD-001-003
402-CD-004-001

This page intentionally left blank.

Preface

The contents of these combined documents define the integration and test plan for the Flight Operations Segment (FOS). Thus, these documents address the data item descriptions for CDRL 054 - 319/DV1 and CDRL 064 - 402/VE1 respectively.

These documents are formal contract deliverables intended as a final submittal with an approval code 1. They require Government review and approval prior to acceptance and use. These documents are under ECS contractor configuration control. Once approved, Contractor approved changes to these documents are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes shall be made by document change notice (DCN) or by complete revision.

Any questions should be addressed to:

Data Management Office
The ECS Project Office
Hughes Information Technology Corporation
1616 McCormick Dr.
Upper Marlboro, MD 20774-5372

This page intentionally left blank.

Change Information Page

List of Effective Pages	
Page Number	**Issue**
Title	Preliminary
iii through xvi	Preliminary
1-1 through 1-4	Preliminary
2-1 through 2-2	Preliminary
3-1 through 3-18	Preliminary
4-1 through 4-24	Preliminary
5-1 through 5-68	Preliminary
6-1 through 6-72	Preliminary
7-1 through 7-62	Preliminary
A-1 through A-28	Preliminary
B-1 through B-4	Preliminary
C-1 through C-46	Preliminary
D-1 through D-48	Preliminary
E-1 through E-42	Preliminary
F-1 through F-42	Preliminary
AB-1 through AB-4	Preliminary

Document History			
Document Number	**Status/Issue**	**Publication Date**	**CCR Number**
319-CD-001-001	Review Copy	November 1994	95-0068
319-CD-001-003 402-CD-004-001	Preliminary Copy	October 1995	95-0699

This page intentionally left blank.

Contents

Preface

1. Introduction

1.1 Identification 1-1

1.2 Scope 1-1

1.3 Purpose 1-1

1.4 Status and Schedule 1-1

1.5 Document Organization 1-1

2. Related Documentation

2.1 Parent Document 2-1

2.2 Applicable Documents 2-1

2.3 Information Documents 2-1

2.3.1 Information Documents Referenced 2-1

2.3.2 Information Documents Not Referenced 2-2

3. FOS Integration & Test Plan

3.1 FOS Context 3-1

3.2 FOS Integration & Test Overview 3-1

3.3 FOS System/Segment Test Overview 3-2

3.4 FOS Test Approach 3-3

3.4.1 FOS Thread/Build 3-3

3.4.2 FOS System/Segment Test Organization Responsibilities 3-4

3.4.3 FOS System/Segment Test Phases 3-4

3.4.4 FOS System/Segment Test Personnel Responsibilities 3-6

3.4.5 Test Verification Methods 3-6

3.5 Test Resources 3-7
3.5.1 Testing Facilities 3-7
3.5.2 Hardware Configuration 3-7
3.6 Test Data and Test Data Sources 3-8
3.7 Test Tools 3-9
3.8 Regression Testing 3-9
3.9 Discrepancy Reporting & Resolution 3-9
3.10 FOS Integration & Test Schedule Overview 3-10
3.11 Release A & B Test Case Definition Organization 3-15

4. FOS Release A Turnover 1 Test Cases

DBS 1000A Database Ingest and Format 4-3
EVT 1000A Event Message Format 4-4
EVT 1010A Event Message Display and Event Graphic Timeline 4-5
FUI 1010A Status Window 4-6
FUI 1020A Screen Management 4-7
FUI 1030A Control Window Manipulation 4-8
FUI 1040A ECL Directives 4-9
FUI 1050A Time Selector 4-10
FUI 1060A Room Builder 4-11
FUI 1070A Subsystem Filter 4-12
SYS 1000A Logical String Configuration I 4-13
SYS 1010A User Station Authentication 4-14
CMD 1000A Command Authorization 4-15
CMD 1010A Ground Script Command Processing 4-17
CMD 1020A Ground Script Command Validation - Database Lookup 4-18
CMD 1030A Manual Command Processing 4-19
CMD 1040A Manual Command Validation - Database Lookup 4-20
CMD 1050A EBnet Interface Connectivity 4-21

TLM 1000A Real-time String Connection 4-22
TLM 1010A Telemetry Packet Processing 4-23
TLM 1020A Telemetry Data Display 4-24

5. FOS Release A Turnover 2 Test Cases

COM 2000A Communications Interface to SDPS 5-4
DBS 2000A PDB Validation 5-5
DBS 2010A Operational Data Base (ODB) Generation 5-6
DBS 2020A Database Edit 5-7
DBS 2040A ASTER Operational Data 5-8
EVT 2000A Event Message Generation (Complete) 5-10
EVT 2010A Event Archive 5-11
FUI 2000A Control Window Manipulation (Complete) 5-12
FUI 2010A PROC Builder 5-13
FUI 2020A PROC Control 5-14
FUI 2030A Request Preplanned Command PROC 5-16
FUI 2040A Time Selector 5-17
FUI 2050A HELP Tool (Preliminary) 5-18
FUI 2060A Display Builder - Alphanumeric Displays 5-19
FUI 2070A Quick Analysis 5-20
SCH 2000A Generation of AM-1 Long Term Spacecraft Ops Plan 5-21
SCH 2010A Activity Definer for Baseline Activity Profile (BAP) 5-22
SCH 2020A Generation of Instrument BAPs 5-23
SCH 2030A Schedule of Instrument BAPs 5-24
SCH 2040A Schedule of Spacecraft Subsystem Activities 5-25
SCH 2050 ASTER ICC Interface Connect. & Rcpt. of ASTER Instrument Activities 5-26
SCH 2060A Set of Target Day Boundaries & Freeze of DAS Activities 5-27
SCH 2070A Expansion of DAS and Generation of ATCs 5-28
SCH 2080A Update of Ground Schedule & Generation of Integrated Report 5-29

SCH 2090A Expansion of DAS and Generation of ATCs for Late Changes 5-30
SCH 2100A Generate Uplink Load & Update Ground Schedule for Late Changes 5-31
SCH 2110A Receipt of Instrument Microprocessor Load Content from an SCF 5-32
SCH 2120A Validation of Instrument Microprocessor Load Content 5-33
SCH 2130A Generation of Instrument Microprocessor Uplink Load 5-34
SCH 2140A Receipt of RTS Load Content 5-35
SCH 2150A Validation of RTS Load Content ID 5-36
SCH 2160A Generate RTS Load Contents 5-37
SCH 2170A Generate RTS Uplink Load 5-38
SCH 2180A Receipt of RTS Load Contents 5-39
SCH 2190A Validation of Table Load Content ID 5-40
SCH 2200A Generate Table Load Contents 5-41
SCH 2210A Generation of Table Uplink Load 5-42
SYS 2000A Logical String Configuration & Control II 5-43
CMD 2000A Ground Script Generate Request 5-44
CMD 2005A Ground Script Control 5-45
CMD 2010A Prerequisite State Check 5-46
CMD 2020A Command Generation & Transmission to EDOS 5-47
CMD 2030A Stored Command Verification - FUI Command Processing 5-48
TLM 2000A Decommutation - Health & Safety Telemetry 5-49
TLM 2010A Decommutation - Housekeeping & Diagnostic Telemetry 5-51
TLM 2020A Engineering Unit Conversion 5-52
TLM 2030A Telemetry Data Dropout 5-53
TLM 2040A Telemetry Plot Display 5-54
TLM 2050A Telemetry Spreadsheets 5-55
TLM 2060A NCC GCMR Processing 5-56
TLM 2070A Telemetry Information Window 5-57
TLM 2080A Real-time Telemetry Archive 5-58
TLM 2090A Expert Advisor State Equation (EASE) Computations 5-59

ANA 2000A Telemetry History Request & Dataset Generation 5-60
ANA 2010A System Generated Statistics Request & Dataset Generation 5-61
ANA 2020A User-Selected Statistics Request & Dataset Generation 5-62
ANA 2030A Telemetry History Request & Dataset Generation - X-ing Dbase Bounds 5-63
ANA 2040A Statistics Request Crossing Database Boundaries 5-64
ANA 2050A Downlink Ordered Report 5-65
ANA 2060A Parameter Out of Limits Report 5-66

6. FOS Release B Turnover 1 Test Cases

DBS 1000B Maintain PDB Time Window 6-4
DBS 1010B Data Base Reporting (Basic) 6-5
DBS 1020B Constraint Definitions - Ingest, Modification & Validation 6-6
FUI 1000B User Authentication & Display 6-7
FUI 1010B Display Builder - Graphs & Tables 6-9
FUI 1020B Report Template Builder 6-10
SCH 1000B FDF Interface Connectivity & Receipt of FDF Planning Aids 6-11
SCH 1010B Send FDF Planning Aids to ASTER 6-12
SCH 1020B Schedule Spacecraft Subsystem BAPs 6-13
SCH 1030B Check Activity Level Constraints 6-14
SCH 1040B Check Command Level Constraints 6-15
SCH 1050B Network Control Center (NCC) Interface Connectivity 6-16
SCH 1060B TDRSS Contact Schedule 6-17
SCH 1070B Schedule Instrument Activity Deviations 6-18
SCH 1080B Schedule Spacecraft Subsystem Activity Deviations 6-19
SCH 1090B Receive ASTER Instrument Activity Deviations 6-20
SCH 1100B Schedule Microprocessor Load Uplink Activities 6-21
SCH 1110B Schedule Flight Software Load Uplink Activities 6-22
SCH 1120B Schedule RTS Load Uplink Activities 6-23
SCH 1130B Schedule Table Load Uplink Activities 6-24

SCH 1140B Check Command Level Constraints & Schedule ATC Uplink Activities 6-25
SCH 1150B Add ATC Load Uplink to Ground Schedule 6-27
SCH 1160B Receive Late Change Requests & Check Activity Level Constraints 6-29
SCH 1170B Schedule ATC Uplink Activities for Late Changes 6-31
SCH 1180B Load Management - Maintain of Microprocessor Catalog 6-32
SCH 1190B Receive Flight Software Load Contents from SDVF 6-33
SCH 1200B Validate Flight Software Load Contents ID 6-34
SCH 1210B Generate Flight Software Uplink Load 6-35
SCH 1220B Load Management - Maintain of Flight Software Catalog 6-36
SCH 1230B Validate RTS Load Contents 6-37
SCH 1240B Load Management - Maintain of RTS Uplink Load Catalog 6-38
SCH 1250B Validate Table Load Contents 6-39
SCH 1260B Load Management - Maintain of Table Uplink Load Catalog 6-40
SCH 1270B Display ATC & RTS Load Buffers 6-41
SYS 1000B Display Hardware/Software Status 6-42
CMD 1000B Command Verification - Receipt Verification 6-43
CMD 1010B Load Command Validation 6-44
CMD 1020B Load Transmission 6-45
CMD 1030B Memory Management 6-46
CMD 1040B Memory Dump Ingest 6-47
TLM 1000B Data Quality Determination 6-48
TLM 1010B Context Dependent Decommutation 6-49
TLM 1020B CODA Reception & Storage 6-50
TLM 1030B Limits Processing 6-51
TLM 1040B Delta Limits Processing 6-52
TLM 1050B Limits Processing Based on Context Key 6-53
TLM 1060B Limits Sense Interval 6-54
TLM 1070B Telemetry Strip Chart Display 6-55
TLM 1080B Telemetry Schematic Display 6-56

TLM 1090B User Performance Data Request to the NCC 6-57
TLM 1100B Receive & Archive NCC Data 6-58
TLM 1110B Telemetry Archiving - Multiple Telemetry Streams 6-59
TLM 1120B Solid State Recorder (SSR) Receipt & Archive 6-60
TLM 1130B Telemetry Replay Processing & Display 6-61
TLM 1140B Telemetry Replay - Crossing Database Boundaries 6-63
TLM 1150B Telemetry Subsetting & Transmission to the FDF 6-64
ANA 1000B Telemetry History Report - Display & Print 6-65
ANA 1010B FDF Data Archiving & System Generated FDF Statistics 6-66
ANA 1020B User-Selected Statistics - Display & Print 6-67
ANA 1030B System Generated Statistics - Display & Print 6-68
ANA 1040B Telemetry History Report - Crossing Database Boundaries 6-69
ANA 1050B Statistics Reporting - Crossing Database Bounds 6-70
ANA 1060B Reporting via the Report Template Builder 6-71
ANA 1070B Standing Orders 6-72

7. FOS Release B Turnover 2 Test Cases

DBS 2000B Operational Data Backup/Restore 7-4
FMG 2000B SDPS Data Backup/Restore 7-5
FMG 2010B Data Mover 7-7
EVT 2000B Quick Message Generator 7-8
EVT 2010B Event History Report - Display & Print 7-9
FUI 2000B User Customization 7-10
FUI 2010B Document Reader 7-11
FUI 2020B E-Mail 7-12
FUI 2030B HELP Utility (Complete) 7-13
FUI 2040B Display Builder - Schematics 7-14
SCH 2000B Long Term Plan Ingest via CSMS MSS 7-15
SCH 2010B FDF Planning Aids to SDPS 7-16

SCH 2015B Generation of Timeline 7-17
SCH 2020B Elimination of Conflicting Activities from the DAS 7-18
SCH 2030B Generate ATC Uplink Load 7-19
SCH 2040B Update Ground Schedule and Generate Integrated Report 7-20
SCH 2050B Generate ATC Uplink Load for Late Changes 7-21
SCH 2060B Add ATC Stored Command Verification to Ground Schedule 7-22
SCH 2070B Build ATC Patch Load for Late Changes 7-23
SCH 2080B Generate ATC Patch Uplink Load & Schedule ATC Patch Uplink 7-24
SCH 2090B Addition of ATC Patch Load Uplink to Ground Schedule & Generation of Integrated Report 7-25
SCH 2100B What-if Planning & Scheduling 7-26
SCH 2110B Generate FDF Table Loads 7-27
SCH 2120B Generate Load Reports 7-28
SYS 2000B String Reconfiguration & Termination 7-29
SYS 2010B Network Failure Recovery 7-30
SYS 2020B Real-time Server Failure Recovery 7-31
SYS 2030B Data Server Failure Recovery 7-32
SYS 2040B User Station Failure Recovery 7-33
SYS 2050B Configuration Monitor 7-34
CMD 2000B Command Mode - FOP Configuration 7-36
CMD 2010B Command Modes - Prerequisite State Check Configuration 7-37
CMD 2020B Command Verification - Telemetry Verification 7-48
CMD 2030B ASTER Command Notification 7-39
CMD 2040B Command Requests 7-40
CMD 2050B Load Criticality 7-41
CMD 2060B Load Verification 7-42
TLM 2000B Derived Parameter Processing 7-43
TLM 2010B User Adjustment of Limits & Limit Set Definitions 7-44
TLM 2020B User Adjustment of EU Conversion Algorithms & Coefficients 7-45

TLM 2030B Multiple Source Telemetry Display 7-47
TLM 2040B Ground Telemetry Receipt, Storage & Retrieval 7-48
TLM 2050B Adjustment of Telemetry Replay 7-49
TLM 2060B Telemetry Replay - Derived Parameter Processing 7-51
TLM 2070B Telemetry Merge 7-53
ANA 2000B Special Processing Algorithms 7-54
ANA 2010B Report Browser/Editor 7-55
ANA 2020B Dataset Generation Based on Triggers 7-56
ANA 2030B Spacecraft State Reporting 7-57
ANA 2040B Spacecraft Clock Correlation based on RDD Calculation Method 7-58
ANA 2050B Spacecraft Clock Correlation based on USCCS Calculation Method 7-59
SEG 2000B Concurrent Operations 7-60
SEG 2010B Spacecraft Activity Log 7-61

Figures

Figure 3-4.1 Release A/B Phase Definitions 3-3
Figure 3.5.2. FOS Test Configuration 3-8
Figure 3-11.1 Release A Thread and Test Order 3-16
Figure 3-11.2 Release B Thread and Test Order 3-17

Tables

Table 3-2 Primary Verification Roles 3-2
Table 3-10. FOS Composite Test Schedule 3-10

Appendix A. Release Functionality Matrix

Appendix B. FOS Dataset Definitions

Appendix C. Level 4 Requirement to Test Case Matrix

Appendix D. Test Case to Level 4 Requirement Matrix

Appendix E. Level 3 Requirement to Test Case Matrix

Appendix F. Test Case to Level 3 Requirement Matrix

1. Introduction

1.1 Identification

This document is the FOS System and Segment Integration and Test Plan for the ECS Project, which are items 054 and 064 on the Contract Data Requirements List (CDRL) and defined by Data Item Descriptions (DIDs) 319/DV1 and 402/VE1 respectively under contract NAS5-6000.

1.2 Scope

This document defines the Flight Operations Segment (FOS) system and segment integration and test plans for Releases A and B. It focuses on delineating the approach that will be taken to incrementally integrate and test the FOS. In particular, the FOS System and Segment Integration and Test Plan for the ECS project details the approach for integrating and testing the segment and verifying that the segment complies with the Level 3 requirements as specified in the Functional and Performance Requirements Specification (#423-41-02), non mission-specific level 4 requirements as specified in the FOS Requirements Specification for the ECS Project, Volume 1 (#304-CD-001-002), and mission-specific requirements as specified in the FOS Requirements Specification for the ECS Project, Volume 2 (#304-CD-004-002). This document is under the FOS Configuration Control Board (CCB) for the October 1995 draft submittal and the final release A/B submittal. Changes to these volumes must be approved by this CCB prior to inclusion in the document.

This document reflects the August 23, 1995 Technical Baseline maintained by the contractor configuration control board in accordance with ECS Technical Direction No. 11 dated December 6, 1994. It covers releases A and B for FOS. This corresponds to the design to support the AM-1 launch.

1.3 Purpose

This System and Segment Integration and Test Plan defines the Flight Operations Segment (FOS) system and segment integration and test plans for Releases A and B. It focuses on delineating the approach that will be taken to incrementally integrate and test the FOS. The plan references the schedule for performing such activities and the need for special resources. In addition, it describes the responsible organizations that are involved in the FOS integration and test including their roles and responsibilities. It provides the program manager and test personnel with a systematic approach to show that all of the requirements have been satisfied by the integrated FOS subsystems.

1.4 Status and Schedule

The combined submittal of DIDs 319/DV2 and 402/DV1 meets the milestone specified in the Contract Data Requirements List (CDRL) of NASA contract NAS5-60000. It is anticipated that

this submittal will be reviewed during the appropriate segment- or system-level Critical Design Review (CDR), and that subsequent changes to the document will be incorporated into a resubmittal according to a schedule mutually agreed to by GSFC and ECS.

1.5 Document Organization

This document is organized in the following manner:

Section 1.0 provides the scope and document organization.

Section 2.0 provides a list of applicable documents, which were used directly or indirectly in the preparation of this document.

Section 3.0 defines the FOS integration and test plan. The section includes defining the responsible organizations involved in the FOS segment test; defining the approach to integrating and testing the FOS and supporting interfaces; identification of a reference to the schedule for performing integration and test of FOS functional components; identification of resources that are required for the system/segment test (i.e. FOS hardware, simulators, data drivers, instrument resources, etc.); and any software/hardware dependencies required for test execution.

Section 4.0 identifies the Release A Internal Build A1 test cases and includes the following for each test case: test number, test title, level 3 requirements satisfied, level 4 requirements satisfied, test support requirements, test dependencies, test description, input, output and success criteria.

Section 5.0 identifies the Release A Incremental Delivery A2 test cases and includes the following for each test case: test number, test title, level 3 requirements satisfied, level 4 requirements satisfied, test support requirements, test dependencies, test description, input, output and success criteria.

Section 6.0 identifies the Release B Internal Build B1 test cases and includes the following for each test case: test number, test title, level 3 requirements satisfied, level 4 requirements satisfied, test support requirements, test dependencies, test description, input, output and success criteria.

Section 7.0 identifies the Release B Incremental Delivery B2 test cases and includes the following for each test case: test number, test title, level 3 requirements satisfied, level 4 requirements satisfied, test support requirements, test dependencies, test description, input, output and success criteria.

Appendix A identifies phases, threads, components, applicable subsystem responsible for the threads/components and availability of the component via the FOS Release Functionality Matrix

Appendix B identifies the FOS Datasets needed for FOS System/Segment testing, and the need dates for each dataset type.

Appendix C identifies the Level 4 Requirements to Test Case matrix.

Appendix D identifies the Test Case to Level 4 Requirements Matrix.

Appendix E identifies the Level 3 Requirements to Test Case matrix.

Appendix F identifies the Test Case to Level 3 Requirements Matrix.

This page intentionally left blank.

2. Related Documentation

2.1 Parent Document

The parent documents are the documents from which this FOS Integration and Test Plan's scope and content are derived.

304-CD-001-003	Flight Operations Segment (FOS) Requirements Specification for the ECS Project, Volume 1: General Requirements
304-CD-004-001	Flight Operations Segment (FOS) Requirements Specification for the ECS Project, Volume 2: AM-1 Mission Specific

2.2 Applicable Documents

The following documents are referenced within this document, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this volume.

194-402-VE1-001	System Integration and Test Plan for the ECS Project
307-CD-001-003/ 329-CD-001-003	Flight Operations Segment (FOS) Release Plan and Development Plan for the ECS Project

2.3 Information Documents

2.3.1 Information Documents Referenced

The following documents are referenced herein and, amplify or clarify the information presented in this document. These documents are not binding on the content of the FOS System & Segment Integration and Test Plan for the ECS Project.

194-201-SE1-001	Systems Engineering Plan for the ECS Project
194-202-SE1-001	Standards and Procedures for the ECS Project
193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
308-CD-001-004	Software Development Plan for the ECS Project,
194-401-VE1-002	Verification Plan for the ECS Project, Final
194-415-VE1-002	Acceptance Testing Management Plan for the ECS Project, Final
194-501-PA1-001	Performance Assurance Implementation Plan for the ECS Project
194-502-PA1-001	Contractor's Practices & Procedures Referenced in the PAIP for the ECS Project

604-CD-001-004	Operations Concept for the ECS Project, Part 1--ECS Overview, 6/95
604-CD-002-001	Operations Concept for the ECS Project, Part 2B--Release B, Annotated Outline, 3/95
604-CD-003-001	ECS Operations Concept for the ECS Project, Part 2A--ECS Release A, Final

2.3.2 Information Documents Not Referenced

The following documents, although not referenced herein and/or not directly applicable, do amplify or clarify the information presented in this document. These documents are not binding on the content of the FOS System & Segment Integration and Test Plan for the ECS Project.

104-CD-001-003	Data Management Plan for the ECS Project
193-105-MG3-001	Data Management Procedures for the ECS Project

3. FOS Integration & Test Plan

This section contains an overview of the approach taken to ensure complete and thorough testing by the FOS at the system/segment level. Included is information concerning the FOS I&T environment, relationships with other test organizations, test schedules, test responsibilities and specific verification activities performed by the FOS System/Segment Test and other organizations.

3.1 FOS Context

The Earth Observing System Data and Information System (EOSDIS) Core System (ECS) involves the collection and distribution of earth science data from space and ground based measurement systems. The Flight Operations Segment (FOS) is one of three segments, which when combined with the Science and Data Processing Segment (SDPS) and the Communications and System Management Segment (CSMS) makes up ECS. The Flight Operations Segment provides a set of functions in support of the EOS AM-1 spacecraft and its complement of instruments and includes mission planning and scheduling, spacecraft commanding, instrument command support, health and safety monitoring and overall mission operations.

3.2 FOS Integration & Test Overview

The FOS integration effort begins with the allocation of functions to internal builds and releases (e.g. developing the build/thread model), and organizing the phasing of the development effort. In particular, internal and external dependencies are identified, resulting in a logical progression of development activities matching the internal/external dependency needs of FOS and its external interfaces outlined in the build/thread model.

Following the integration and development phase of each release, the segment development organization performs unit testing of newly developed and heritage software, as well as those COTS software products incorporated into segment software. Following unit testing, the FOS System/Segment Test Organization performs verification of Level 3 and Level 4 requirements (excluding hardware and operations requirements) using test methodologies based on the build/thread approach (see also section 3.4.1). Following system/segment testing, the IATO performs acceptance testing of formal releases and witnesses, monitors, and supports other verification activities. Verification at the Acceptance Test level focuses on broader operational scenario based tests. The Maintenance & Operations (M&O) Organization performs verification of COTS hardware and those COTS software products used in the hardware support environment, such as operating systems. M&O personnel support the efforts of other verification organizations and maintain the operational system by verifying changes during the M&O phase. Additionally, the M&O organization provides a high level of operational support to acceptance test planning, scenario development, and conduct. The M&O organization also performs verification activities in support of specific ECS flight missions. The Quality Office monitors and witnesses tests and ensures that test plans and procedures are followed and nonconformances

are correctly documented. The Configuration and Data Management (CM) organization provides baselined items for accomplishing all levels of testing, and they support configuration audits. The IV&V contractor performs an independent assessment of the functionality and performance of ECS releases.

Table 3-2 depicts the verification role of each organization during the development and operational stages of ECS. The organizations are mapped to the five verification levels which correspond to an increase in scope from unit testing of individual modules to final operational testing leading up to launch.

Table 3-2 Primary Verification Roles

Organization	Development			Operations	
	Unit Testing	**Segment/ System I&T**	**Acceptance Testing**	**IV&V Testing (Pre-Operational)**	**Operational Testing**
Segment/ Development	Perform (software)	Support			
System/segment Test	Monitor	Perform	Support	Support	Support
IATO		Witness	Perform	Support	Support
M&O	Perform (hardware)	Support	Support	Support	Perform
Quality Office	Monitor	Monitor	Monitor		Monitor
Configuration and Data Management	Support	Support	Support		
IV&V Contractor			Witness	Perform	

3.3 FOS System/Segment Test Overview

For each FOS internal build and incremntal release, the FOS Segment Development Organization performs unit testing of newly developed and heritage FOS software. During unit testing, the FOS Segment Test Organization provides a test support role which includes monitoring software integration activity and supporting test execution. Following integration and unit testing, the FOS System/Segment Test Organization verifies that the FOS integrated software meets Level 3 requirements as specified in the Functional and Performance Requirements Specification (#423-41-02), and also meets Level 4 requirements as specified in the FOS Requirements Specification for the ECS Project, Volume 1 - General Requirements (#304-CD-001-002) and FOS Requirements Specification for the ECS Project, Volume 2 - AM-1 Mission Specific Requirements (#304-CD-004-002). Testing at this level also includes verification of FOS capabilities for supporting external interface interoperability.

3.4 FOS Test Approach

3.4.1 FOS Thread/Build

The thread/build concept, which is based on the incremental aggregation of functions, is used to plan FOS segment test activities. All FOS internal builds and incremental releases are logically grouped into 5 high-level building blocks called phases - Infrastructure, Support Services, Scheduling, Real-time, and Analysis. Figure 3.4.1 below provides a high-level breakdown of the FOS functions defined for each phase of development.

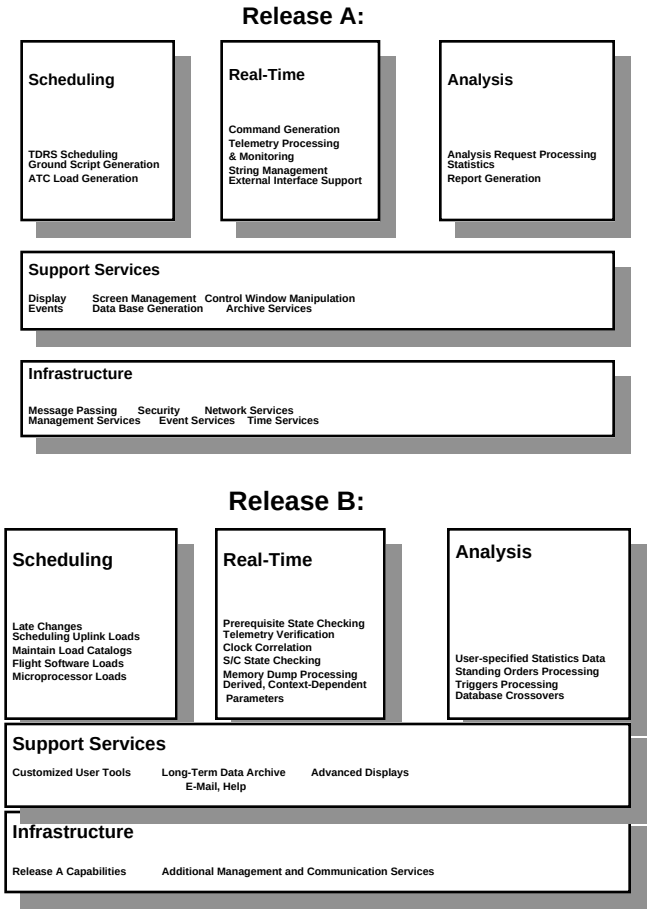

Figure 3-4.1 Release A/B Phase Definitions

Each phase is analyzed and broken down into component threads and builds, resulting in the FOS Release Functionality Matrix identified in Appendix A. Release A and B test plans delivered in this document are based on the thread/build approach outlined in the Release Functionality Matrix; the matrix provides a detailed representation of the FOS scenario components utilized in the process of developing the segment and identifies the logical timing (i.e. Release A, turnover 1, Release B, turnover 2, etc.) of each functional thread delivered by the FOS. In turn, this matrix provides a logical approach to testing, as it identifies each FOS

subsystem function, its associated internal and external functional dependency, and the timing of each delivered thread and thread component.

3.4.2 System/Segment Test Organization Responsibilities

The FOS System/segment Test Organization roles and responsibilities include the following:

- Develop test plans and test procedures in accordance with the FOS Integration Organization's Build/Thread Plan.
- Accept unit-tested software from the Segment Development organizations.
- Conduct testing of system/segment level threads and builds following internal builds and incremental deliveries
- Verify those COTS software products that are incorporated into segment software and are not part of the hardware support environment.
- Test functions as components are added to system configurations with a focus on internal and external interfaces.
- Conduct intra-segment interface verification.
- Report system/segment I&T results.
- Generate non conformance reports.
- Re-verify changes resulting from non conformance reports via regression testing.
- Work with the IATO in support of acceptance testing.
- Work with the M&O and ESDIS organizations in support of operational ground system testing.
- Work with the IV&V contractor in support of interface tests.

3.4.3 FOS System/Segment Test Phases

The following sections define FOS test activities performed during the FOS system/segment test phase.

3.4.3.1 Test Planning Phase

During the SDR-PDR timeframe, FOS Segment/System Integration & Test Plan (#319/DV1 & #402/DV1) outlines are developed by the System/Segment Test Organization utilizing high-level operations concepts developed by the Segment Development Organization in conjunction with the FOS build/thread plan. During the PDR-CDR timeframe, the system/segment test plan descriptions are completed and the FOS Segment/Element Integration & Test Plan (# 319/DV1 & #402/VE1) is made available for CCB approval two weeks prior to the FOS CDR. Also during this time frame, test data drivers, test dependencies, test configuration, and test location support needs are identified by a combined effort of the FOS Segment Development and FOS System/Segment Test Organizations.

During the CDR-TRR time frame, the FOS System & Segment Integration and Test Procedures Document (#322/DV3 & #414/VE1) is developed by the FOS System/Segment Test Organization using the FOS System and Segment Integration & Test Plan (#319/DV1 & #402/VE1) as an outline for test procedures. This document is made available for CCB Approval at TRR.

3.4.3.2 Test Execution & Analysis Phase

The FOS System/Segment Level Test is performed in-plant following each internal build (i.e. A1, B1), incremental delivery (A2) and final delivery (B2). The System/Segment test for Internal Build A1 is based on Internal Build A1's associated test plans; at Incremental Delivery A2, the System/Segment test is based on Incremental Delivery A2's associated test plans and regression testing of all A1 test cases. This philosophy continues with Release B, where testing at Internal Build B1 is based on B1's associated test plans and regression testing of A1/A2 test cases; Final Delivery B2 testing is based on B2 test plans and regression testing of A1/A2/B1 test cases.

The System/Segment Test Organization is responsible for test execution, with support from the FOS Segment Development Organization. All FOS segment test activity is performed using the FOS System/Segment/Element Integration & Test Procedures Document (#322/DV3 & #414/VE1). Non-conformance software reports are written by the segment test engineer, test conductor or designee and delivered to the FOS Segment Development Organization.

All test analysis activity associated with the execution of test procedures (i.e. command data bit-busting, decommutation calculation analysis, etc.) is identified in the FOS System/Segment Integration & Test Procedures Document (#322/DV3 & 414/VE1) on a test by test basis. Analysis methods, analysis results, test data logs, event logs and NCRs written as a result of analysis activity are identified in the FOS System/Segment Integration & Test Reports Document (#324/DV3 & 405/VE3).

3.4.3.3 Test Reporting Phase

FOS segment test reporting activity is performed by the FOS System/Segment Test Organization for all builds (e.g. A1, A2, B1, B2). For internal builds, all test reporting is internal. For incremental and final deliveries (e.g. A2, B2) All testing activity performed during the FOS segment test execution phase is logged by the test engineer and/or test conductor, with support from the NASA Technical Officer or representative, and the QA representative. These test logs, along with data analysis results performed during the test analysis phase are used by the FOS Segment Test Organization in developing the FOS Segment/Element Integration & Test Reports Document (#324/DV3 & 405/VE3). Reporting information includes the results of each test, deviations made from the test procedures, data analysis methods and results, and copies of all NCRs. The FOS System/Segment Integration & Test Reports Document is made available to the CCB two weeks prior to the CSR.

3.4.4 FOS System/Segment Test Roles and Responsibilities

The following FOS System/Segment Test personnel shall be responsible for the execution of the FOS system/segment level test in the following manner:

Test Engineer - The FOS segment test engineer, or appointed representative shall be responsible for the generation and publication of all system/segment test plans and procedures.

Test Conductor - The FOS system/segment test conductor, or appointed representative is responsible for establishing test configuration and ensuring test prerequisites are satisfied. The test conductor is also responsible for scheduling and coordinating the time and resources needed for specific tests, rescheduling tests following test failure, collecting test outputs and test logs, writing NCRs, and recording test results. The test conductor is also responsible for writing the segment test report following test completion.

Test Participants - The FOS Segment Development Organization may assist the test conductor/engineer(s) in the performance of the test procedures. Other supporting organizations may include Maintenance and Operations (M&O) and Configuration and Data Management (CM). M&O will be responsible for reconfiguring the system as needed to continue testing; CM will provide a controlled environment for the storing and maintaining of information about the test environment including hardware, software and test tool environments.

Test Witnesses - Individuals invited to directly observe test conduct. This may include members from the IATO, M&O, or ESDIS organizations.

Quality Assurance (QA) - During the segment test planning phase, the QA organization reviews the FOS I&T Plan for the traceability of FOS level 4 and level 3 requirements to the planned test cases. During the test procedure generation phase, QA reviews test procedures for test and requirements consistency between the FOS I&T Plan and FOS I&T Procedures. During the formal segment test execution phase, QA verifies the configuration of the software prior to the performance of the tests. QA also witnesses the tests to monitor that procedures are tested as written, and that problems and deviations are noted. During the test analysis and reporting phase, QA reviews the test report for accuracy and verifies that NCRs are written for all validated problems and entered into the non-conformance tracking system.

3.4.5 Verification Methods

The four verification methods used during the FOS segment test period include inspection, analysis, demonstration, and test as defined below:

- Inspection. The visual, manual examination of the verification item and comparison to the applicable requirement or other compliance documentation, such as engineering drawings.
- Analysis. Technical or mathematical evaluation based on calculation, interpolation, or other analytical methods.

- Demonstration. Observation of the functional operation of the verification item in a controlled environment to yield qualitative results without the use of elaborate instrumentation, procedure, or special test equipment.
- Test. A procedure or action taken to determine under real or simulated conditions the capabilities, limitations, characteristics, effectiveness, reliability, or suitability of a material, device, system, or method.

Each segment level requirement will be verified by one or more of these methods; individual FOS Level 4 requirements and associated verification method(s) are specified in the ECS Verification Plan (#194-401-VE1-002).

3.5 Test Resources

The following paragraphs in this section identify and describe the resources necessary to accomplish FOS system/segment testing. Included are identification of test facilities, test data sets, and hardware configurations.

3.5.1 Testing Facilities

The ECS Development Facility (EDF) located at the ECS facility in Upper Marlboro, Md. has been designated as the testing facility for FOS system/segment testing. ECS will be solely responsible for the test environment. This includes installation, initial checkout and startup, upgrades, access control, and maintenance. All formal System/Segment Testing is performed in the EDF, with the prerequisite being the complete installation and functionality of external interface transmission links to the EDF facility (i.e. NCC, EDOS/EBnet, FDF, SDVF, SCFs, etc.). Following a successful ETR, the developed software is delivered to the GSFC EOC Facility (building 32) and/or SCF sites. Following software installation at those sites, regression testing is performed in order to validate internal and external functionality following the transitional period.

3.5.2 Hardware Configuration

Figure 3.5.2 below provides the FOS hardware configuration used in support of FOS System/Segment testing at the EDF. Additionally, for test cases requiring additional hardware not shown in the figure, additional hardware is listed under the associated test case's "Test Support" heading.

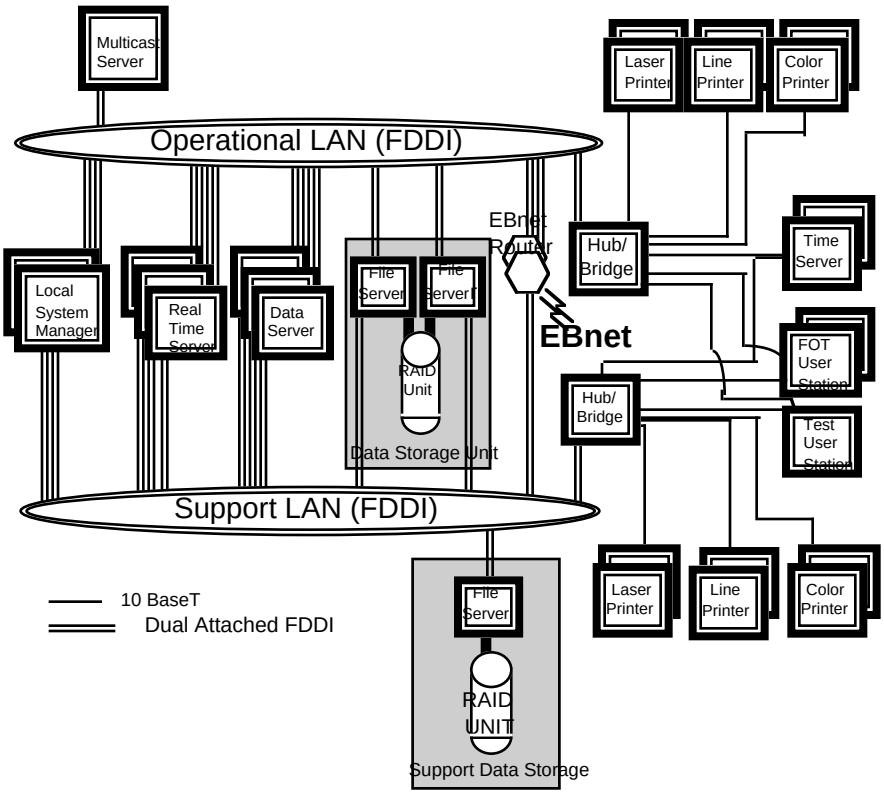

Figure 3.5.2. FOS Test Configuration

3.6 Test Data & Test Data Sources

In support of FOS Release A segment testing the following test data sources have been identified:

- EOS Test System (ETS): The ETS will be used in the Release B timeframe for the transfer of AM-1 spacecraft telemetry and spacecraft recorder data to the EOC by emulating EDOS. It will also be used for the transfer and acceptance of AM-1 spacecraft and instrument commands. A prototype version of the ETS will also be available for limited interface functionality testing during the Release A Turnover 2 time frame.
- Spacecraft telemetry data tapes provided by the AM-1 spacecraft contractor Marietta Corporation (MMC). AM-1 Spacecraft health & safety, engineering, recorder playback data will be provided in order to verify telemetry and data base requirements.
- FDF IST: The FDF simulator (located at the FDF facility) provides a test bed for the transmission of FDF planning and scheduling products to the FOS, and for the transmission/receipt of test, acknowledgment and other FDF/EOC interface data and messages.

- NCC Emulator: The NCC emulator (located at the NCC facility) provides a test bed for the transmission of TDRSS schedules and various schedule messages to the FOS. It also provides for the transmission/receipt of test, acknowledgment and other NCC interface data and messages.
- Software Data Drivers: Provided in-house, data drivers will be provided by the FOS Development Organization when specific test data/interface simulation is not available via any other source (e.g. telemetry data drivers utilized in early multicast functionality testing). Data driver functionality is defined by the combined effort of the FOS Development Organization and FOS Development Organization. The aggregate set of data drivers will reside on a designated test user station which is accessed and controlled by the System/Segment Test Organization (see Appendix B for the aggregate set of test datasets and need dates).

3.7 Test Tools

The FOS segment will utilize the following ECS selected COTS tools in support of the test environment:

- Requirements and Traceability Management Tool (RTM) - CASE tool which provides the means for creating, populating, and maintaining a data base containing requirements, verification, and design information. RTM provides the means for mapping Level 4 and Level 3 requirements to FOS test cases.
- ClearCase Configuration Management Tool - CM tool used to support configuration management for developing, testing and maintaining software.
- Distributed Defect Tracking System (DDTS) - discrepancy tracking tool used to record, track and report nonconformances encountered during a test session.

3.8 Regression Testing

Regression testing is supplemental testing performed during internal build and incremental delivery testing to ensure that existing software is not adversely affected by modified or new software. For internal build and incremental build testing, regression tests performed are tests performed for previous builds and/or deliveries. For "patch" releases, test cases chosen for regression test activity are those existing test cases which encompass the most functional paths related to the modified software component(s). All regression test activities will be coordinated with the FOS segment development and QA organizations. All regression tests performed and associated test results will be documented in the System/Segment Integration & Test Report Document (#324/DV3 & #405/VE3).

3.9 Discrepancy Reporting and Resolution

During the execution and analysis phases of testing, all non-conformance reports (NCRs) are written by the test engineer, test conductor, NASA Technical Officer/representative, or the QA representative. NCRs are written whenever the performance of the FOS system does not meet

the requirements as specified in the FOS Requirements Specification for the ECS Project, Volume 1 (#304-CD-001-001).

The FOS System/Segment Test organization shall use ECS selected COTS tools for tracking nonconformances. Individual NCR information tracked includes the date the NCR was received, the subsystem the NCR is written against, the priority of the NCR and the current resolution status of the NCR. Once a discrepancy is corrected, regression testing is performed to make sure no new problems have been introduced by the fix. If necessary, the tester develops additional tests to ensure the problem is satisfactorily corrected. Quality Assurance representatives are responsible for audits to ensure reported nonconformances are resolved.

3.10 FOS Integration and Test Schedule Overview

The following table identifies all tests and FOS integration milestones. The table includes both FOS internal milestones, but also ground tests planned by the ESDIS organization which require support from the FOS. The purpose of this table is to delineate the functionality required by the FOS to support these tests and to emphasize internal dependency milestone dates in which the FOS needs to have integrated this functionality.

Table 3-10. FOS Composite Test Schedule (page 1 of 6)

Time From Launch	Test Name	Test Dates	Test Requirements	FOS Requirements
Launch (L)				
L-28	Release A TRR	3/96		
L-27	Release A System/ Segment Test	4/2/96 - 9/30/96		All FOS and external hardware in place in the EDF and GSFC Bldg 32
L-27	EDOS/ETS/ EBnet	4/2/96 - 4/5/96	Contingency Command; Low Rate Telemetry	125 bps forward command capability; 1.0 kbps telemetry processing and display capability
L-26	RLS A ETR	5/96		
L-22	ASTER ICC Data Flow Test	9/5/96 - 9/10/96	ASTER access to EOC Planning & Scheduling information	ASTER-ICC land lines to the EDF operational; or ASTER ICC at EDF
L-21	IST 2-Way Data Flow Test	10/1/96 - 10/4/96	Basic EOC/IST communications; IST access to EOC Planning & Scheduling data.	Support Planning & Scheduling data flows of timelines and activities; Partial IST toolkits.
L-21	RLS A CSR	(10/96)		

Table 3-10. FOS Composite Test Schedule (page 2 of 6)

Time From Launch	Test Name	Test Dates	Test Requirements	FOS Requirements
L-21	Release A IATO Test	10/2/96 - 11/29/96		
L-20	AM-1 spacecraft Bus Compreh. Performance Test	11/6/96 - 11/15/96	TLM Rates: 1/1, 16/16 KBPS. Real-time Tlm/SCC Data	EDOS/ETS IF; EBnet I/F; FOS User Interface (FUI), ODBs to support r/t tlm & SCC dump processing at EOC, ISTs , Real-time telemetry processing and display, command procedures and script execution.
L-19	Rel A IV&V Test	12/2/96 - 12/31/96		
L-18	AM-1 Compatibility Test 1	1/15/97 - 1/16/97		
L-18	NCC, FDF Data Flow Test	1/8/97 - 1/13/97		Functional user interface; planning and scheduling aids; telemetry subsets; uplink data file transfer tables; commands; TONS. TDRSS rqst messages & acknowledgments. Schedules from NCC; Schedule mods from NCC.
L-18	RLS B TRR	(1/97)		
L-18	Release B Segment/ System Test	1/2/97 - 5/30/97		
L-17	Data Analysis Test	2/28/97 - 3/3/97	Housekeeping Data from ETS/EDOS processed at EOC	All tlm data rates listed in the RF ICD; FUI

Table 3-10. FOS Composite Test Schedule (page 3 of 6)

Time From Launch	Test Name	Test Dates	Test Requirements	FOS Requirements
L-16	TLM & CMD Data Processing Test	3/3/97 - 3/7/97	CMD & TLM Processing at EOC. CMD verification CLCW at ETS/EDOS, transmitted to EOC	All forward and return links in the RF ICD. All command types in ICD 106; FUI
L-16	AM-1 Spacecraft Compreh. Performance Test	3/1/97 - 3/6/97		
L-15	Command Management Test	4/8/97 - 4/11/97	CMD Load built at EOC. CMD verification following transmission to ETS/EDOS	All command types from ICD 106; FUI
L-15	AM-1 Spacecraft Compat-ibility Test	4/20/97 - 4/24/97	CTV, TDRSS, GN	All forward and return links in the RF ICD; FUI. TDRSS scheduling through NCC interface.
L-14	AM-1 Compreh. Performance Test	5/12/97 - 5/15/97	Spacecraft housekeeping processing by the EOC; spacecraft and instrument dump processing by the EOC.	All forward and return links in the RF ICD; FUI
L-14	EOC Compat-ibility Test 1	5/19/97 - 6/6/97	Hard-line between spacecraft and the EOC; EBnet, EDOS, S/C Checkout Station, ETS support	Simple demo of EOC ability to generate commands and process hkpg. telemetry command
L-13	Release B ETR	6/97		

Table 3-10. FOS Composite Test Schedule (page 4 of 6)

Time From Launch	Test Name	Test Dates	Test Requirements	FOS Requirements
L-13	IST 2-Way Data Flow	6/2/97 - 6/6/97		Tailored telemetry processing at IST, receipt of command requests from IST; IST Toolkits, FUI
L-12	Mission SIM Readiness Test	7/7/97 - 7/11/97	Verify functional capability of s/c data base, perform spacecraft maneuvers, mission sims.	All forward and return links required for support. real-time and contingency commanding. Not intended for verification of ground system.
L-13	RLS B CSR	6/1/97		
L-13	Rel B IATO Test	6/2/97 - 8/29/97		
L-12	AM-1 Compat-ibility Test 2	7/1/97 - 7/3/97	CMD RATES: 125 BPS, KBPS, 2KBPS, 10 KBPS. TLM Rates: 1/1, 16/16, 16/256, 16/516 KBPS Real-Time / SCC Data, SSR Buffer Dump. EOC, EDOS, EBnet, WSGT, TDRSS support.	All forward and return links in the RF ICD; Compre-hensive EOS Command and Telemetry demo.Test completed between L-13 months and L-3 months; completed prior to spacecraft end to end test.
L-11	AM-1 Spacecraft Thermal Vacuum Test	8/20/97 - 9/5/97	TLM RATES: 1/1, 16/16, 16/256, 16/516 KBPS Real-Time/SCC Data, SSR Buffer Dump	All forward and return links in the RF ICD; FUI
L-10	Rel B IV&V	9/2/97 - 9/30/97		
L-9	RLS B RRR	10/97		

Table 3-10. FOS Composite Test Schedule (page 5 of 6)

Time From Launch	Test Name	Test Dates	Test Requirements	FOS Requirements
L-9	Mission Data Processing Test	10/6/97 - 10/10/97	Various data from ETS/EDOS processed by EOC	All forward and return links in the RF ICD; FUI
L-7	OBC Data Management Test	12/10/97 - 12/12/97	EOC Produces OBC Loads. EOC Uplinks Loads to SSIM	All uplink products specified in ICD 106.
L-6	AM-1 Compati-bility Test 3	1/2/98 - 1/6/98	ALL CMD RATES: ALL TLM Rate: . EOC, ISTs, ASTER, FDF, DAACs, WSGT, TDRSS, EBnet, EDOS.	Test completed between L-13 months and L-3 months; completed prior to spacecraft end to end test.
L-5	AM-1 Compreh. Performance (Post Acoustics) Test	2/2/98 - 2/6/98	CMD RATES: 125 BPS, 1KBPS, 2 KBPS, 10 KBPS TLM Rates: 1/1, 16/16, 16/256, 16/516 KBPS. Real-Time SCC Data, SSR buffer Dump	All forward and return links in the RF ICD; ASTER ICC; TDRSS, EBnet, EDOS. 100 hours of operations scheduled through the NCC; no commanding.
L-4	Scheduling/ Plan Support Test	3/2/98 - 3/5/98	EOC schedules AM-1 Events through NCC. NCC sends confirmed schedules to EOC	All formats and data types specified in the ICD between the NCC and FOS.
L-4	Mission Operations Simulation	3/18/98 - 3/23/98	Validate subset of nominal, contingency mission ops procedures	100 hours of operations scheduled.
L-4	TLM, Tracking, and Command Test	3/6/98 - 3/10/98	Antenna Systems of TDRSS, DSN, WOTS, GN	All forward and return links required for support; FUI and ground system ready for full support.

Table 3-10. FOS Composite Test Schedule (page 6 of 6)

Time From Launch	Test Name	Test Dates	Test Requirements	FOS Requirements
L-4	AM-1 End-to End Test	3/3/98 - 3/11/98	TLM RATES; 1/1, 16/16, 16/256, 16/516 KBPS Real-Time /SCC Data, SSR Buffer Dump	All forward and return links required for support; FUI; ASTER; backup command and control capabilities.
L-4	Mission Ops Simulation (2nd EOC Compat.) Test	3/9/98 - 3/20/98	Validate subset of nominal, contingency mission ops procedures	100 hours of operations scheduled.
L-2	AM-1 Compreh. (launch site) Performance Test	5/21/98 - 6/1/98	CMD RATES: 125 BPS, 1KBPS, 2 KBPS, 10 KBPS	All forward and return links required for support.
L-2	Ground Data System Test	5/18/98 - 5/31/98	All Command interfaces checked. All Sched Functions and interfaces checked. All S/C Data and Types checked.	All forward and return links required for support at VAFB. Includes DSN, GN & WOTS.
L-1	AM-1 Launch Site Readiness Test	6/2/98 - 6/5/98	SCS Provides data from VAFB to EDOS. EDOS sends Data to EOC. EOC sends attitude data to FDF & CMDS to VAFB via EDOS.	All forward and return links required for support at VAFB.
LAUNCH		6/30/98		

3.11 Release A & B Test Case Definition Organization

As described earlier, a detailed breakdown of the aggregate set of functional phases for Releases A and B are identified in the Release Functionality Matrix provided in Appendix A. This matrix serves as a detailed snapshot of the grouping of subsystems, associated threads, thread components and corresponding level 4 requirements used in establishing test case definitions for each internal build (A1, B1), incremental delivery (A2) and final delivery (B2). For internal build/delivery testing, test cases are performed in thread order according to the table in Appendix A and re-emphasized in figures 3-11.1 and 3-11.2 below.

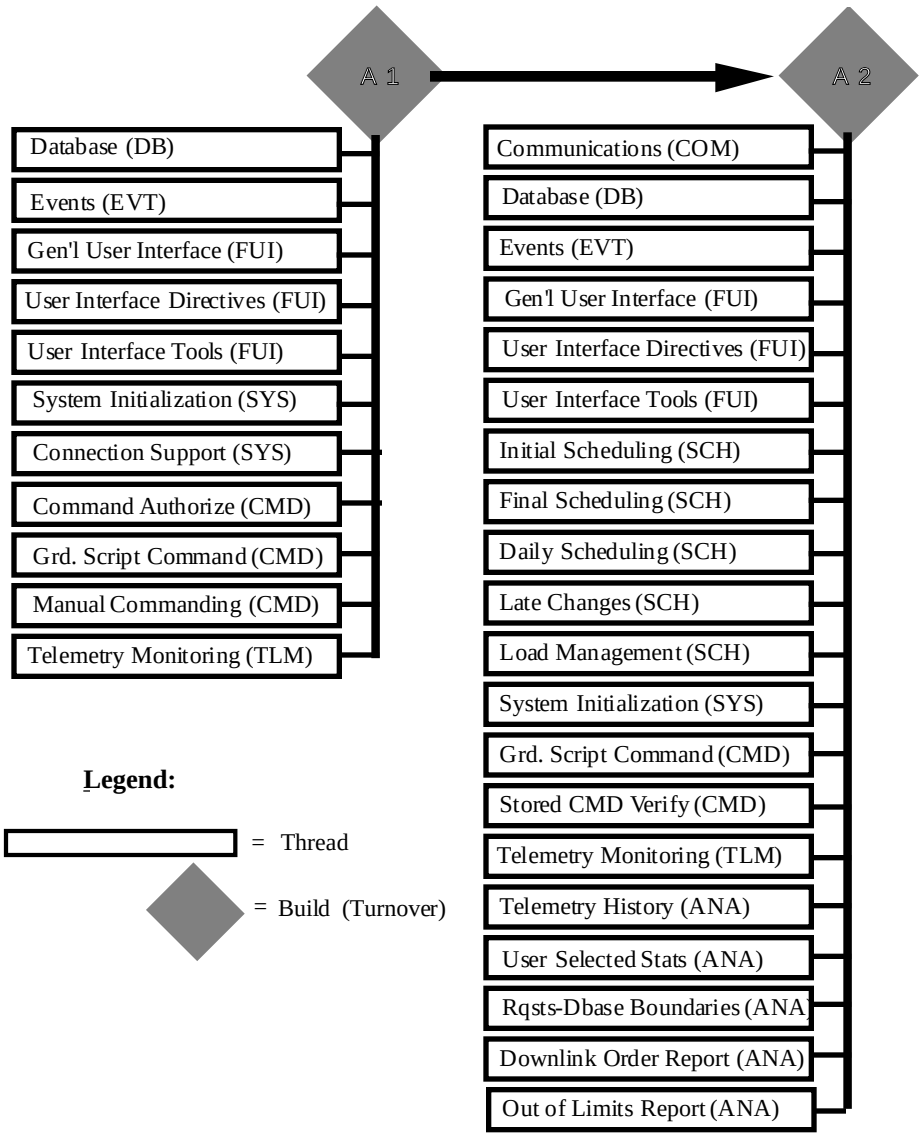

Figure 3-11.1 Release A Thread and Test Order

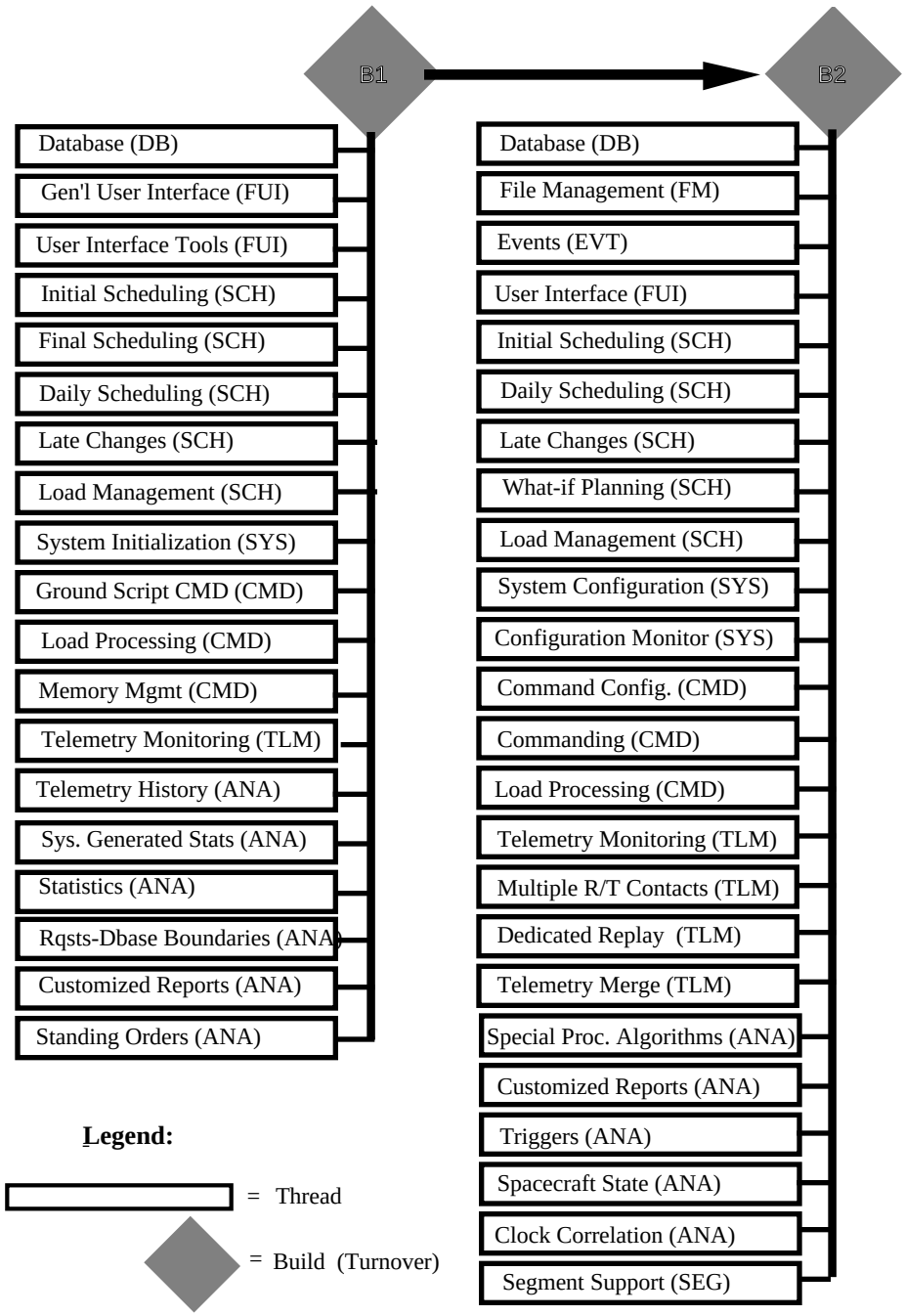

Figure 3-11.2 Release B Thread and Test Order

Note each acronym in parenthesis for each thread title above. Each test case corresponding to a particular thread has an associated test title starting with the thread's assigned acronym.

This page intentionally left blank.

4. FOS Release A Turnover 1 Test Cases

The following Release A Turnover 1 test cases are provided in this section:

Infrastructure/Support Phases:

Data Base Thread Tests:

DBS 1000A Database Ingest and Format

Events Thread Tests:

EVT 1000A Event Message Format
EVT 1010A Event Message Display and Event Graphic Timeline

General User Interface Thread Tests:

FUI 1010A Status Window
FUI 1020A Screen Management
FUI 1030A Control Window Manipulation

User Interface Directive Input Thread Tests:

FUI 1040A ECL Directives

User Interface Tools Thread Tests:

FUI 1050A Time Selector
FUI 1060A Room Builder
FUI 1070A Subsystem Filter

Real-time Phase:

Real-time System/String Initialization Thread Tests:

SYS 1000A Logical String Configuration I

Connection Support Thread Tests:

SYS 1010A User Station Authentication

Managing Command Authorization Thread Tests:

CMD 1000A Command Authorization

Ground Script Commanding Thread Tests:

CMD 1010A Ground Script Command Processing
CMD 1020A Ground Script Command Validation - Database Lookup

Manual Commanding Thread Tests:

CMD 1030A Manual Command Processing
CMD 1040A Manual Command Validation - Database Lookup
CMD 1050A EBnet Interface Connectivity

Real time Telemetry Monitoring Thread Tests:

TLM 1000A Real-time String Connection
TLM 1010A Telemetry Packet Processing
TLM 1020A Telemetry Data Display

Test No.: DBS 1000A

Test Title: Data Base Ingest and Format

Test Support: Test Configuration 4

Test Dependencies: Source data base provided by MMC

Test Description:

This test verifies the ability to load the Martin Marietta provided Spacecraft data base into the FOS DMS server, and that associated command, telemetry, activity and constraint definition format files ingested into the DMS archive conform to format definitions specified in the FOS PDB Data Format Control Document (DFCD).

The test begins with the initiation of the data base ingest process at the DMS archive. Following verification of successful spacecraft data base ingest, ASCII printouts of data base files described below are generated via UNIX directives. Printouts of all ASCII files are analyzed post-test to ensure conformance of all file types with the FOS PDB DFCD.

Telemetry data base files are printed first and include specified packet processing definitions, discrete telemetry definitions, analog telemetry definitions, discrete state definitions, limit definitions, linear EU conversion definitions, polynomial EU conversion definitions, derived parameter definitions, context dependent definitions, and subsystem/instrument definitions. Spacecraft and instrument command files are accessed and printed, and include specified spacecraft command definitions, instrument command definitions, command criticality definitions, telemetry verification definitions, prerequisite state checking definitions, command conversion instruction definitions, memory mapping definitions and table definitions.

Following telemetry and command file format verification, spacecraft and instrument activity files are accessed and printed. Activity files printed and verified post test include activity command lists, parameter mapping definitions and parameter limit definitions.

Input:

ECL directives to ingest the source data base files. UNIX directives to access, view, print data base ASCII files.

Output:

ASCII printouts.

Success Criteria:

Command, telemetry and activity files/records loaded successfully and comply with FOS PDB DFCD. UNIX directives allow access/printout of all PDB ASCII files.

Test No.: EVT 1000A

Test Title: Event Message Format

Test Support: Event message driver

Test Dependencies: Event message definitions resident in the operational data base.

Test Description:

This test verifies the ability to generate event messages based on data base defined event definitions, and format each to include UTC time tag, event type, event identifier, event message text, spacecraft identifier (if applicable) and instrument identifier (if applicable).

The test begins with the initialization of the operational configuration and sign-on by specified EOC user stations. This is followed by the initiation of an events driver, designed to trigger event message generation activity. Examples of all event types will be generated, and multicast for display by the configured EOC user stations. As messages are multicast, event pages displaying generated event messages are printed and analyzed post-test to ensure accurate formatting.

Input:

ECL directives to configure the EOC and user stations. UNIX directives to initiate and control event message driver.

Output:

Event display page printouts.

Success Criteria:

Each event contains accurate UTC time tag. Spacecraft/instrument IDs included based on data base definitions. Event message type, event message ID and event display text match associated data base definitions.

Test No.: EVT 1010A

Test Title: Event Message Display and Event Graphic Timeline

Test Support: Event message driver

Test Dependencies: User interface event display; graphical timeline display

Test Description:

This test is designed to verify the ability to display generated event messages at EOC user stations utilizing event message display options supplied by the FOS user interface.

The test begins with the initialization of the EOC and sign on by specified EOC user stations. The event page displays are requested at configured EOC user stations, and the event message generator is invoked. As messages are multicast and displayed, the graphical event timeline functionality is verified, including event indicators and event type color coding, time correlated visual indicators, and event message selection based on graphical timeline selection. The next set of steps deals with the activation and deactivation of auditory alarms associated with the occurrence of event messages.

Input:

ECL directives to configure the EOC and user stations, display event pages, activate/scroll and select event messages from the graphical timeline, activate/deactivate auditory alarms. UNIX directives to initiate and control event message data driver.

Output:

Event message and graphical timeline displays at EOC user stations. Auditory alarms.

Success Criteria:

Event page displays comprehensive list of generated event messages in UTC time order. Event graphical timeline displays all event occurrences, with accurate time indicators and color coding for each event occurrence. Event page and graphical timeline, when scrolled, work in unison and time indicators match. Chosen graphical timeline event or event time period results in associated event message or set of messages displayed on the event display page and match time period or message selected. Search of event message by text string displays the earliest event message matching the string. Text string searches resulting in no match results in error message. Alarms specified for an event message results in auditory alarm at requesting user station for each specified event occurrence. At alarm deactivation, auditory alarm ceases for specified event message. Auditory alarm activation/ deactivation is user station specific.

Test No.: FUI 1010A

Test Title: Status Window

Test Support: None

Test Dependencies: Telemetry transmission and packet processing; TDRSS contact plan

Test Description:

This test is designed to verify the display of a fixed set of information associated with a single logical string via the Status Window display.

The test begins with the initialization of the EOC including the configuration of operational, test and development logical strings in support of real-time, simulation and replay activities. Following the configuration of each logical string and associated resources for support, the status window is viewed and UTC time and spacecraft identifier field functionality is verified. Real-time telemetry is transmitted, and associated Status Window fields (i.e. spacecraft time, data source, cycle count, telemetry format and telemetry rate fields are verified. The Status Window fields are compared to logical string activity to assure status window fields are accurate. Status window update rates are requested at different intervals at different user stations; the UTC time interval as seen on the display is compared to the user-specified update rate to ensure update rate accuracy. The countdown clock field is compared to the latest TDRSS contact times to ensure countdown to AOS time accuracy. At AOS, the countdown clock field is compared to the scheduled LOS to ensure countdown to LOS accuracy.

Input:

ECL directives to initialize and configure logical strings, request Status Window display, request TDRSS contact times, and to request status window update changes.

Output:

Status Window displays, logical string configuration displays.

Success Criteria:

One status window available for each assigned logical string; status window fields match those from the assigned logical string activity only. Additional logical string assignments do not affect other string's status window. Status window update rates match those specified by the user and are not treated globally (i.e. for requesting user station only). Countdown time field matches the duration of time from the current time to the next scheduled AOS. Following AOS, countdown time field changes to match the countdown to scheduled LOS.

Test No.: FUI 1020A

Test Title: Screen Management

Test Support: None

Test Dependencies: Default room definitions

Test Description:

This test is designed to verify the ability to manage the EOC user station desktop environment via the use of rooms and windows. Following initialization and sign on at several user stations, default rooms are invoked. Default rooms are then compared to the default room associated with each user. Windows are added and deleted dynamically, windows are repositioned within the displayed room, windows are re-sized to overlap one another, and border colors are changed. Various system defined rooms are chosen for display, and room definitions are modified dynamically via keyboard/mouse selection. Following room and room definition modification activity, each room is displayed in its tiled state, and then to its default state. User stations are then reinitialized and signed on by the same user to ensure that the previously saved room definitions are available.

Input:

ECL directives to initialize EOC and user stations, request room display. Keyboard/mouse selection of menu options.

Output:

Room and window displays, event messages.

Success Criteria:

Default room display matches the individual user's default room assignment. Windows added/deleted to any system defined room upon user selection. Any room can contain up to 12 windows; attempt to add 13th window results in an error message. Any system defined room may be displayed via user selection. Rooms are displayed in the default, tiled and modified state upon user selection. Window selection, repositioning of windows within each room, room naming, and border color assignment may be dynamically switched via keyboard/mouse selection. Upon user station reinitialization, the displayed room has the same appearance (i.e. mode, window assignments, window positions, window border colors, window names, etc.) as it did when it was left.

Test No.: FUI 1030A

Test Title: Control Window Manipulation

Test Support: None

Test Dependencies: ECL directive processing functionality

Test Description:

This test is designed to verify the ability to manage the EOC user station desktop environment using a combination of input areas (i.e. command line, control window) and devices (i.e. mouse, keyboard). Following initialization and sign on at several user stations, steps are provided to invoke window options via keyboard and mouse input. Functions invoked include window selection, window movement, window resizing, window closing and window iconifying. The next set of steps focuses on the input of ECL directives at the command line, and the subsequent recall and editing capabilities of the latest 20 submitted directives.

Input:

ECL directives to configure EOC and user stations, request room display. Keyboard/mouse selection of window options.

Output:

Room and window displays, command line, event messages.

Success Criteria:

Any window may be focused, moved, re-sized, closed and iconified via mouse/keyboard selection. Any available ECL directive may be entered at the command line; any previously entered directive (up to the 20th most recent) may be retrieved for display at the command line, and subsequently edited and entered for processing. Attempt at retrieving older directives results in an error message.

Test No.: FUI 1040A

Test Title: ECL directives

Test Support: none

Test Dependencies: ECL Directive functionality

Test Description:

This test is designed to verify the ability to input ECL directives from the command line at EOC user stations in all modes of user station operation (i.e. scheduler, real-time, analyst). User-Directives entered in each mode include window display directives and event display directives. Response message output and specific actions taken as a result of directive input will be verified by viewing response line and event display areas of the display screens.

Input:

ECL directives for command line entry.

Output:

Room and window event displays at EOC user stations, event messages.

Success Criteria:

ECL directives entered at EOC user stations result in correct action taken by the specific user station entering the directive. Subsequent event message response is displayed at user station and matches response from initiating directive. All incorrectly specified directives result in event message stating directive error. Upon directive entry, the command line is immediately cleared.

Test No.: FUI 1050A

Test Title: Time Selector

Test Support: none

Test Dependencies: Basic analysis display capabilities.

Test Description:

This test is designed to verify the ability to select time durations and interval options for historical analysis and replay functions via the Time Selector utility. Following sign-on at the EOC, various analysis functions utilizing the Time Selector utility are invoked. Time duration options selected from the Time Selector Menu include calendar date and time, last N hours, and last N orbits. For those requests requiring time intervals, selected interval options include every N passes, every N orbits, every N hours, every N weeks, and every N months. The above set of steps is repeated for historical analysis requests utilizing the Time Selector utility.

Input:

ECL directives for initializing EOC and user stations, invoking Time Selector utility. Keyboard/mouse selection of window/utility options.

Output:

Time Selector utility display.

Success Criteria:

Historical analysis and replay requests allow calendar date and time, last N hours, last N orbits as valid time duration options; Every N passes, every N orbits, every N hours, every N weeks, and every N months are valid time interval options for analysis and replay requests. All incorrectly specified duration or time intervals result in error messages and blank out previously entered times.

Test No.: FUI 1060A

Test Title: Room Builder

Test Support: none

Test Dependencies: String Configuration Capabilities, User interface display tools

Test Description:

This test is designed to verify the ability to build and manage rooms in the EOC user station desktop environment. Following initialization and sign on at several user stations, steps are provided to define individual windows associated with a specified room and set of rooms, in both default and tiled room modes. Following room generation activity, window position and window size are modified for the default and tiled states, saved and redisplayed. Finally, sets of previously generated rooms are deleted and attempts are made for their redisplay.

Input:

ECL directives to configure EOC and user stations, request room display. Keyboard/mouse selection of window/utility options.

Output:

Room content, window displays

Success Criteria:

Room definitions allowed to include any system defined window or set of windows. Once generated, room definitions are modifiable to include different rooms, different window sizes and different window positions. The above conditions are met by both the default and tiled mode room display capabilities. Attempts to generate rooms with unavailable windows or display an unavailable room result in an error message.

Test No.: FUI 1070A

Test Title: Subsystem Filter

Test Support: none

Test Dependencies: Complete set of subsystem filter menus

Test Description:

This test is designed to verify the ability to filter a list of items (i.e. mnemonics, events, reports) for user interface menus according to a specific spacecraft (e.g. AM-1, PM-1, etc.), spacecraft subsystem (e.g. power communications, etc.), instrument (e.g. MISR, MODIS, etc.), or ground system (e.g. NCC, EDOS, EBnet, etc.). Following initialization of the EOC and sign-on at several user stations, specific user interface menus are selected which contain associated subsystem filter menus. For selected menus, the complete list of associated filter menu choices are selected. Following each selection, associated items relating to the chosen filter(s) are viewed and analyzed off-line to ensure accurate filtering based on selected spacecraft, subsystem(s), instrument(s), or ground system(s).

Input:

ECL directives to initialize the EOC and user stations, invoke menus.

Output:

Menu displays.

Success Criteria:

Subsystem filtering options available for real-time and analysis functional menus. For historical analysis requests, mnemonic filters based on selected spacecraft, subsystem, or instrument result in complete set of mnemonics matching only the chosen filter(s). For event requests, event filters based on spacecraft, subsystem(s), instrument(s) or ground system(s) result in complete set of events matching only the chosen filter(s).

NOTE: Additional Subsystem Filter functionality is also verified in test EVT 2000A.

Test No.: SYS 1000A

Test Title: Logical String Configuration

Test Support: None

Test Dependencies: Configuration display windows

Test Description:

This test is designed to verify the ability to automatically configure the FOS resources in support of the default ground configuration, including resource allocation in support of real-time, simulation and replay activity.

The test begins with user sign-on and initialization of the EOC. Configuration status pages are displayed, verifying the default configuration. Several iterations of requesting access to logical string configurations are performed by those users signed on in order to verify the initialization and support of established logical strings. Configuration displays are printed following each configuration iteration to ensure accurate management and display of the EOC.

Input:

ECL directives for initializing the EOC, displaying configuration status/event display pages, and accessing real-time, simulation and replay logical strings.

Output:

Configuration status display pages/snaps and event displays/snaps at EOC user stations.

Success Criteria:

Initialization of the EOC results in the automatic invocation of the default logical string(s). All subsequent logical string activity allowed by ground controller position only; logical string configuration activity accurately portrayed by configuration status displays and event messages. All EOC users (those users passing authentication) are allowed connection to any existing logical string; requests to connect to non-existent strings denied and event message(s) displayed. Attempts to duplicate any existing logical string are denied.

Test No.: SYS 1010A

Test Title: User Station Authentication

Test Support: None

Test Dependencies: Valid Usernames/passwords

Test Description:

This test is designed to verify the ability to sign on to the operational configuration based on defined functionality automatically invoked at sign-on. Both authorized/unauthorized users will attempt to sign-on to various strings (i.e. operational, test, etc.). Following those users who successfully sign on, specific string configuration activity will be attempted. Verification of string access and functionality performed upon access is verified by event messages and configuration display pages invoked at the user stations.

Input:

ECL directives to attempt sign-on and connection to logical strings.

Output:

Sign-on responses, event window displays.

Success Criteria:

Default user station string access and functional activity allowed matches username/password specification of each user.

Test No.: CMD 1000A

Test Title: Command Authorization

Test Support: None

Test Dependencies: DMS, FOS User Interface, ECL

Test Description:

This test is designed to verify the FOS capability to support a user request for command authorization. This test demonstrates that a user is able to input the necessary ECL directives to request Command Activity Controller (CAC) privileges at the user's workstation. The FOS rejects any request for command authority made by a user that does not have appropriate privileges. For a command authority request received from a valid user, the FOS notifies the current CAC user and requires an approval or denial. For the scenario in which the request is approved, the FOS removes CAC privileges from the current user and provides CAC privileges to the new command user. For the scenario in which the request is denied, the FOS retains the current CAC assignment and generates a user notification to the requester advising of the denied response.

Testing also verifies that a user that is authorized to issue a select group of commands is only able to issue the commands within that group or set and no others. Attempts to issue commands outside of the authorized set or group are rejected due to insufficient privileges.

Throughout this test only one workstation retains CAC privileges at any given time, regardless of the number of workstations making command requests. Also, the FOS shall accurately tracking the change of CAC privileges and the workstation that currently holds CAC privileges throughout this test.

Input:

User directives and menu selections to initialize multiple EOC workstations and assign CAC privilege to the default command console. User directives and menu selections to make authorized and unauthorized requests for command authorization. User directives and menu selections at the current CAC workstation to approve or deny command requests that have been submitted by other users. Upon reassignment of command authorization, command directives at the requesting user's workstation to verify CAC privileges have actually been reassigned. Command directives are input from all other workstations and are rejected due to insufficient privileges.

Output:

User notification and display window updates verifying that command authorization requests from unauthorized user's have been rejected. Notification at the CAC workstation that another authorized user is requesting command authorization. Notification at the authorized user's workstation that the request for command authorization has been approved or denied by the current CAC user. For command authorization requests that are approved, notification is provided to the user's as to the reassignment of CAC privileges.

Success Criteria:

Review of the event history report to verify that all unauthorized requests for command authorization are rejected. Review of the event history report to verify that authorized requests for command authorization are processed and either approved or denied based on the response from the current CAC workstation. Review of event history report and page snaps to confirm that all reassignments of CAC privileges. Verification that the EOC maintains a single point of command throughout the duration of the test.

Test No.: CMD 1010A

Test Title: Ground Script Command Processing

Test Support: None

Test Dependencies: Ground Script Data Set, FOS User Interface, ECL

Test Description:

This test is designed to verify the FOS capability to support FUI processing of command directives that are entered at the user workstation as part of the flight operations ground script. This test demonstrates that the FOS User Interface (FUI) subsystem is capable of recognizing command directives when entered at the user workstation, verify the user authorization exist for the particular command and transfer to the Command Subsystem the necessary information for command uplink processing. The FUI is capable of rejecting without processing all unauthorized command directives entered by the user.

Input:

Valid flight operations ground script with associated command loads available for uplink processing. User directives and menu selections to initiate the ground script from the user workstation. User directives and menu selections to execute the command portions of the ground script. User directives and menu selections in an attempt to initiate the ground script without the appropriate command authorization.

Output:

User notification and display window updates confirming valid, authorized command directives are processed and transferred to the Command subsystem for unlink. Event messages and display window updates confirming unauthorized ground script initiation or unauthorized command directives have been rejected by FUI.

Success Criteria:

Analysis of event history report and page snaps to verify that the FUI subsystem recognizes command directives and processes valid, authorized command directives for transfer to the Command subsystem. Accordingly, unauthorized attempts to initiate the ground script and associated command directives are rejected by the FUI subsystem .

Test No.: CMD 1020A

Test Title: Ground Script Command Validation - DB Lookup

Test Support : None

Test Dependencies: DMS, FOS User Interface, ECL

Test Description:

This test is designed to verify the FOS capability to perform command validation for commands that are incorporated and being executed as part of a ground script. This test demonstrates that for commands issued as part of a ground script, the FOS is capable of validating the commands against definitions that reside in the FOS database. Both spacecraft and instrument commands are accepted by the FOS for command validation prior to command uplink processing.

Input:

Valid ground script that includes spacecraft commands. Command definitions residing in the FOS database. User directives and menu selections to initiate the execution of the ground script command validation process. User directives and menu selections to initiate command directives that are not defined in the PDB.

Output:

Event messages and display window updates confirming that valid commands are being successfully checked against the command definitions in the PDB. User notification of invalid commands that are rejected during the command validation process.

Success Criteria:

Analysis of event history reports, ground script report and PDB report to verify command validation process is being performed in accordance with the command definitions in the PDB.

Test No.: CMD 1030A

Test Title: Manual Command Processing

Test Support : None

Test Dependencies: DMS, FOS User Interface, ECL

Test Description:

This test is designed to verify the FOS capability to support FUI processing of command directives that are entered manually in real-time at the CAC user workstation. This test demonstrates that the FUI subsystem is capable of recognizing the difference between command directives and ground directives entered at the CAC workstation. The FOS is capable of verifying command authorization for the particular command directives entered at the CAC workstation. Following command authorization, the FUI subsystem passes the relevant command mnemonic and parameter values to the Command subsystem for further processing.

Attempts to manually enter command directives from EOC workstation or by users without the proper command authorization are recognized and rejected prior to any command processing.

Input:

User directives and menu selections to enter real-time manual commands at the CAC user workstation. User directives and menu selections to manually enter ground directives at the CAC user station. User directives and menu selections to enter unauthorized command directives from various user workstation.

Output:

Event messages and display window updates confirming the FOS processing of valid manual commands entered at the CAC user workstation. Event messages and display window updates confirming the FOS differentiates ground directives from R/T command directives and processes ground directives appropriately. Event messages and display window updates confirming the rejection of unauthorized command directives entered from various EOC workstations including the CAC workstation.

Success Criteria:

Analysis of event history report and page snaps to verify that the FOS recognizes command directives and processes authorized command directives for transfer to the Command subsystem. Accordingly, unauthorized command inputs are recognized by the FOS and rejected without any further command processing.

Test No.: CMD 1040A

Test Title: Manual Command Validation - DB Lookup

Test Support: None

Test Dependencies: DMS, FOS User Interface, ECL

Test Description:

This test is designed to verify the FOS capability to perform command validation for commands that are manually entered at the user workstation. This test demonstrates that the FOS is capable of accepting manual commands and performing a validation check based on definition that reside in the FOS database. The user issues manual commands for the spacecraft subsystem and instruments. The commands issued are representative of command definitions in the FOS database as well as invalid commands that have not been defined in the database. The FOS is able to validate those commands that conform to database definitions and flag as invalid those commands that do not conform to definitions in the database. The user is notified of those commands that are not defined in the database and no further uplink processing takes place.

Input:

Valid command definitions residing in the FOS database. Command directives available for manual entry. Command directives and menu selections to initiate manual command directives that are defined in the FOS database. Command directives and menu selections to initiate command directives that are not defined in the FOS database. User directives and menu selections in an attempt to continue command processing for those commands that are not defined in the database.

Output:

User notification and display window updates confirming the database lookup and validation of those commands that are defined in the FOS database. User notification and display window updates confirming those commands that are not defined in the FOS database and therefore have been rejected during the validation process. User notification and display updates confirming that attempts to further process invalid commands have been rejected by the FOS.

Success Criteria:

Post-test review of the command definitions in the FOS database along with a review of the event history report and page snaps shall confirm the that the FOS successfully performs the database lookup and command validation process for manual commands entered from the CAC workstation.

Test No.: CMD 1050A

Test Title: EBnet Interface Connectivity

Test Support: EDOS or EDOS Simulation/EBnet

Test Dependencies: FOS User Interface, ECL

Test Description:

This test is designed to verify the FOS capability to support EBnet interface connectivity. This test demonstrates that an authorized user is provided with the capability to enable the FOS-EBnet interface, send test messages/files to an external interface via EBnet, receive test messages/files from an external interface via EBnet, and disable the interface at the conclusion of the test.

Input:

ECL directives and/or menu selections at the user workstation to enable the FOS-EBnet interface. ECL directives and/or menu selections to initiate the transfer of test messages to an external interface (or external simulator), via EBnet. ECL directives and/or menu selections to coordinate the receipt of test messages from an external interface (or external simulator), via EBnet. ECL directives and/or menu selections to disable the FOS-EBnet interface and conclude the test.

Output:

Event messages and display window updates confirming the EBnet interface has been enabled. Event messages and display window updates confirming the transfer of test messages to an external interface via EBnet. Event messages and display window updates confirming the receipt of test messages from an external interface via EBnet

Success Criteria:

Post-test review of the event history report and page snaps to confirm that the authorized user is capable of enabling the EBnet interface and transferring message traffic across the EBnet to an external interface.

Test No.: TLM 1000A

Test Title: Real-time String Connection

Test Support: None

Test Dependencies: User Interface, basic telemetry string configuration capabilities.

Test Description:

This test is designed to verify the ability to manage FOS resource allocation in support of real-time telemetry and command processing activity at the EOC in support of real-time, replay or simulation activity. A secondary objective of the test is to verify the ability to monitor multiple spacecraft at a single user position and monitor the same spacecraft at multiple user positions.

The test begins with the initialization of all FOS Real-time servers (RTSs), followed by the initialization of several EOC user stations. Configuration status pages are displayed, verifying the default configuration of the EOC. Several iterations of logical string configuration requests performed by the ground controller are made in support of real-time, simulation and replay activity. After string configurations are complete, attempts are made at connecting to established configurations by EOC users.

Input:

ECL directives for initializing the EOC, configuring logical strings, user connections to logical strings, displaying configuration/event displays.

Output:

Configuration status windows, event display windows.

Success Criteria:

Initialization of the EOC results in the automatic invocation of the default logical string(s). All subsequent logical string activity allowed by ground controller position only; logical string configuration activity accurately portrayed by configuration status displays and event messages. All EOC users (those users passing authentication) are allowed connection to any existing logical string; requests to connect to non-existent strings denied and event message(s) displayed. Attempts to duplicate any existing logical string are denied.

Test No.: TLM 1010A

Test Title: Telemetry Packet Processing

Test Support: Telemetry packet driver - all APIDs supported.

Test Dependencies: Telemetry multicast capabilities; real-time logical string configuration and real-time logical string connection, limited alphanumeric data display

Test Description:

This test verifies the ability to receive and process spacecraft and instrument telemetry packets, extracting the primary and secondary header fields upon receipt, and determining packet APID, sequence count, packet length, and packet time stamp.

The test begins with the initialization of the EOC, real-time logical string, and initialization of several EOC user stations in support of the real-time string. Predefined CCSDS telemetry packets are transmitted to the EOS operational LAN via a telemetry packet data driver. Prior to receipt of data packets by the real-time data server, event message displays are invoked and printed at the EOC to verify the receipt of broadcast packets, display of packet sequence counts, APID, and time stamp. Telemetry multicast and packet processing steps mentioned above are repeated for each telemetry packet APID provided to the FOS from EDOS.

Input:

ECL directives to configure the EOC, display event and status displays, and to connect to the real-time logical string. UNIX directives to configure and control the telemetry data driver.

Output:

Event display windows; status display windows.

Success Criteria:

Multicast telemetry received by adressees only; APIDs, sequence and time fields match those in multicast packets. Telemetry receipt messages are displayed at connected EOC user stations. Telemetry packet dumps when analyzed show no data integrity loss upon receipt at the RTS.

Test No.: TLM 1020A

Test Title: Telemetry Data Display

Test Support: Telemetry packet driver - all APIDs supported; page display driver

Test Description:

This test verifies the ability to display spacecraft and instrument telemetry and status information via alphanumeric CRT displays available at EOC user stations.

The test begins with the initialization of the EOC, real-time logical string, and initialization of several EOC user stations in support of the real-time string. The Page Display Driver is invoked, and pre-defined alphanumeric page displays are selected and viewed at configured EOC user stations. As the driver broadcasts EU and other telemetry information, alphanumeric display of analog, discrete state, and derived parameter fields are viewed and associated display pages printed. As values are updated, analog parameter display changes (i.e. EU to raw hex, raw hex to raw octal, etc.) and discrete parameter display changes (i.e. text state to raw octal, raw decimal to raw hexadecimal, etc.) are verified. Finally, flag display field functionality associated with parameters (i.e. limits, quality, delta limits,) and telemetry status information fields (i.e. spacecraft time, current orbit number, data source, current major/minor frame cycle, current telemetry format, current telemetry rate and spacecraft ID) are viewed and associated display pages are printed. Via off-line analysis, telemetry and status fields associated with printed displays are compared against data-driven values to ensure data integrity.

Input:

ECL directives to configure the EOC, select and print alphanumeric page displays. UNIX directives to configure and control the Page Display Driver.

Output:

Alphanumeric page displays and printouts.

Expected Results:

Alphanumeric and status display windows. Mnemonic names may be changed dynamically to descriptive text. Analog telemetry values representable in EU, raw octal, raw decimal or raw hexadecimal formats. Discrete telemetry values representable in state, raw octal, raw decimal, raw hexadecimal and decimal formats. Derived telemetry values representable in state, raw, or EU values. Parameter and parameter display format is dynamically selectable. Via off-line analysis, status information (i.e. parameter flags, UTC, spacecraft time, current orbit number, data source, current major/minor cycle counts, current telemetry format, current telemetry rate, spacecraft ID) matches data driven values.

5. FOS Release A Turnover 2 Test Cases

The following Release A Turnover 1 test cases are provided in this section:

Infrastructure/Support Phases:

Communications Thread Tests:

COM 2000A Communications Interface to SDPS

Data Base Thread Tests:

DBS 2000A PDB Validation
DBS 2010A Operational Data Base (ODB) Generation
DBS 2020A Database Edit
DBS 2040A ASTER Operational Data

Events Thread Tests:

EVT 2000A Event Message Generation (Complete)
EVT 2010A Event Archive

General User Interface Thread Tests:

FUI 2000A Control Window Manipulation (Complete)

User Interface Directive Input Thread Tests:

FUI 2010A PROC Builder
FUI 2020A PROC Control
FUI 2030A Request Preplanned Command PROC

User Interface Tools Thread Tests:

FUI 2040A Time Selector
FUI 2050A HELP Tool (Preliminary)
FUI 2060A Display Builder - Alphanumeric Displays
FUI 2070A Quick Analysis

Scheduling Phase:

Initial Scheduling Thread Tests:

SCH 2000A Generation of AM-1 Long Term Spacecraft Ops Plan
SCH 2010A Activity Definer for Baseline Activity Profile (BAP)
SCH 2020A Generation of Instrument BAPs

Final Scheduling Thread Tests:

SCH 2030A Schedule of Instrument BAPs
SCH 2040A Schedule of Spacecraft Subsystem Activities

SCH 2050A ASTER ICC Interface Connectivity & Receipt of ASTER ICC Instrument Activities

Daily Scheduling Thread Tests:

SCH 2060A Set of Target Day Boundaries & Freeze of DAS Activities
SCH 2070A Expansion of DAS and Generation of ATCs
SCH 2080A Update of Ground Schedule & Generation of Integrated Report
SCH 2090A Expansion of DAS and Generation of ATCs for Late Changes

Late Changes Thread Tests:

SCH 2100A Generate Uplink Load & Update Ground Schedule for Late Changes

Load Management Thread Tests:

SCH 2110A Receipt of Instrument Microprocessor Load Content from SCF
SCH 2120A Validation of Instrument Microprocessor Load Content
SCH 2130A Generation of Instrument Microprocessor Uplink Load
SCH 2140A Load Management - Maintain Microprocessor Catalog
SCH 2150A Receive Flight Software Load Contents from SDVF
SCH 2160A Validate Flight Software Load Content ID
SCH 2170A Generate Flight Software Uplink Load
SCH 2175A Maintain Flight Software Catalog
SCH 2180A Receipt of RTS Load Contents
SCH 2190A Validation of RTS Load Content ID
SCH 2200A Generate RTS Load Contents
SCH 2210A Validate RTS Load Contents
SCH 2220A Generation of RTS Uplink Load
SCH 2230A Maintain RTS Uplink Load Catalog
SCH 2240A Validation of Table Load Content ID
SCH 2250A Generate Table Load Contents
SCH 2260A Validate Table Load Content
SCH 2270A Generation of Table Uplink Load
SCH 2280A Maintain Table Uplink Load Catalog

Real-time Phase:

Real-time System/String Initialization Thread Tests:

SYS 2000A Logical String Configuration & Control

Ground Script Commanding Thread Tests:

CMD 2000A Ground Script Control
CMD 2010A Prerequisite State Check via Ground Script Control
CMD 2020A Command Generation & Transmission to EDOS

Stored Command Verification Thread Tests:

CMD 2030A Stored Command Verification - FOS User Interface

Real-time Telemetry Monitoring Thread Tests:

TLM 2000A Decommutation - Health & Safety Telemetry
TLM 2010A Decommutation - Housekeeping & Diagnostic Telemetry
TLM 2020A Engineering Unit Conversion
TLM 2030A Telemetry Data Dropout
TLM 2040A Telemetry Plot Display
TLM 2050A Telemetry Spreadsheets
TLM 2060A NCC GCMR Processing
TLM 2070A Telemetry Information Window
TLM 2080A Real-time Telemetry Archive
TLM 2090A Expert Advisor State Equation (EASE) Computations

Analysis Phase:

Telemetry History Thread Tests:

ANA 2000A Telemetry History Request & Dataset Generation
ANA 2010A System Generated Statistics Request & Dataset Generation

User Selected Statistics Thread Tests:

ANA 2020A User-Selected Statistics Request & Dataset Generation

Historical Requests Crossing D/B Boundary Thread Tests:

ANA 2030A Telemetry History Request & Dataset Generation - Crossing Database Boundaries
ANA 2040A Statistics Request Crossing Database Boundaries

Downlink Ordered Report Thread Tests:

ANA 2050A Downlink Ordered Report

Parameter Out of Limits Report Thread Tests:

ANA 2060A Parameter Out of Limits Report

Test No.: COM 2000A

Test Title: Communications Interface to SDPS

Test Support: SDPS interface

Test Dependencies: SDPS connectivity; SDPS interface displays

Test Description:

This test verifies the ability to exchange test and acknowledgment messages with the SDPS.

Input:

ECL directives to transmit test messages, and to display event page and SDPS displays.

Output:

Event and SDPS interface displays.

Success Criteria:

Test messages transmitted from the EOC are acknowledged by the SDPS; SDPS test messages transmitted from the SDPS are received and acknowledged by the EOC. All interface message transmission and receipt activity is reflected in event messages displayed via the event window display and/or SDPS interface displays.

Test No.: DBS 2000A

Test Title: PDB Validation

Test Support: PDB media.

Test Dependencies: Project Database including telemetry, command and activity definitions; Database Administrator (DBA) functionality

Test Description:

This test is designed to verify the ability to validate the PDB, and includes steps for validating the telemetry, command and activity files for operational use.

The test begins with the selection of the PDB validation process by the Data Base Administrator, and the selected options associated with choosing the specific database for validation and which source files to validate (i.e. entire database, activity only). During the PDB validation process, event messages reporting validation errors are compared to scripted errors to ensure that the FOS implementation of database validation techniques (i.e. data item counting, relational checking, value checking, range checking, foreign-key referencing, cross-validation, etc.) results in acceptable PDB error recognition coverage. Finally, test steps are provided to validate only the activity portions of the PDB.

Input:

DBA directives to validate the project database. Combination of SQL directives and DBA options to view database files.

Output:

DBA Utility displays.

Success Criteria:

All induced PDB errors residing in the telemetry, command and activity portions of the PDB are reported. PDB validation is performed in order: telemetry, command, and activity. Activity validation errors reported during the global database validation request match errors found during the validation performed on the activity-only validation; Activity validation errors reported during the global database validation request match errors reported during the activity-only validation request.

Test No.: DBS 2010A

Test Title: Operational Database (ODB) Generation

Test Support: None

Test Dependencies: Validated database; DBA functionality

Test Description:

This test is designed to verify the ability to generate FOS operational data from the PDB, including the generation of telemetry, command, constraint and activity file and table information.

The test begins with the access and initialization of the TBD data tool(s) available for access and generation of operational data files (i.e. DBA menus, SQL directive input, etc.). Via menu options, a global data base generation is requested. Through the use of DBA and/or SQL options, information residing in the operational command, telemetry, constraint and activity files is compared to associated information residing in the PDB to ensure no data integrity loss during the transformation of PDB data to ODB data tables and files. The above steps are repeated for options of generating command and activity data files individually and generating activity data files individually.

Input:

DBA directives to generate the operational database. Combination of SQL directives and DBA options to view database files.

Output:

DBA utility displays; database files.

Success Criteria:

Generation of telemetry, command, constraint and activity portions of the operational database are accurate and complete; no data integrity loss during the database generation process. All generated operational telemetry and command files reside in a designated DMS directory; command, activity and constraint tables reside in a designated DMS directory. No extraneous files appear in the DMS archive area following database generation activity. Only one database operational at any given time. During database generation, status messages reflect current status of the PDB build process.

Test No.: DBS 2020A

Test Title: Data Base Edit

Test Support: None

Test Dependencies: Source database; Operational database; DBA functionality

Test Description:

This test is designed to verify the ability to edit non-operational telemetry, command, activity and constraint definitions located in the project database via DBA utility options provided at the EOC. Following sign-on to the DBA, data base edit menu options (i.e. edit, delete, modify) are invoked and specified telemetry, command, constraint and activity files are edited. Editing performed includes the modification of operational information (i.e. different commands for activity definitions, different limit definitions for a mnemonic, etc.), the addition of new operational information and the deletion of operational information; both valid and invalid information is inserted into the database during the edit session. The database edits are saved and the entire project database validated. During the PDB validation process, messages in the edit log reporting validation errors are compared to errors introduced during the editing session. Via DBA menu options, a global data base generation is requested on the newly validated database. Following the completion of the generation process, steps are provided to ensure the generation of the complete set of telemetry, command, constraint and activity tables to include the edited information.

Input:

DBA directives to edit, validate, generate database information. Combination of SQL directives and DBA options to view database files.

Output:

DBA utility displays. Database files.

Success Criteria:

Any non-operational data base file of any type (telemetry, command, activity, constraint) may be edited by authorized users and from DBA account access only. Editing activity does not affect the most recent operational database. Generation of telemetry, command, constraint and activity portions of the operational data are accurate and complete following editing and validation activity; The edit log reflects all errors encountered during the validation process. No data integrity loss is encountered during the database validation and generation processes. The newly generated database "takes over" as the newly released operational data. Once data tables/files become operational, those files are not editable.

Test No.: DBS 2040A

Test Title: ASTER Operational Data

Test Support: ASTER ICC

Test Dependencies: Source database provided by MMC; DBA functionality; ASTER interface functionality

Test Description:

This test verifies the ability to load the Martin Marietta provided ASTER portion of the Spacecraft data base into the FOS DMS server and verify ASTER command, telemetry, activity and constraint definition tables/files conform to format definitions specified in the FOS PDB Data Format Control Document (DFCD). The secondary objective is to verify the transition of the ASTER portion of the PDB into FOS operational data, and the ability to forward database files to the ASTER ICC upon operational data generation.

The test begins with the initiation of the ASTER data base ingest process at the DMS archive using a combination of DBA and/or SQL input. Following verification of ASTER data base ingest including command, telemetry, constraint and activity files and tables, ASCII printouts of data base files are generated via UNIX directives. Printouts of all ASCII files are analyzed post-test to ensure conformance of all ASTER file types with the FOS PDB DFCD.

ASTER telemetry data base files are printed first and include specified packet processing definitions, discrete telemetry definitions, analog telemetry definitions, discrete state definitions, limit definitions, linear EU conversion definitions, polynomial EU conversion definitions, derived parameter definitions, context dependent definitions, and subsystem/instrument definitions. ASTER related spacecraft and instrument command files are accessed and printed, and include specified spacecraft command definitions, instrument command definitions, command criticality definitions, telemetry verification definitions, prerequisite state checking definitions, command conversion instruction definitions, memory mapping definitions and table definitions. Following ASTER telemetry and command file format verification, spacecraft and instrument activity and constraint files are accessed and printed. Activity and constraint files printed and verified post test include activity command lists, parameter mapping definitions, parameter limit definitions, spacecraft constraint definitions, instrument constraint definitions, and operational mode transition definitions. Following validation of all files, the operational data is transmitted to the ASTER via the FOS-ASTER interface.

Input:

ECL directives to ingest the source data base files. UNIX directives to access, view, print data base ASCII files. DBA and/or SQL directives/menu options to control ASTER PDB ingest and ASTER operational data validation functions. ECL directives to initiate and control the transmission of operational data to the ASTER ICC.

Output:

ASCII printouts. Event display pages; ASTER interface display pages and events.

Success Criteria:

ASTER command, telemetry, constraint and activity definitions loaded and validated without affecting data integrity; all scripted errors residing in ASTER data definitions are listed in the validation report. Since some types of errors in the database do not necessarily result in the failure of operational data generation, each scripted ASTER error will be analyzed off-line to its resulting action in order to verify accurate ASTER operational data generation activity. All ASTER command, telemetry, activity and constraint files and tables loaded comply with the FOS PDB DFCD. FOS operational data functions allow the ingest, validation and comparison of ASTER related operational data files. No data integrity loss during the transmission of operational data file to the ASTER ICC.

Test No.: EVT 2000A

Test Title: Event Message Generation (complete)

Test Support: Event message driver

Test Dependencies: Basic event display capability

Test Description:

This test is designed to verify the receipt and display of event messages and the ability to filter event message display at the EOC according to instrument, spacecraft subsystem or event message type. Event message color coding and event timeline highlights will also be verified in this test. All event messages and event message types will be simulated from an event message driver and will include spacecraft commands, verification messages, system status configuration messages, operator directives, external interface messages, and other operational event messages. Following sign-on to the real-time logical string and event message data driver initiation, event screening activity will be initiated at EOC user stations. Verification of event display activity is made by viewing event messages as they are received by the user station FUI displays, and by viewing color codes associated with displayed events and highlighted event timeline areas. Also verified via event display is the proper formatting of the events including event numbering, event time stamp, spacecraft ID, and data base defined text. Auditory alarms associated with specific event message types will then be enabled/disabled via directive input on an individual user station basis.

Input:

ECL directives to sign on to string configurations, view event messages, and to enable/disable screen filtering and auditory alarms.

Output:

Event message displays; auditory alarm displays.

Success Criteria:

All event message formats match data base definitions. Each event format field matches information provided by the event driver and/or event process (i.e. event number, UTC time stamp, spacecraft ID). Events are displayed sequentially according to time stamp; timeline areas are highlighted. Events displayed match event filtering options selected. Displayed event colors match data base defined event type color designations. Auditory alarms disabled/enabled based on user request and affect requesting user station only.

Test No.: EVT 2010A

Test Title: Event Archive

Test Support: Event message driver

Test Dependencies: Event message display capabilities

Test Description:

This test is designed to verify the ability to archive all event message types defined for the AM-1 spacecraft and to verify the ability to block duplicated events (i.e. local alarm messages) from being archived. Following real-time, simulation and replay logical string initialization, several user stations are signed on to support each string. Following sign-on and string configuration, an event message driver is initialized, multicasting a set of unique and non-unique event messages associated with each string onto the FOS LAN. The archive dump files are printed and compared to the event driver messages to ensure all broadcast events are archived.

Input:

ECL directives to sign on and initialize strings, display event message windows, manage archiving function. UNIX directives to control event message driver.

Output:

Event archive file dumps, event display windows.

Success Criteria:

Event messages output via the event driver archived in the FOS event archive in UTC time order received. Event archive directory files contain proper UTC and configuration naming conventions. Duplicated event messages do not appear in the archive. Event messages stating archive process status following archive on/off directives. Event archive includes no events during archive disabled time periods. Archive enable/disable allowed by ground controller only.

Test No.: FUI 2000A

Test Title: Control Window Manipulation (Complete)

Test Support: None

Test Dependencies: User interface display; ECL directive entry

Test Description:

This test is designed to verify additional capabilities related to the control and management of the user station desktop environment (see also test FUI 1030A) including the three-line event area display and capabilities relating to room and window assignments using room/window lists.

Following initialization of separate logical string assignments, several user stations are initialized and rooms are selected for display via a menu-driven list of windows. Windows assigned to rooms are then selected from a list of available windows. This is repeated for all user stations signed on to each logical string configuration. The event driver is invoked, resulting in event messages associated with configured logical strings broadcast onto the FOS LAN. The event message window and three-line event area are displayed, and specific event types (i.e. telemetry, command, NCC , FDF, etc.) are filtered from appearing at the three-line event area. Finally, test steps are included for the selection of user station environment options (i.e. color background, borders, etc.) from a menu-driven environment setup tool.

Input:

ECL directives to configure the EOC, initialize user stations, request room/window displays, filter three-line event area events. Keyboard/mouse selection of window options.

Output:

Room and window displays. Three-line event area display.

Success Criteria:

All user defined rooms are available in the menu-driven room display; all windows defined for a given room are also available in a menu-driven window display. The screen display of rooms and windows match the menu selections chosen by the user. The three-line event area displays the most recent three event messages only, in UTC order. Three-line event filtering matches the filter options selected by the user; three line event area selections affect only the user station where the filtering is performed. All three line event area filtering affects the three-line event area only. functional options and event message screening functions are allowed for all user stations via directives and or mouse/keyboard input. Three-line event area screening directives result in event message types not displayed. Three-line event area user station functionality in no way affects event display at event status windows.

Test No.: FUI 2010A

Test Title: PROC Builder

Test Support: None

Test Dependencies: ECL directive functionality

Test Description:

This test is designed to verify the ability to create, edit, store, print and delete preplanned PROCs.

The test begins with the initialization of the EOC to support PROC processing. The PROC Builder tool is invoked and several PROCs are generated according to a specified PROC type (i.e. emergency, command, ground, local, activity, and user-defined) and then saved to a specified spacecraft, instrument, or spacecraft-instrument related directory. The next set of steps involves the editing of several previously defined PROCs. Standard editing options (i.e. cut, copy, paste text, delete text, insert text, search/replace text string, insert an existing PROC) and command builder tool options (i.e. choosing from a list of ECL directives/mnemonics/limits) are used to edit the PROCs. OASIS-based PROCs are then transformed into FOS PROCs; PROCs are then printed and deleted.

Input:

ECL directives to initialize the EOC, perform PROC create, edit, save, delete and print functions. PROC builder and command builder input via directives and keyboard/mouse input.

Output:

PROC builder displays, PROC printouts, event message window displays.

Success Criteria:

PROC functionality allows for the building, editing, deleting, saving of PROCs under author, spacecraft, instrument or spacecraft/instrument designation. PROCs saved according to emergency, command, ground, local, activity and user defined types are retrievable according to assigned type. PROC access allowed by author and/or authorized users only (i.e. command PROC activity authorization given to real-time mode users only. Edited PROCs once saved replace PROCs with the same name only if they are saved to the same category.

Test No.: FUI 2020A

Test Title: PROC Control

Test Support: None

Test Dependencies: Ground script execution including command and ground PROC execution capabilities

Test Description:

This test is designed to verify the ability to access PROCs and initiate and control PROC execution. This includes the invocation of PROCs pertaining to specified types (i.e. emergency, command, ground, etc.), suspending PROC execution, resuming PROC execution, terminating PROC execution, and monitoring PROC execution.

The test begins with the execution of the ground script, and invocation of several local PROCs at configured user stations. As the ground script is executed, several command PROCs embedded in the ground script are initiated sequentially. Attempts at executing additional command PROCs are made by the ground controller and other users. As the command PROCs are executed, the Command Control Display and Command Monitor Displays are used to verify accurate command PROC execution. The next set of steps involves the execution of a ground PROC, and the attempt at executing another ground PROC simultaneously. Attempts are also made to execute PROCs with invalid directives as well as PROCs saved under different authors/spacecraft configurations. Error messages displayed via the event message window display and command input response lines will be used to verify proper PROC processing.

Input:

ECL directives to initiate the ground script, initiate and manage PROC activity.

Output:

Ground script display, event message displays, PROC window displays.

Success Criteria:

Simultaneous execution of local PROCs allowed at any configured user station. Local PROC execution and control does not affect PROC processing at any other user station. Only one command and one ground PROC execution allowed at any given time. PROC access and execution allowed by authorized users only. All PROCs, regardless of type, may be executed, suspended, and resumed by authorized users. Command control display allows monitoring of all command PROCs executed; all other PROCs are filtered from this display. Non-command PROCs submitted for execution result in PROC display automatically invoked at the requesting user station. As PROCs are executed, directives are entered on the display in time order. PROC execution performed (i.e. directives processed) matches PROC directive content. All attempts at access and execution of PROCs saved by different authors or for another spacecraft are denied and error messages are displayed as a result. Attempts at executing PROCs with invalid directives result in the directive being flagged at execution time and results in the PROC being

paused. PROC resumption allowed only at the direction of the user initiating the PROC and begins at the next valid directive in the PROC.

Test No.: FUI 2030A

Test Title: Request Preplanned Command PROC

Test Support: PROC builder tool

Test Dependencies: Previously saved PROCs for all defined PROC types

Test Description:

This test is designed to verify the ability to automatically perform consistency and syntax checking on all directives residing in a PROC when a "PROC save" operation is attempted.

The test begins with the initialization of the EOC to support PROC processing. The PROC Builder tool is invoked and PROCs are accessed. Once accessed, each PROC is edited to include directives incorrectly entered and directives not allowed for the assigned PROC type (i.e. command directives in a local PROC, ground directives in a local PROC, etc.). After each PROC is edited, an attempt at saving the PROC is initiated.

Input:

ECL directives to display PROC builder tool, edit and save PROCs.

Output:

PROC window displays, event messages.

Success Criteria:

All PROCs fail save attempts until each directive contained in the PROC is syntactically correct. Any attempt at saving a PROC containing non-consistent directives results in error messages displayed and the PROC failing the save attempt.

Test No.: FUI 2040A

Test Title: Time Selector

Test Support: None

Test Dependencies: basic user interface display capabilities.

Test Description:

This test is designed to verify the ability to select time durations and interval options for historical analysis and replay functions via the Time Selector utility. Following sign-on at the EOC, various analysis functions utilizing the Time Selector utility are invoked. Time duration options selected by the user from the Time Selector Menu include north/south equator crossing, orbital day/orbital night, loss of signal/acquisition of signal, and epoch time.

Input:

ECL directives for initializing the EOC and invoking functions requiring time selection. Keyboard/mouse selection of window/utility options.

Output:

Time Selector utility displays.

Success Criteria:

Historical analysis functions selected allow time duration options including north/south equator, entering orbital day/night, loss of signal/acquisition of signal. All incorrectly specified duration or time intervals result in error messages and blank out previously entered times.

Test No.: FUI 2050A

Test Title: Help Tool (Preliminary)

Test Support: None

Test Dependencies: User interface window/display capabilities

Test Description:

This test is designed to verify the ability to display the HELP utility at the EOC. Following sign on to an EOC user station, several FOS activities are initiated (i.e. logical string configuration, event and window display, etc.). As activities are initiated, HELP windows are selected to display HELP information pertinent for the particular activity taking place. HELP windows are canceled, other activities are initiated, and additional HELP windows are selected for display. for display for activities taking place on the user station. utility is invoked in real time, analysis and scheduler modes of operation, the HELP utility will be invoked. Through the use of the HELP menus, HELP functions verified include directive use and syntax, mouse and function key usage and general HELP information areas.

Input:

ECL directives to initiate EOC user station functions; keyboard/mouse selection of HELP menu options.

Output:

HELP utility displays.

Success Criteria:

HELP utilities are accessible from any user station window. HELP text is pertinent to the activity taking place in the selected window area. Any HELP retrieval request is canceled upon user selection of HELP cancel options.

Test No.: FUI 2060A

Test Title: Display Builder - Alphanumeric Displays

Test Support: None

Test Dependencies: String Configuration Capabilities; User interface display tools

Test Description:

This test is designed to verify the ability to build and manage displays in the user station desktop environment.

The test begins with the invocation of the Display Builder and Display Builder Palette tools at the EOC user station. Via the use of these tools, a combination of "drag and drop" page building functions are performed, including the generation of page background information (i.e. labels, horizontal/vertical separators), and the generation of page foreground information (i.e. telemetry parameters, units, flags). Display page attribute definition and display page positioning are also performed during this test.

The "Data Source Selector" tool is invoked, and steps are provided to establish the data source (i.e. AM-1 operational configuration in mirror mode, AM-1 replay in tailored mode, PM-1 test in mirror mode) for each display. After display pages and connecting data sources are established, the pages are saved, reinvoked from the DMS archive for redisplay, and printed at specified user station printers. Steps are then performed to change the display data source, individually and globally using the Data Source Selector and Data Source Global Switch tools. Following data source changes, tool menus are viewed to ensure changes made are mirrored in the tool displays. Pages are then requested for display at user stations supporting different logical strings than those where the pages were generated. Steps are provided to ensure that the page data source for all requested display pages may be viewed/edited for each requesting user station to match a desired logical string, and that changes in data source does not affect processing at other user stations.

Input:

ECL directives, FUI keyboard/mouse input.

Output:

Room content; page displays; FUI Tool displays - Display Builder Palette, Display Builder, Data Source Selector, Data Source Global Switch

Success Criteria:

Dynamic display page background and foreground generated per user request; all drag and drop display generation activities match those input via FUI display builder tools; all displays generated may be accessed and printed by any requesting EOC user. Page data source editable at requesting user station and valid for requesting user station only; Data source changes made by the various tools are reflected in each tool's menu display(s). FUI tools reflect exact string configuration, both before and after string reconfigurations. All pages generated are available from the room in which they are generated only.

Test No.: FUI 2070A

Test Title: Quick Analysis

Test Support: Telemetry data driver; scripted housekeeping and health & safety telemetry packets

Test Dependencies: Telemetry decommutation, EU conversion, alphanumeric page display

Test Description:

This test verifies the ability to provide quick analysis of real-time telemetry data. Functions include selecting telemetry points for analysis and displaying analysis results in selected output view(s).

Following sign-on and configuration of the real-time logical string, the real-time data driver is configured to transmit housekeeping/health & safety telemetry packets for subsequent processing by the quick analysis function. The Quick Analysis tool and telemetry display pages are invoked at the EOC user station. Via the Quick Analysis tool, parameter and output view(s) are selected for each analysis request. Analysis request output views performed for this test include informational, alphanumeric, table and graph. Subsequent to analysis request activity, printouts of real-time telemetry displays are made and compared post-test with quick analysis output products. Steps will also be provided to ensure quick analysis functionality for all supported data rates and formats.

Input:

ECL directives to request Quick Analysis Tool. Mouse/keyboard Quick Analysis tool selections. UNIX directives to initialize and control real-time data driver.

Output:

Quick Analysis output products (alphanumeric, informational, table, graph). Alphanumeric page displays. Event page displays.

Success Criteria:

All output views (informational, alphanumeric, table, graph) are supported, via display at the user station and printouts of the products. Parameter raw/EU values on all displays match operational database definitions. Quick analysis inputs cancelable via user input. Alphanumeric display output matches quick analysis product output (for those shared mnemonics for the same UTC time periods).

Test No.: SCH 2000A

Test Title: Generate Long Term Spacecraft Operations Plan

Test Support : None

Test Dependencies: LTSP, LTIP, FDF Orbit Data, FOS User Interface, Report/Browser Tool, PAS

Test Description:

This test verifies requirements related to the FOS capability to support the generation of a Long Term Spacecraft Operations Plan for the AM-1 mission. This test demonstrates that an authorized user is provided with access to the FUI Report/Browser tool, and is capable of generating a spacecraft operations plan based on the LTSP, LTIP and FDF orbital data as input. Once generated, the user is able to save the Spacecraft Operations Plan to the FOS database. Testing demonstrates that once the plan has been generated and saved to the database, all authorized users are able to invoke the FUI Report/Browser Tool and view the contents of the plan in a text, readable format.

Input:

User directives and menu selections to invoke the Report/Browser tool for FOT user generation, modification and storage of the spacecraft operations plan. User directives and menu selections to invoke the Report Browser Tool and view the spacecraft operations plan.

Output:

User notification that the Report Browser/Editor Tool has been invoked. User notification in response to input during spacecraft plan creation, modification and storage in the FOS database. Report Browser display of the spacecraft operations plan contents at the user workstation.

Success Criteria:

From the EOC workstation, the test conductor is capable of invoking the tool necessary for plan generation. Display windows required during the generation of the plan are accessible at the EOC workstation. The test conductor is able to successfully save the contents of the spacecraft operations plan to the FOS database. The contents of the generated plan reflects the associated LTSP, LTIP and FDF data products. Authorized users are provided access to the Report Browser Tool for viewing the finished plan.

Test No.: SCH 2010A

Test Title: Activity Definer for Baseline Activity Profile (BAP)

Test Support: None

Test Dependencies: Activity Definer Tool, FOS User Interface, DMS

Test Description:

This test is designed to verify the FOS capability to support the generation of instrument and subsystem activity definitions that are saved and used as input to user selected Baseline Activity Profiles (BAPs). This test demonstrates that an authorized user is capable of utilizing the Activity Definer Tool to define a logical command sequence that performs an action on an instrument or a spacecraft subsystem. The authorized user is able to define an activity that can for example, change the mode of operation of an instrument or subsystem. In addition, the user is able to associate with an activity modeling information such as power consumption and data rates. The user is provided with the option of creating a new activity or editing a previously defined activity that exists in the project database.

The user is able to access the Activity Definer Tool from the options provided within the "PAS room" that is provided by the FOS User Interface (FUI) subsystem. After the user has specified all of the activity definition parameters, the tool checks for any internal constraints or inconsistencies within the activity and notifies the user. The user is provided with the capability to make the necessary changes and save the activity for incorporation into the project database.

Input:

User directives and menu selections to access the "P&S room" and select the Activity Definer Tool from the options provided. User directives and menu options to define the resource and activity name. User directives and menu options to define the activity attributes, such as the ATC or ground script commands, relative times, power consumption, data rate, mode transitions and constraints associated with the activity. User directives and menu options to save the activity edits for further incorporation into the project database and an associated BAP.

Output:

User notification confirming the Activity Definer Tool has been invoked. Activity Definer window display at the user workstation. User notification and window updates confirming the activity definitions that have been created, edited, saved and deleted by the user.

Success Criteria:

Only authorized users have access to the Activity Definer Tool. Authorized users are capable of bringing up the following displays: Command Editor, Enumerated Parameters, Parameter Functions, Parameter Range, Mode Transition, and Constraint Definer. Through the use of these display windows, the user is able to create valid activity definitions. Post-test analysis to confirm that the activity edits made have been saved and are available for incorporation into a user specified BAP and/or the project database.

Test No.: SCH 2020A

Test Title: Generation of Instrument Baseline Activity Profiles (BAPs)

Test Support: None

Test Dependencies: BAP Definer Tool, Activity Definer Tool, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to support generation of instrument Baseline Activity Profiles (BAPs) through the use of the BAP Definer Tool. This test demonstrates that the FOS provides an authorized user with the capability to access the BAP Definer Tool and generate a BAP for those instruments that utilize one (i.e. CERES, MISR, MODIS and MOPITT). The user is able to access the BAP Definer Tool display by selecting from the options within the "P&S room" that is provided by the FUI subsystem. The user is provided the capability to create a new BAP, edit an existing BAP and view the contents of a BAP. The user is able to select activities defined in the project database and add them to the BAP. Once all activities that make up the BAP are defined, the user is able to access the BAP Scheduling window to specify scheduling information on each activity. The user is able to save the BAP edits for incorporation into the mission schedule.

During BAP editing, the user is able to access the following window displays: BAP Editor, Enumerated Parameters, Parameters Functions, Parameter Range, and BAP Scheduler Window.

Input:

Valid instrument activity definitions for CERES, MISR, MODIS and MOPITT instruments. User directives to invoke the BAP Definer Tool. User directives to create/edit instrument activities into the BAP. User directives to save the BAP to the FOS database for future incorporation into the mission schedule.

Output:

User notification that the BAP Definer Tool has been invoked. User notification confirming edits made to instrument activities in the BAP.

Success Criteria:

Authorized users are capable of accessing the BAP Definer Tools. Successful generation of instrument BAPs for the CERES, MISR, MODIS and MOPITT instruments Authorized users are capable of saving instrument BAPs in the project database for future incorporation into the mission schedule. Once saved, authorized users are able to access the BAPs , view the contents and make valid modifications.

Test No.: SCH 2030A

Test Title: Schedule of Instrument Baseline Activity Profiles (BAPs)

Test Support: None

Test Dependencies: Instrument BAP(s), Activity Scheduler, Timeline, FOS User Interface, DMS

Test Description:

This test is designed to verify the FOS capability to support the scheduling of an instrument Baseline Activity Profiles (BAPs) through the use of the Activity Scheduler Tool. This test demonstrates that the Activity Scheduler Tool provides an authorized user with the capability to create and modify the planned operations for an instrument as defined in the instrument BAP. Testing verifies the Activity Scheduler graphical interface that allows the user to create a BAP schedule request and submit the request to the PAS Resource Model for constraint checking and updating of the mission plan. When a constraint violation is detected by the Resource Model, the user is notified graphically through the Timeline display and by an event message. The user is able to verify via the Timeline display window that the activities have been scheduled as expected.

Input:

Instrument Baseline Activity Profile(s) previously defined through the BAP Definer Tool. User directives or menu options if necessary to initialize the Resource Model. User directives or menu options to start the Activity Scheduler and select the BAP option. User selection of the instrument to schedule against and the BAP the user is interested in scheduling. The user is capable of viewing the baseline activity profile definition via the read-only BAP View window display. User selection of the scheduling start time and activation of the scheduling request.

Output:

Activity Scheduler window updates to reflect the instrument selected by the user for scheduling. Activity Scheduler window updates to reflect a list of the instrument BAPs available for scheduling. Activity Scheduler window updates to reflect the BAP selected by the user. Display updates to the BAP View window to reflect the baseline activity profile definition of the user selected BAP.

Success Criteria:

Activities are successfully sent to the Resource Model for constraint checking and incorporation into the mission schedule. For constraint violations, the user is graphically notified through their timeline display and an event message. The user's timeline display updates to reflect incorporation into the mission schedule of the instrument activities.

Test No.: SCH 2040A

Test Title: Schedule of Spacecraft Subsystem Activities

Test Support: None

Test Dependencies: Spacecraft Subsystem Activities, Activity Scheduler Tool, Timeline, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the scheduling of spacecraft subsystem activities through the use of the Activity Scheduler Tool. This test demonstrates that the Activity Scheduler Tool provides an authorized user with the capability to create and modify the planned operations for a spacecraft subsystem based on activities that have been previously defined for the subsystem in the FOS database. Testing verifies the Activity Scheduler graphical interface that allows the user to create a subsystem schedule request and submit the request to the Resource Model for constraint checking and updating of the mission plan. When a constraint violation is detected by the Resource Model, the user is notified graphically through the Timeline display and by an event message. The user is able to verify via the Timeline display window that the subsystem activities have been scheduled as expected.

Input:

Spacecraft subsystem activities previously defined through the Activity Definer Tool. User directives or menu options if necessary to initialize the Resource Model. User directives or menu options to start the Activity Scheduler and select the activities option. User selection of the subsystem to schedule against and the activities the user is interested in scheduling. User selection of the scheduling start time and activation of the scheduling request.

Output:

Activity Scheduler window updates to reflect the subsystem selected by the user for scheduling. Activity Scheduler window updates to reflect a list of the instrument BAPs available for scheduling. Activity Scheduler window updates to reflect the BAP selected by the user. Display updates to the BAP View window to reflect the baseline activity profile definition of the user selected BAP.

Success Criteria:

Authorized users are capable of successfully invoking the tools and windows necessary to select, modify and make the subsystem activities available for incorporation/consideration into the DAS.

Test No.: SCH 2050A

Test Title: ASTER ICC I/F Connectivity & Receipt of ASTER Instrument Activities

Test Support: ASTER ICC Interface (or Simulation), ASTER Instrument Activity Data

Test Dependencies: FOS User Interface, PAS, Activity Definer Tool, Activity Scheduler Tool, Plan Tool, Timeline, DMS

Test Description:

This test is designed to verify the FOS capability to interface with the ASTER ICC and receive from the ASTER ICC instrument activities for incorporation into the mission schedule. This test demonstrates the capability to 'ftp' test files from the ASTER to the FOS and from the FOS to ASTER without corruption of the file contents.

In addition, this test demonstrates that an authorized user at the ASTER ICC is capable of accessing the IST Activity Definer and Activity Scheduler Tools for creation of ASTER instrument activities. Upon completion of the activities being created, the user at the ASTER IST is capable of selecting the activity files for 'ftp' transfer to the FOS for incorporation into the ECS mission schedule.

Input:

Directives at the EOC user workstation to 'ftp' files to the ASTER ICC. Directives at the ASTER ICC/IST to 'ftp' files to the EOC. User directives and menu options at the ASTER IST to invoke the Activity Definer and Activity Scheduler Tools to define activities for the ASTER instrument. User directives to select ASTER activities for 'ftp' transfer to the FOS for incorporation into the mission schedule.

Output:

User notification confirming the successful transfer of test files between the ASTER and FOS. User notification at the ASTER IST confirming the Activity Definer and Activity Scheduler Tools have been invoked. User notification at the ASTER IST confirming the activities created/edited. User notification confirming the successful 'ftp' transfer from the ASTER IST to the FOS of the activities to be incorporated into the mission schedule.

Success Criteria:

Examination of the test files transferred to confirm the files have been transferred free of any corruption. Successful use of Activity Definer and Activity Scheduler tools at the ASTER IST. Successful transfer and incorporation of the activities into the mission schedule. Review of the mission schedule and timeline to confirm the activities have been incorporated correctly.

Test No.: SCH 2060A

Test Title: Set of Target Day Boundaries & Freeze of DAS Activities

Test Support: None

Test Dependencies: Timeline, DMS, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to support the definition of the start and end times (boundaries) of the Detailed Activity Schedule (DAS) as well as freeze the contents of the Detailed Activity Schedule for a given target day. This test demonstrates that the EOC is provided the capability to set the start time and end time boundaries for a given target day. The activities within a given DAS will correspond to the start and end times of the associated target day. Activities that fall outside of the target day boundaries will not be included in the DAS. This test also demonstrates that the contents of the DAS for a given target day can be frozen/locked so that users are no longer able to make updates to the DAS. The contents of a DAS that is frozen/locked shall be made available to the Command Management Subsystem (CMS) for expansion into Absolute Time Commands.

Input:

User directives to initialize EOC workstations into the FOS operational string. User directives to invoke the tools necessary to define the start time and end time boundaries of the DAS for an associated target day. User directives to invoke the freezing/locking of the DAS contents to ensure users are no longer able to make updates to the contents. User directives attempting to update a DAS that has been frozen/locked.

Output:

Event messages confirming that start and end boundaries have been set for a given target day. Event messages confirming insufficient privileges to make any further updates to the DAS.

Success Criteria:

The EOC is capable of setting target day boundaries and only activities within these boundaries are scheduled in the corresponding DAS. The EOC is capable of protecting the contents of a given DAS to ensure that further updates are not allowed.

Test No.: SCH 2070A

Test Title: FOS Expansion of DAS and Generation of Absolute Time Commands (ATCs)

Test Support : None

Test Dependencies: Detailed Activity Schedule, DMS, PAS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the expansion of a Detailed Activity Schedule (DAS) and generation of the corresponding absolute time commands (ATCs) for the time span of the DAS. This test demonstrates that the Planning & Scheduling subsystem successfully interfaces with the Command Management subsystem to expand the activities within the DAS into a database defined command directive. Each directive is merged in time order into the DAS command list. Once the expansion of the DAS is complete, the expanded command list is automatically constraint checked. For hard constraint violations, testing confirms that a CMS Failed Status object is sent to PAS and processing of the DAS ceases. For soft constrain violations, testing confirms that a CMS Pending Status object is sent to PAS and DAS processing waits for a response on whether to continue to process the DAS with the soft constraints.

Upon completion of the constraint check, testing verifies the CMS capability to generate the ATC load for the expanded DAS. A Spacecraft model is invoked to compute the number of partitions that the load needs to be broken into based on the uplink period and the available space in the ATC buffer. The Spacecraft Model creates a working ATC buffer model for each of the partitions and returns a list of Load Data objects. For each Load Data object in the list, an ATC load object is created which builds the binary load and the load report from the input list of directives.

Input:

User directives from the PAS workstation to initiate the expansion of the DAS. User directives to print the ATC load generation report.

Output:

Event messages at the user interface confirming the expansion of the DAS has been invoked. Event message confirming ATC generation and the results of the command-level constraint check. Event messages confirming the print of the ATC load report.

Success Criteria:

Analysis of DAS report, Event History report, Constraint violation report and ATC load report to confirm the successful expansion of the DAS into an ATC load.

Test No.: SCH 2080A

Test Title: Update of Ground Schedule & Generation of Integrated Report

Test Support: None

Test Dependencies: Command Management Subsystem, PAS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the generation of a ground schedule and Integrated Report based on the contents of a valid DAS. This test demonstrates that the FOS provides the capabilities necessary to retrieve the orbital events file from the Data Management Subsystem. For each of the orbital events contained in the time span covered by the DAS, a Directive object is created that merges the orbital event directives into the DAS Command List. The Command List is added to the ground schedule. Based on the time span of the previous DAS, an Integrated Report is generated and stored with DMS.

Input:

User directives to invoke the Ground Schedule DAS processing function. User directives to print the Integrated Report.

Output:

Event messages confirming the Ground Schedule DAS processing function has been invoked. Generated ground schedule and Integrated Report stored with DMS.

Success Criteria:

Analysis of Ground Schedule and Integrated Report to confirm the Ground Schedule processing of the DAS.

Test No.: SCH 2090A

Test Title: Expansion of DAS and Generation of Absolute Time Commands (ATCs) for Late Changes

Test Support: None

Test Dependencies: DAS Late Changes, CMS, DMS, FOS User Interface,

Test Description:

This test verifies requirements related to the FOS capability to support the expansion of a Detailed Activity Schedule (DAS) that has been modified due to activity late changes and generate the corresponding absolute time commands (ATCs) that reflect the late changes. This test demonstrates that the EOC is provided with the capability to expand the activities within the late change DAS into a lists of absolute time commands by utilizing expansion definitions found in the project database. For the absolute time commands generated as a result of the late change expansion, the EOC user is provided with the capability to check the commands against command-level constraint definitions found in the project database. For the conflict-free ATCs, the EOC user is provided with the capability to generate a corresponding ATC load that covers the same operational period (target day) as the late change DAS. If the original ATC load has not been uplinked, the revised ATC load will replace the original. If the original ATC load has been uplinked, the revised ATC load must be treated as a patch load by Command Management.

Input:

User directives to initialize EOC workstations into the FOS operational string. User directives to initiate the expansion of the late change DAS. User directives to constraint check the absolute time commands generated. User directives to generate the absolute time commands (ATC) and ATC load.

Output:

Event messages at the user interface confirming the expansion of the DAS has been invoked. Event message confirming ATCs generated and the results of the command-level constraint check. Event message confirming the generation of the associated ATC load. ATC load available in the appropriate directory location.

Success Criteria:

Successful expansion of the DAS into ATCs. Successful constraint check of the commands generated against the project database with all conflicts resolved. Successful generation of a valid ATC load that corresponds to the operational period and activities listed in the DAS.

Test No.: SCH 2100A

Test Title: Generate Uplink Load & Update Ground Schedule for Late Changes

Test Support: None

Test Dependencies: Detailed Activity Schedule, PAS, CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to process late change activities received for incorporation into the mission schedule. This test demonstrates that the CMS is capable of receiving a late change activity list from PAS and initiating the necessary action to generate activity expansion of the late change DAS, constraint check the late change activities, generate the late change ATC load and ground schedule. Testing also verifies that the CMS properly manages to replacement of the existing ATC load and ground schedule information with the newly generated Late Change products.

Input:

User directives at the PAS user workstation to invoke the transfer of the Late Change DAS to the CMS for processing. User directives and menu options to print the ATC load report, Ground Schedule and Integrated Load Report.

Output:

User notification confirming the processing of the late change DAS, including ATC load generation and ground schedule updates. User notification confirming the deletion of the subsequent DAS, associated ATC load and ground schedule.

Success Criteria:

Review of the Event History Report, Load Catalog Report, DAS and ATC load reports to verify the CMS is capable of managing the expansion of a late change DAS.

Test No.: SCH 2110A

Test Title: Receipt of Instrument Microprocessor Load Content from SCF

Test Support: Science Computing Facility (or Simulation), SCF IST (or Simulation)

Test Dependencies: Instrument Microprocessor Load Contents, FOS User Interface, CMS, DMS

Test Description:

This test verifies requirements related to the FOS capability to support the receipt of an instrument microprocessor load from the SCF via the SCF's IST. This test demonstrates that instrument microprocessor loads can be transferred to the FOS in preparation for uplink to the AM-1 spacecraft. Instrument microprocessor loads are transferred from an SCF (simulated) platform to the SCF's respective IST. From the IST, the microprocessor load is transferred to the appropriate command management directory location for uplink preparation.

Input:

User directives to initiate the EOC workstation and IST workstations into the FOS operational configuration. User directives to invoke the transfer of the microprocessor load that the EOC authorized user is able to access.

Output:

Event messages confirming the transfer of the microprocessor load to the specified location.

Success Criteria:

The successful transfer of the microprocessor load to a location that the EOC authorized user is able to access.

Test No.: SCH 2120A

Test Title: FOS Validation of Instrument Microprocessor Load Content

Test Support : None

Test Dependencies: FOS User Interface, DMS, CMS

Test Description:

This test verifies requirements related to the FOS capability to validate an instrument microprocessor load received from an external source. This test demonstrates that the FOS provides the capability to validate the microprocessor load source id, destination id and size of the loads binary format. Valid source id, destination id and size of each type of microprocessor load is defined in the project constraints database. Microprocessor loads with known content violations are included in the test case.

Input :

User directives at the EOC workstation to invoke the tool necessary for load content validation. User directives to specify the microprocessor load to validate.

Output:

Event messages confirming the tool has been invoked and the microprocessor load that is to be validated. Event messages reporting the results of the validation.

Success Criteria:

The results of the validation coincide with the contents of the load being validated. Known violations are detected during the validation process.

Test No.: SCH 2130A

Test Title: FOS Generation of Instrument Microprocessor Uplink Load

Test Support: None

Test Dependencies: FOS User Interface, CMS, DMS

Test Description:

This test verifies requirements related to the FOS capability to support the generation of an instrument microprocessor uplink load. This test demonstrates that the FOS provides the capability to generate and append to the microprocessor load all control commands necessary for uplink transmission to the AM-1 spacecraft.

Input:

User directives to invoke the tool necessary for uplink load generation. User directive to specify the microprocessor load name to be prepared for uplink.

Output:

Event message confirming that the generation of an uplink load has been invoked. Microprocessor load report is generated at the completion of the process.

Success Criteria:

Successful generation of the uplink load and load generation report. Generated uplink load is available to command subsystem for uplink transmission to the AM-1 spacecraft. Load contents are dumped, actual data are analyzed and compared to load data expected results.

Test No.: SCH 2140A

Test Title: FOS Receipt of RTS Load Contents

Test Support: None

Test Dependencies: RTS Load Contents, CMS, DMS, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to support the receipt of an RTS load that has been built within the EOC or externally at an SCF or SDVF location. This test demonstrates that RTS load content can be transferred to a directory location that the EOC Scheduler is able to access and begin preparation of the uplink of the load to the AM-1 spacecraft.

Input:

User directives to invoke the transfer of the RTS load from the EOC workstation directory and/or SCF/SDVF directory location to a directory location that the EOC Scheduler is able to access.

Output:

Event messages confirming the transfer of the RTS load to the specified directory location.

Success Criteria:

The successful transfer of the RTS load to the specified location that the EOC authorized user is able to access.

Test No.: SCH 2150A

Test Title: FOS Validation of RTS Load Content ID

Test Support: None

Test Dependencies: RTS Load Content, FOS User Interface, CMS, DMS

Test Description:

This test verifies requirements related to the FOS capability to support validation of an RTS load received at the EOC. This test demonstrates that the FOS provides the capability to validate RTS contents using the definitions as provided in the project database. This includes the capability to check the relative time commands in the RTS against command-level constraints defined in the project database. RTS loads with known violations are introduced into the validation process.

Input:

User directives at the EOC Scheduler workstation to invoke the tool necessary for RTS validation. User directives to specify the RTS load to validate.

Output:

Event messages confirming the initialization of the load validation. Event message reporting the results of the load validation.

Success Criteria:

The results of the validation coincide with the contents of the load being validated. Known violations are detected during the validation process.

Test No.: SCH 2160A

Test Title: Generate RTS Load Contents

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the authorized user generation of a Relative Time Sequence (RTS) load content file using the load builder tools available through the command management subsystem. This test demonstrates that an authorized user is provided with the tools necessary to invoke the load builder and generate RTS load contents for later validation and uplink to the spacecraft. The user is provided with the option of building the RTS load contents based on a previous RTS content file that is already available on the FOS system.

Input:

ECL directives and menu selections to invoke the load builder tool necessary for RTS load contents generation. ECL directives and menu selections to initiate the RTS contents build and save the final product.

Output:

Event messages and display window updates confirming the user has initiated the RTS builder tool. Event messages and display window updates confirming the generation of the RTS contents and successful save of the final product.

Success Criteria:

Analysis of the RTS contents and validation against the RTS buffer characteristics defined in the Project Data Base to confirm the user is properly notified when the RTS contents being generated contains violations and/or format discrepancies..

Test No.: SCH 2170A

Test Title: FOS Generation of RTS Uplink Load

Test Support : None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to support the generation of an RTS uplink load. This test demonstrates that the FOS provides the capability to convert the command portion of each relative time command from mnemonic to binary form using conversion instructions defined in the project database. The time tag of each relative time command is converted to a spacecraft compatible format defined in the database. The necessary load control commands are generated and appended to the load. An associated load report is generated at the completion of the process.

Input:

User directives to invoke the tool necessary for uplink load generation. User directive to specify the RTS load name to be prepared for uplink.

Output:

Event message confirming that the generation of an uplink load has been invoked. RTS load report is generated at the completion of the process.

Success Criteria:

Successful generation of the uplink load and load generation report. Generated uplink load is available to command subsystem for uplink transmission to the AM-1 spacecraft.

Test No.: SCH 2180A

Test Title: FOS Receipt of Table Load Contents

Test Support: External IST

Test Dependencies: Table Load Content File, CMS, DMS, FOS User Interface, Load Ingest Window

Test Description:

This test is designed to verify the FOS capability to support the ingest of a Table load file that has been created at a location external to the FOS. This test demonstrates that an authorized user is able to access the Load Ingest window at the IST workstation and invoke the transfer of the table load from the external location. The Load Ingest window allows the user to select a Table load contents file that is located in the user's non-FOS directory. The user is provided with the menu option to transfer the file to an FOS directory. Once the file has been transferred to the FOS directory, testing verifies that the user is able to access the load file via the Load Manager window for further FOS processing.

Input:

User directives and menu selections to invoke the Load Ingest window and initiate the transfer of the Table load file. User directives and menu selections to invoke the Load Manager window upon completion of the file transfer to ensure that the user is able to access the load file in the FOS directory.

Output:

User notification confirming the Load Ingest has been invoked and the Load file selected is being processed for transfer to the FOS. User notification confirming the name of the FOS directory that the file has been transferred to.

Success Criteria:

The user is able to successfully verify the transfer of the load, including the name of the file and FOS directory that it has been transferred to. Upon transfer completion, the user is able to access the Table load file via the Load Manager window.

Test No.: SCH 2190A

Test Title: FOS Validation of Table Load Content ID

Test Support: None

Test Dependencies: Table Load Content File, CMS, DMS, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to support validation of a Table load received at the EOC. This test demonstrates that the FOS provides the capability to validate Table load contents using the definitions as provided in the project database. Table loads with known violations are introduced into the validation process.

Input:

User directives at the EOC Scheduler workstation to invoke the tool necessary for Table load validation. User directives to specify the Table load to validate.

Output:

Event messages confirming the initialization of the load validation. Event message reporting the results of the load validation.

Success Criteria:

The results of the validation coincide with the contents of the load being validated. Known violations are detected during the validation process.

Test No.: SCH 2200A

Test Title: Generate Table Load Contents

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the authorized user generation of a Table Load content file using the load builder tools available through the command management subsystem. This test demonstrates that an authorized user is provided with the tools necessary to invoke the load builder and generate a table load contents file for later validation and uplink to the spacecraft. The user is provided with the option of building the table load contents based on a previous table load content file that is already available on the FOS system.

Input:

ECL directives and menu selections to invoke the load builder tool necessary for table load contents generation. ECL directives and menu selections to initiate the table load contents build and save of the final product.

Output:

Event messages and display window updates confirming the user has initiated the Table builder tool. Event messages and display window updates confirming the generation of the Table load contents and successful save of the final product.

Success Criteria:

Analysis of the Table Load contents and validation against the Table buffer characteristics defined in the Project Data Base to confirm the user is properly notified when the Table load contents being generated contains violations and/or format discrepancies..

Test No.: SCH 2210A

Test Title: FOS Generation of Table Uplink Load

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to support the generation of a Table uplink load. This test demonstrates that the FOS provides the capability to convert the Table load contents from mnemonic to binary form using conversion instructions defined in the project database. The necessary load control commands are generated and appended to the load and an associated load report is generated at the completion of the process.

Input:

User directives to invoke the tool necessary for uplink load generation. User directive to specify the Table load name to be prepared for uplink.

Output:

Event message confirming that the generation of an uplink load has been invoked. Table load report is generated at the completion of the process.

Success Criteria:

Successful generation of the uplink load and load generation report. Generated uplink load is available to command subsystem for uplink transmission to the AM-1 spacecraft.

Test No.: SYS 2000A

Test Title: Logical String Configuration & Control

Test Support: None

Test Dependencies: User interface configuration displays

Test Description:

This test is designed to verify the ability to configure FOS resource allocation in support of EOS spacecraft telemetry and command processing activity at the EOC. This includes initialization of the default ground configuration upon startup and the addition of other logical string assignments in support of operational, test, and training modes. A Secondary objective of the test is to verify the ability to monitor multiple spacecraft at a single user position and monitor the same spacecraft at multiple user positions.

The test begins with the sign-on of several user stations and the initialization of the EOC. Configuration and event pages are displayed and used to verify the EOC configuration following logical string assignments. Several iterations of requesting ground control access are made by those users signed on in order to verify management of the ground controller position. Logical string assignments supporting real-time, simulation and replay strings are performed for each supported mode (i.e. operational, test, and training). Following string assignments, several EOC user stations are configured to support new logical string assignments, others will reconfigure to support existing logical strings, while other users sign-off. Configuration displays are printed following each configuration iteration to ensure accurate display of the EOC configuration.

Input:

ECL directives for initializing the EOC, configuring logical strings, user connections to logical strings, displaying configuration/event display windows.

Output:

Configuration status display pages/printouts and event displays/printouts at EOC user stations.

Success Criteria:

Initialization of the EOC results in the automatic invocation of the default logical string(s). All subsequent logical string activity allowed by ground controller position only; logical string configuration activity accurately portrayed by configuration status displays and event messages. All EOC users (those users passing authentication) are allowed connection to any existing logical string; requests to connect to non-existent strings denied and event message(s) displayed. Attempts to duplicate any existing logical string are denied. Real-time, simulation and replay logical assignments may be configured for any mode (i.e. operational, training, test).

Test No.: CMD 2000A

Test Title: Ground Script Generate Request

Test Support: None

Test Dependencies: FOS User Interface, DMS, CMS, CMD

Test Description:

This test is designed to verify the FOS capability to support a ground script generation request for a specified time period. This test demonstrates that an authorized user is able to invoke a ground script generation request from the FOS User Interface. For the specified time period, the CMS populates the ground script directive list with directives whose time tag falls within the requested time interval. The completed Ground Script is stored with DMS and returns a success status to the FOS User Interface.

Input:

User request for ground script generation received by CMS from the FOS User Interface.

Output:

Event messages notifying the user that the ground script generation request has been received by the CMS. User notification as to the ground script file being generated and stored with DMS.

Success Criteria:

Analysis to confirm the generated ground script file has been stored with the DMS. Ground script status returned to the FOS User Interface.

Test No.: CMD 2005A

Test Title: Ground Script Control

Test Support: None

Test Dependencies: Generated Ground Script, FOS User Interface, DMS, CMS, CMD

Test Description:

This test verifies requirements related to the FOS capability to support control of the flight operations ground script from the user interface. This test demonstrates that a user with CAC privileges is provided the tools necessary to initiate the execution of a ground script and manipulate ground script execution. Testing verifies the displays provided to the users for verifying proper execution of ground script directives. For the CAC user, testing verifies FOS capabilities provided to the CAC for manipulation of an executing ground script to include enable/disable of state checking, verification checking, enable/disable of individual directives, suspend, resume and termination of the currently executing ground script.

Input:

User directives to initialize EOC workstations into the FOS operational string. User directives to display ground script window at CAC workstation and select ground script for execution. User directives to invoke the execution of the ground script and manipulate ground script control. User directives from a non-CAC workstation to confirm ground script execution and control is not possible.

Output:

Ground script window displayed at the CAC workstation. Event messages confirming the selection of a ground script by CAC, script execution and manipulation.

Success Criteria:

Successful demonstration of CAC capabilities to select a valid ground script, initiate execution of the ground script, manipulate ground script control and terminate the ground script via user directives. Demonstration that non-CAC users have no control and no effect on the execution of EOC ground scripts.

Test No.: CMD 2010A

Test Title: Prerequisite State Check

Test Support: None

Test Dependencies: Expected State Table, Telemetry Data Stream, DMS, CMD, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to perform a prerequisite state check of the spacecraft upon initial execution of a valid ground script and initial receipt of telemetry. This test demonstrates that ground scripts generated by the FOS will include directives to initiate an expected state check at the start of each spacecraft contact. The state check will compare expected telemetry values predicted by the CMS to actual values as received in telemetry. For telemetry values which fail the state check as defined in the project database, the associated spacecraft command(s) to be executed in the ground script will be ignored and not transmitted to the spacecraft.

Input:

User directives to initialize EOC workstations into the FOS operational string. User directives at the EOC CAC workstation to invoke execution of a selected ground script. User directives to initiate the flow of telemetry data set into the EOC. User directives to enable prerequisite state checking and control the ground script execution.

Output:

Event messages confirming the selected ground script has been invoked. Event messages confirming telemetry receipt. Event messages and window display update reporting the results of prerequisite state check. Event messages confirming execution of remaining ground script directives.

Success Criteria:

Successful demonstration that the prerequisite state check is performed when enable and not performed when disabled. Successful demonstration that based on those telemetry points that fail the prerequisite state check, the associated commands included in the executing ground script are not transmitted to the spacecraft.

Test No.: CMD 2020A

Test Title: Command Generation & Transmission to EDOS

Test Support: EDOS (or Simulation)/EBnet Communications

Test Dependencies: DMS, CMD, FOS User Interface, RMS, TLM

Test Description:

This test verifies requirements related to the FOS capability to support transmission of commands to EDOS via ground script control. This test demonstrates that commands, executed as part of a ground script, are processed by the command subsystem, properly formatted in CCSDS packets, validated and transmitted/transferred to EDOS for uplink.

Input:

User directives to initialize the CAC workstation into the FOS operational string. User directives to enable the EBnet link with EDOS (sim). User directives to select and invoke execution of the ground script. User directives to control ground script execution.

Output:

Event messages confirming ground script execution. Event messages confirming commands generated as a result of ground script execution. Transmission of commands to EDOS (sim) for uplink.

Success Criteria:

Successful demonstration that commands within an executing ground script are processed appropriately by the command subsystem and transmitted to the EDOS for uplink.

Test No.: CMD 2030A

Test Title: Stored Command Verification - FUI Command Processing

Test Support : None

Test Dependencies: FOS User Interface, DMS, CMD

Test Description:

This test verifies requirements related to the FOS capability to support display windows available to the EOC users for stored command verification activity. This test demonstrate that the FOS provides the EOC users with the capability to display a ground image of the ATC and RTS buffers. Verified in this test is the capability to display and highlight buffer information such as executed commands, commands awaiting execution, critical commands, hazardous commands, empty buffer areas, commands associated with a specific instrument and commands associated with a specific subsystem.

Input:

User directives to initiate EOC workstations into the FOS operational string. User directives to simulate ATC and RTS uplink and execution. User directives to display ground image of ATC and RTS buffers.

Output:

Event messages confirming simulated uplink and onboard execution of ATC and RTS loads. Window display of RTS and ATC buffer image.

Success Criteria:

Successful demonstration that the FOS User Interface (FUI) Subsystem provides the capability to control uplink and processing of ATC and RTS loads with verification of ATC and RTS execution being displayed to the user via ground image windows.

Test No.: TLM 2000A

Test Title: Decommutation - Health & Safety Telemetry

Test Support: Telemetry data driver - data scripting capabilities.

Test Dependencies: Validated PDB with health & safety telemetry definitions. Previously defined alphanumeric displays including telemetry parameters downlinked in the health & safety, diagnostic, and standby telemetry streams. Parameters include single and multiple bit word definitions, contiguous multi-word definitions, non-contiguous multi-word definitions, with parameter bit length ranges from 1 to 32 bits.

Test Description:

This test is designed to verify the ability to receive spacecraft/instrument health & safety EDOS Data Units (EDUs), extract telemetry packets from the EDUs, extract the telemetry information from the packet application data field, and decommutate the data based on the packet APID and associated decommutation information residing in the PDB. Formats and rates tested include health & safety, diagnostic and standby Command and Telemetry Interface Unit (CTIU) each received at the 1 kbps rate.

Following sign-on, alphanumeric telemetry pages which include parameter and associated parameter Decom value displays are invoked at the user station. The telemetry data driver is initiated, broadcasting health & safety telemetry onto the FOS LAN in the form of EDUs. Following sign-on and configuration of the real-time logical string, alphanumeric telemetry windows are displayed, supporting the display of parameter Decom values. The telemetry data driver is invoked, and health & safety telemetry is broadcast onto the FOS LAN in the form of EDUs. As telemetry packets are received and the telemetry information decommutated, telemetry displays are printed at specified times. Parameter values residing on alphanumeric displays are analyzed post-test to ensure decommutated values match scripted raw values for specified mnemonics. The above steps are repeated for diagnostic telemetry and standby CTIU telemetry in the 1 kbps format.

Input:

ECL directives to configure the EOC for telemetry processing; UNIX directives to configure the telemetry data driver.

Output:

Alphanumeric page displays/printouts. Health & safety, diagnostic and standby CTIU packet dumps from the telemetry data driver.

Success Criteria:

Raw data values shown for each parameter (as seen on telemetry page windows) match the raw data value scripted in the telemetry packet(s). This includes single and multiple bit contiguous parameters, single and multi-bit non-contiguous parameters, and multi-word parameters. All

packets decommutated sequentially. All telemetry data within the packet(s) is decommutated. No data integrity loss during the data receipt, decommutation and subsequent display of decommutated values.

Test No.: TLM 2010A

Test Title: Decommutation - Housekeeping & Diagnostic Telemetry

Test Support: Telemetry data driver with scripting capabilities.

Test Dependencies: Validated PDB with health & safety telemetry definitions. Previously defined alphanumeric displays including telemetry parameters downlinked in the housekeeping and diagnostic telemetry streams. Parameters include single and multiple bit word definitions, contiguous multi-word definitions, non-contiguous multi-word definitions, with parameter bit length ranges from 1 to 32 bits.

Test Description:

This test is designed to verify the ability to receive spacecraft/instrument housekeeping (EDUs), extract telemetry packets from the EDUs, extract the telemetry information from the packet application data field, and decommutate the data based on the packet APID and associated decommutation information residing in the PDB. Formats and rates tested include housekeeping and diagnostic telemetry received at the 16 kbps rate.

Following sign-on, alphanumeric telemetry pages which include parameter and associated parameter value displays are invoked at the user station. The telemetry data driver is initiated, broadcasting housekeeping telemetry onto the FOS LAN in the form of EDUs. As telemetry packets are received and the telemetry information decommutated, the displayed alphanumeric displays are printed at specified times. Parameter values residing on alphanumeric displays are analyzed post-test to ensure decommutated values match scripted raw values for specified mnemonics. The above steps are repeated for diagnostic telemetry at the 16 kbps rates, and again for the simultaneous processing of the 16 kbps housekeeping and 16 kbps diagnostic telemetry streams.

Input:

ECL directives to configure the EOC for telemetry processing; UNIX directives to configure the telemetry data driver.

Output:

Alphanumeric page displays/printouts. Housekeeping and diagnostic packet dumps from the telemetry data driver.

Success Criteria:

Raw data values shown for each parameter (as seen on telemetry page windows) match the raw data values scripted in the telemetry packet(s). This includes single and multiple bit contiguous parameters, single and multi-bit non-contiguous parameters, and multi-word parameters. All packets decommutated sequentially. All telemetry data within the packet(s) is decommutated. No data integrity loss during the data receipt, decommutation and subsequent display of decommutated values.

Test No.: TLM 2020A

Test Title: Engineering Unit Conversion

Test Support: Telemetry data driver with data scripting capabilities.

Test Dependencies: Validated PDB with housekeeping and health & safety telemetry conversion information defined, including calibration coefficients based on seventh order or lower polynomial functions and linear interpolations of line segments containing up to 15 point pairs.

Test Description:

This test is designed to verify the conversion of decommutated telemetry data from raw counts to engineering units (EUs) for all AM-1 supported data formats (i.e. health & safety, housekeeping, diagnostic CTIU/standby telemetry) at all supported data rates per format (i.e. 1 kbps, 16 kbps, or both).

Following sign-on, alphanumeric telemetry pages which visually associate parameter and associated parameter Decom and EU value displays are invoked at the user station. The telemetry data driver is initiated, broadcasting housekeeping telemetry onto the FOS LAN in the form of EDUs. As telemetry packets are received and parameter EU conversions are displayed, telemetry displays are printed at specified time periods (i.e. every 5 seconds, 10 seconds, etc.). Parameter EU values as shown on alphanumeric displays are analyzed post-test to ensure EU values match the converted raw value when each parameter's database defined calibration coefficient is applied. The above steps are repeated for diagnostic telemetry at the 16 kbps rates, and again for the simultaneous processing of the 16 kbps housekeeping and 16 kbps diagnostic telemetry streams.

Input:

ECL directives to configure the EOC for telemetry processing; UNIX directives to configure the telemetry data driver.

Output:

Alphanumeric telemetry displays and printouts; event messages.

Success Criteria:

EU values shown for each parameter (as seen on alphanumeric telemetry page displays) coincide with the raw conversion when applying each mnemonic's calibration coefficient. This includes conversions for single and multiple bit contiguous parameters, single and multi-bit non-contiguous parameters, and multi-word parameters. Any parameter failing EU conversion results in an error message and conversion error flag on associated alphanumeric page display(s). Polynomial conversions up to the seventh order, segment point pairs up to 15 segments, and exponential-three coefficient conversions result in accurate conversions.

Test No.: TLM 2030A

Test Title: Telemetry Data Dropout

Test Support: Telemetry data driver

Test Dependencies: Validated PDB

Test Description:

This test is designed to verify the ability to mark individual telemetry parameters as "static" when no recent input telemetry has been decommutated.

Following sign-on, alphanumeric telemetry pages which visually associate parameter and associated parameter Decom and EU value displays are invoked at the user station. Displays are printed before telemetry is received. The telemetry data driver is initiated, broadcasting housekeeping telemetry onto the FOS LAN in the form of EDUs. Data dropout periods are simulated, ranging from one to sixty-five seconds (a major cycle occurs every 64 seconds). As telemetry packets are received and EU conversions are displayed, alphanumeric displays are printed. Static indicators associated with each parameter are compared against dropout periods in order to verify timely flagging of static indicators for each parameter. The above steps are repeated for all AM-1 supported data formats (i.e. health & safety, housekeeping, diagnostic CTIU/standby telemetry) at all supported data rates.

Input:

ECL directives to configure the EOC for telemetry processing; UNIX directives to configure the telemetry data driver.

Output:

Alphanumeric telemetry displays and printouts; event messages.

Success Criteria:

Individual parameter values on all telemetry displays are marked as "static" and "no data available" before real-time data is received. As individual parameters are decommutated, each is marked as "active". As telemetry data is decommutated, individual parameter's "static" and/or "no data" indicators disappear from the alphanumeric displays. Any parameter not decommutated for more than a major cycle is marked as "static". Any parameter marked as "static" no longer is processed (i.e. limit checked, EU converted, etc.).

Test No.: TLM 2040A

Test Title: Telemetry Plot Display

Test Support: Telemetry data driver with data scripting capabilities.

Test Dependencies: Validated PDB; user interface telemetry displays

Test Description:

This test verifies the ability to display real-time spacecraft and instrument telemetry and status information via graph display where up to six telemetry parameter values are displayed in an X vs. Y format. Graphs include telemetry value vs. time and telemetry value vs. telemetry value. Also tested is the ability to customize graph output to include graph title, labels, axis granularity, grid granularity, line style and telemetry parameter symbols.

The test begins with the initialization of a real-time logical string, initialization of an EOC user station in support of the real-time string and selection of graph functionality from a predefined dynamic page. Two graphs are displayed - a parameter vs. parameter graph, and a parameter vs. time graph. Each graph's attributes are edited via menu options and include selected parameters, limits line symbols, axis lines/labels/scales, line separator style, high/low/yellow/red limits line style, and graph titles. Once graph attributes are generated, the telemetry data driver is initialized, broadcasting housekeeping data packets. As graphs are updated with real-time Decom values, the graphs are printed at various time intervals. Via post-analysis, graph values are compared with scripted telemetry values to ensure data integrity and accurate representation of telemetry Decom/EU values. The above steps are repeated for the graphing of health & safety telemetry packets.

Input:

ECL directives to configure the EOC, select graph options, display/print graphs and alphanumeric page displays. UNIX directives to configure and control the Telemetry Data Driver.

Output:

Graph and alphanumeric page displays and printouts.

Success Criteria:

Up to four graphs displayed/printed per alphanumeric page. All telemetry values portrayed on graphs match scripted values; any non-existing telemetry value within the given time span is visually flagged on the graph. Minimum, maximum, and current value for each selected telemetry parameter is displayed on its associated graph. Graph attributes selected from menu options are reflected on the graph display.

Test No.: TLM 2050A

Test Title: Telemetry Spreadsheets

Test Support: Telemetry data driver with data scripting capabilities.

Test Dependencies: Alphanumeric page display

Test Description:

This test verifies the ability to display up to 50 columns and 300 rows of real-time telemetry values and their associated times at a user selectable rate from 1 to 60 seconds.

The test begins with the selection of the spreadsheet function from a predefined dynamic page. The spreadsheet attributes (i.e. mnemonic/descriptors, time intervals, title labels, and current range of time displayed) are selected from the spreadsheet menu options. Once spreadsheet attributes are generated, the telemetry data driver is initialized, broadcasting housekeeping data packets. As spreadsheets are updated with real-time Decom values, the spreadsheets are printed at various time intervals. Via post-analysis, spreadsheet values are compared with scripted telemetry values to ensure data integrity and accurate representation of telemetry Decom/EU values. The above steps are repeated for health & safety telemetry packets.

Input:

ECL directives to select spreadsheet options, display/print spreadsheets and alphanumeric page displays. UNIX directives to configure and control the Telemetry Data Driver.

Output:

Spreadsheet displays and printouts.

Success Criteria:

All telemetry values portrayed on spreadsheets match scripted values; Upon selection of the option to save all parameter updates, the updates may be retrieved for the selected time period. Spreadsheet attributes selected from menu options are reflected on the spreadsheet display. Spreadsheet update rate matches user selected update rate.

Test No.: TLM 2060A

Test Title: NCC GCMR Processing

Test Support: NCC or NCC Emulator

Test Dependencies: User Interface; NCC Interface

Test Description:

This test verifies the ability to exchange Communication Test and Acknowledgment messages with the NCC and to receive/process Acquisition Failure Notification, GCM Status and GCM Disposition messages. A secondary objective is the transmission of Ground Configuration Message Requests to the NCC (i.e. User Reacquisition Requests, Forward Link Sweep Requests, Forward Link Reconfiguration Requests, Expand User Frequency Uncertainty Requests and Doppler Compensation Inhibit/Enable Requests) and acknowledgment of each message type from the NCC

Input:

ECL directives to initialize the EOC/NCC interface, to transmit test and other message requests, and to display event page and NCC displays.

Output:

NCC and event displays. Event messages.

Success Criteria:

Test and GCM messages transmitted to the NCC and acknowledgment messages received at the EOC match formats as specified in the ICD Between the NCC and MOC (530-ICD-NCCD April, 1995). All interface message transmission and receipt is mirrored in event messages displayed via the event display.

Test No.: TLM 2070A

Test Title: Telemetry Information Window

Test Support: None

Test Dependencies: Validated PDB

Test Description:

This test verifies the ability to display a telemetry information window capable of displaying a column of up to 50 telemetry mnemonics and respective columns of associated data from the PDB, including mnemonic ID, descriptor, parameter and spacecraft ID, cycle locations, valid discrete states, analog conversion polynomials/line segments, and limit information.

Following sign-on and configuration to the real-time string the telemetry information window is displayed; different sets of parameters will then be specified for display via menu options. Mnemonic description information for selected parameters is scrolled; Information residing on the display is printed and compared post-test to printouts of validated database information.

Input:

ECL directives to display information window.

Output:

Telemetry information display windows/printouts.

Success Criteria:

Telemetry status window displayable at EOC. PDB Parameter display information includes mnemonic name, mnemonic descriptor, valid discrete parameter states, conversion polynomials or line segments, descriptor ID, valid states for discrete parameters, delta limits, red/yellow high/low limits values, derived telemetry points, parameter and spacecraft IDs. All mnemonic descriptive information displayed matches PDB definitions.

Test No.: TLM 2080A

Test Title: Real-time Telemetry Archive

Test Support: Real-time data driver; housekeeping, health & safety, diagnostic telemetry broadcast capabilities

Test Dependencies: telemetry receipt, DMS archive directory access

Test Description:

This test is designed to verify the ability to archive housekeeping and health & safety packets simultaneously and provide unique catalog entries for all archived telemetry. Several EOC user stations will be signed on to the operational real-time string, and others configured to the simulation string. Following sign-on and string configuration, the real-time data driver multicasts housekeeping, health and safety, and diagnostic telemetry data packets onto the FOS LAN, each stream broadcast in sequential time order. Access to the archive will be performed during and after the archive process to ensure proper cataloging of received data. Test steps will then be provided to display, dump and compare archive content to scripted data in order to verify archive data integrity.

Input:

ECL directives to sign on and initialize strings, display event message windows. UNIX directives to control real-time data driver.

Output:

Data archive file dumps, event display pages.

Success Criteria:

Telemetry data output via the real-time data driver archived in the FOS archive in UTC time order received. Data archive directory files contain proper UTC and configuration naming conventions. Access to the archive allowed by authorized users only; archive processing directives denied for all non-authorized users. Analysis of archived telemetry data files reveals no data integrity loss during the archive process. Data archive content following archiving on/off directives coincides with the archive status following each on/off period. Housekeeping, health & safety, and diagnostic telemetry data packets are archived in separate files.

Test No.: TLM 2090A

Test Title: Expert Advisor State Equation (EASE) Computation & Display

Test Support: Telemetry data driver with data scripting capabilities

Test Dependencies: Previously defined EASE alphanumeric displays.

Test Description:

This test is designed to verify the ability to define EASE rules, compute EASEs based on previously defined rules (i.e. exclusive ANDs, ORs, parameter to parameter comparisons, etc.) and to display EASE results via alphanumeric displays. Also tested are functions relating to associating commands and ECL procedures to defined EASE rules.

EASE rules are generated by the command controller and ground controllers (representing EOC and IST user stations), using TRUE/FALSE results to "trigger" associated ECL procedures, commands, and/or text. The rules are entered via software tools provided by the user interface. The telemetry data driver is initiated, broadcasting housekeeping telemetry onto the FOS LAN in the form of EDUs. As telemetry packets are received and the telemetry information decommutated, EASE displays are printed at specified times. Parameter values residing on EASE displays are analyzed post-test to ensure decommutated values match scripted raw values for specified mnemonics. The above steps are repeated for diagnostic telemetry and standby CTIU telemetry.

Input:

ECL directives to configure the EOC for EASE computation and EASE alphanumeric display.

Output:

Alphanumeric EASE displays/printouts.

Success Criteria:

Via off-line analysis, EASE computations are accurate based on defined comparison of parameter values associated with each EASE rule, and defined actions associated with an EASE rule (i.e. command requests, text output, etc.) are invoked upon computing that the EASE result is true. EASE computations support the following: 1) Equal to, 2) Not Equal To, 2) Less than, 3) Greater Than, 4) Equal to or Greater Than, 5) Equal to or Less Than and 6)AND/OR Boolean operators. Defined EASEs may be edited ,saved, deleted by authorized users only. Up to 50 EASE rules may be processed at any one time.

Test No.: ANA 2000A

Test Title: Telemetry History Request & Dataset Generation

Test Support: None

Test Dependencies: Telemetry Archive and retrieval; all telemetry formats supported in the archive and within start/stop boundaries of the operational database.

Test Description:

This test is designed to verify the ability to build a telemetry history request via the combination of user interface and analysis tool options and automatically generate a dataset of matching archived telemetry data based on selected analysis options (i.e. telemetry parameter names, start/stop time intervals, sampling rates, etc.).

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and an historical request is generated, with selected options including request name, start/stop time interval, parameter names, and sampling rates. The request is saved, and then submitted for dataset generation based on the menu options previously submitted. During the dataset generation time frame, the previous request is selected for editing. Parameter names, start/stop time interval and sampling rates are changed. The "edited" request is renamed, resubmitted, and saved. Following the generation of each dataset, ASCII printouts are generated and analyzed off-line to ensure dataset accuracy and integrity. The last portion of the test deals with the selection of menu options causing error conditions (i.e. mnemonics not matching operational database, attempting to save statistics request without sufficient information, etc.). Following the completion of each invalid request, the request is submitted for dataset generation.

Input:

Keyboard/mouse selection of analysis tools and selection of telemetry history options. ECL and/or UNIX directives for generating ASCII dataset reports.

Output:

Analysis status windows, ASCII reports of generated datasets.

Success Criteria:

User interface menus supporting telemetry history options include the selection of parameter names, data type (raw, engineering unit value), start/stop time intervals (year, day, hour, minute, second, orbit number), and telemetry flag information (i.e. limits, delta limits, quality, static). Via off-line analysis, it is determined that telemetry history report options selected match dataset content, and that data integrity is not compromised during the archive retrieval and subsequent generation of datasets. Illegal options or typos entered into the Analysis Request and/or Time Selector windows (except for illegal mnemonics) disallow dataset generation and result in error messages. All requests containing erroneous information (i.e. illegal mnemonics, incomplete

field selection, etc.) are screened from the dataset generation process and result in an error message.

Test No.: ANA 2010A

Test Title: System Generated Statistics Request & Dataset Generation

Test Support: None

Test Dependencies: Telemetry Archive and retrieval; all telemetry formats supported in the archive and within start/stop boundaries of the operational database.

Test Description:

This test is designed to verify the ability to build a system generated statistics request via the combination of user interface and analysis tool options and automatically generate a dataset of matching statistics based on archived telemetry data associated with the user request.

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and a statistics request is generated, with selected options including request name, parameter names, start/stop time interval (i.e. orbit, daily, monthly, mission to date) and statistic type (i.e. minimum, maximum, mean and standard deviation). The request is saved, and then submitted for dataset generation based on the menu options previously submitted. During the dataset generation time frame, the previous request is selected for editing. Parameter names, start/stop time interval and statistic types are changed. Edited requests are renamed, resubmitted, and saved. Following the generation of each dataset, ASCII printouts are generated and analyzed off-line to ensure dataset accuracy and integrity. The last portion of the test deals with the selection of statistical menu options causing error conditions (i.e. attempting to request statistical computations on discrete parameters, attempting to save the statistic request which lacks sufficeint information, etc.). Following the completion of each invalid request, the request is submitted for dataset generation.

Input:

Keyboard/mouse selection of analysis tools and selection of statistical request options. ECL and/or UNIX directives for generating ASCII dataset reports.

Output:

Analysis status windows, ASCII reports of generated datasets.

Success Criteria:

User interface/analysis menus supporting system-generated statistics options include the selection of request name, parameter names, start/stop time interval, and statistic type (minimum, maximum, mean, standard deviation). Via off-line analysis, it is determined that system generated statistic request options selected from the combination of user interface and analysis menus match associated dataset content. Statistics computations are accurate and based only on associated start/stop time interval, and data integrity is not compromised during the generation of datasets. The number of samples listed for each statistical computation match the number of samples available in selected start/stop time interval. Illegal statistic options or typos entered

into the Analysis Request and/or Time Selector windows disallow dataset generation and result in error messages.

Test No.: ANA 2020A

Test Title: User-Specified Statistics Request & Dataset Generation

Test Support: None

Test Dependencies: Telemetry Archive and retrieval; all telemetry formats supported in the archive and within start/stop boundaries of the operational database.

Test Description:

This test is designed to verify the ability to build a user-specified statistics request via the combination of user interface and analysis tool options and automatically generate a dataset of matching statistics based on archived telemetry data associated with the user request.

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and a user-specified statistics request is generated, with selected options including request name, parameter names, start/stop time, and statistic type (i.e. minimum, maximum, mean and standard deviation). The request is saved, and then submitted for dataset generation based on the menu options previously submitted. During the dataset generation time frame, the previous request is selected for editing. Parameter names, start/stop times and statistic types are changed. Edited requests are renamed, resubmitted, and saved. Following the generation of each dataset, ASCII printouts are generated and analyzed off-line to ensure dataset accuracy and integrity. The last portion of the test deals with the selection of user-selectable statistical menu options causing error conditions (i.e. attempting statistical computations on data not residing in the archive, etc.). Following the completion of each invalid request, the request is submitted for dataset generation.

Input:

Keyboard/mouse selection of analysis tools and selection of user-specified statistical request options. ECL and/or UNIX directives for generating ASCII dataset reports.

Output:

Analysis status windows, ASCII reports of generated datasets.

Success Criteria:

User interface/analysis menus supporting user-specified statistics options include the selection of request name, parameter names, start/stop times, and statistic type (minimum, maximum, mean, standard deviation). Via off-line analysis, it is determined that user-specified statistic request options selected from the combination of user interface and analysis menus match associated dataset content. Statistics computations for each selected parameter are accurate and based only on associated start/stop times and selection of good quality/bad quality data in the statistic computations. Data archive integrity is not compromised during the generation of datasets. The number of samples listed for each statistical computation match the number of samples available in selected start/stop time. Illegal statistic options or typos entered into the Analysis Request and/or Time Selector windows disallow dataset generation and result in error messages.

Test No.: ANA 2030A

Test Title: Telemetry History Request & Dataset Generation - Crossing Database Boundaries

Test Support: None

Test Dependencies: Telemetry Archive and retrieval; all telemetry formats supported in the archive and within start/stop boundaries of two separate databases

Test Description:

This test is designed to verify the ability to build a telemetry history request which uses more than one operational database to build the dataset. The historical request is generated using selected analysis options (i.e. telemetry parameter names, start/stop time intervals, sampling rates, etc.) from a combination of user interface and analysis tool menus.

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and an historical request is generated, with selected options including request name, start/stop time interval, parameter names, and sampling rates. The start/stop time interval selected spans two database IDs. The request is saved, and then submitted for dataset generation based on the menu options previously submitted. Following the generation of the dataset, ASCII printouts are generated and analyzed off-line to ensure that each portion of the dataset is based on the applicable database. The last portion of the test deals with the selection of menu options causing database crossover error conditions (i.e. start/stop times not matching any operational database, mnemonics not matching one or more databases, etc.). Following the completion of each invalid request, the request is submitted for dataset generation.

Input:

Keyboard/mouse selection of analysis tools and selection of telemetry history request options. ECL and/or UNIX directives for generating ASCII dataset reports.

Output:

Analysis status windows, ASCII reports of generated datasets.

Success Criteria:

User interface menus supporting telemetry history options include the selection of parameter names, data type (raw, engineering unit value), start/stop time intervals (year, day, hour, minute, second, orbit number), and telemetry flag information (i.e. limits, delta limits, quality, static). Via off-line analysis, it is determined that menu options selected match dataset content, dataset content is based on the applicable database, and that data integrity is not compromised during the generation of a dataset using multiple databases. Illegal options or typos entered into the FUI windows disallow dataset generation and result in error messages.

Test No.: ANA 2040A

Test Title: Statistics Requests Crossing Database Boundaries

Test Support: None

Test Dependencies: Telemetry Archive and retrieval; all telemetry formats supported in the archive and within start/stop boundaries of multiple databases

Test Description:

This test is verifies the ability to build user-specified and system generated requests which initiate dataset generation based on archived telemetry associated with two separate databases.

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and a system-generated statistics request is generated, with start/stop time interval selected spanning multiple databases. Separate requests are submitted with different parameters, start/stop time intervals and statistic types. Each request is submitted for dataset generation. The above steps are repeated for user-specified statistics requests.

Following the generation of each dataset, ASCII printouts are generated and analyzed off-line to ensure dataset accuracy and integrity.

Input:

Keyboard/mouse selection of analysis tools and selection of statistical request options. ECL and/or UNIX directives for generating ASCII dataset reports.

Output:

Analysis status windows, ASCII reports of generated datasets.

Success Criteria:

Computations of system-generated and user-specified statistics are accurate and based only on associated parameter, start/stop time interval and statistic type. Statistical Computations are based on the associated database before and after the database crossover period. Telemetry archive data integrity is not compromised during the generation of datasets. The number of samples listed for each statistical computation match the number of samples available in selected start/stop time interval.

Test No.: ANA 2050A

Test Title: Downlink Order Report

Test Support: None

Test Dependencies: Telemetry Archive and retrieval; all telemetry formats supported in the archive and within start/stop boundaries of the operational database.

Test Description:

This test is designed to verify the ability to build a telemetry history report request via the combination of user interface and analysis tool options, automatically generate a dataset of matching archived telemetry data based on selected analysis options, and display/print the report output.

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and a downlink order request is generated, with selected options including request name and start/stop time interval. The request is saved, and then submitted for dataset generation based on the menu options previously submitted. During the dataset generation time frame, the previous request is selected for editing. The start/stop time interval is changed to the maximum timeframe - one major frame/cycle. The "edited" request is renamed and resubmitted. Following the generation of each dataset, the report is requested for output to the screen and to a configured line printer(s).

Input:

Keyboard/mouse selection of analysis tools and selection of downlink order report options. ECL directives to display and print report content.

Output:

Analysis status windows, report displays and printouts.

Success Criteria:

Via off-line analysis, it is determined that the downlink report display and printouts match, that report content matches dataset values, and that report values match database definitions for a sample of the displayed parameters. All parameters supported by the associated telemetry format(s) are included in the report, along with associated raw or EU values. The report output matches the start/stop time specified in the downlink order request. All mnemonics resident on the report are displayed in the order in which they are sampled by the spacecraft. Reports displayable and printable via ECL directives or mouse/keyboard selection. Attempting to request a report associated with data not residing in the archive, for a time period less than one second or greater than one major cycle results in error message display and the report not generated. Requests of reports based on existing datasets is allowable, with the above success criteria applied.

Test No.: ANA 2060A

Test Title: Parameter Out of Limits Report

Test Support: None

Test Dependencies: Telemetry Archive and retrieval; all telemetry formats supported in the archive and within start/stop boundaries of the operational database.

Test Description:

This test is designed to verify the ability to generate, display and print parameter out of limits reports based on out-of-limit report request information selected from a combination of Time Selector and Analysis tool menus.

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and a Parameter Out of Limits request is generated, with selected options including request name, start/stop time interval, and parameter names. The request is saved, and then submitted for dataset generation based on the menu options previously submitted. During the dataset generation time frame, separate report requests are generated at other user stations with different start/stop time, parameters, and request names. These report requests are submitted for report output. Following the generation of each dataset, reports are requested for output to the screen and to configured line printers. Report requests are also submitted based on previously generated datasets.

Input:

Keyboard/mouse selection of analysis tools and selection of Parameter Out of Limit Report options. ECL directives to display and print report content.

Output:

Analysis status windows, report displays and printouts.

Success Criteria:

Each Parameter Out of Limits Report contains each telemetry parameter name violating a limit definition, the spacecraft time for the start of each violation, duration of each violation and sum of durations of all limit violations within the duration of the report. Each report includes limit violation information for specified parameters and for specified time periods only. Telemetry archive data integrity is not compromised during the dataset and report generation processes. Any invalid mnemonic names specified in the parameter out of limits report request are flagged and event messages are generated. Invalid mnemonic specifications do not affect dataset and report generation activity. Limit violation information contained in the report matches dataset content. Printouts of the out of limits reports match user interface display of the same report. Requests of Parameter Out of Limits Reports based on existing datasets is allowable, with the above success criteria applied.

6. FOS Release B Turnover 1 Test Cases

The following Release B Turnover 1 test cases are provided in this section:

Infrastructure/Support Phases:

Data Base Thread Tests:

DB 1000B Maintain PDB Time Window
DB 1010B Database Reporting (Basic)
DB 1020B Constraint Definitions - Ingest, Modification & Validation

General User Interface Thread Tests:

FUI 1000B User Authentication & Display

User Interface Tools Thread Tests:

FUI 1010B Display Builder - Graphs & Tables
FUI 1020B Report Template Builder

Initial Scheduling Thread Tests:

SCH 1000B FDF Interface Connectivity & Receipt of FDF Planning Aids
SCH 1010B Send FDF Planning Aids to ASTER
SCH 1020B Schedule Spacecraft Subsystem BAPs
SCH 1030B Check Activity Level Constraints
SCH 1040B Check Command Level Constraints
SCH 1050B NCC Interface Connectivity
SCH 1060B TDRSS Contact Schedule

Final Scheduling Thread Tests:

SCH 1070B Schedule Instrument Activity Deviations
SCH 1080B Schedule Spacecraft Subsystem Activity Deviations
SCH 1090B Receive ASTER Instrument Activity Deviations
SCH 1100B Schedule Microprocessor Load Uplink Activities
SCH 1110B Schedule Flight Software Load Uplink Activities
SCH 1120B Schedule RTS Load Uplink Activities
SCH 1130B Schedule Table Load Uplink Activities

Daily Scheduling Thread Tests:

SCH 1140B Check Command Level Constraints & Schedule ATC Uplink Activities
SCH 1150B Add ATC Load Uplink to Ground Schedule

Late Changes Thread Tests:

SCH 1160B Receive Late Change Requests & Check Activity Level Constraints
SCH 1180B Schedule ATC Uplink Activities for Late Changes

Load Management Thread Tests:

SCH 1190B Load Management - Maintain Microprocessor Catalog
SCH 1200B Receive Flight Software Load Contents from SDVF
SCH 1210B Validate Flight Software Load Content ID
SCH 1220B Generate Flight Software Uplink Load
SCH 1230B Maintain Flight Software Catalog
SCH 1240B Validate RTS Load Content ID
SCH 1250B Generation of RTS Uplink Load
SCH 1260B Maintain RTS Uplink Load Catalog
SCH 1270B Validate Table Load Contents
SCH 1280B Maintain Table Uplink Load Catalog
SCH 1290B Display ATC & RTS Buffers

Real-time Phase:

Real-time System/String Initialization Thread Tests:

SYS 1000B Display Hardware/Software Status

Ground Script Commanding Thread Tests:

CMD 1000B Command Verification - Receipt Verification

Load Processing Thread Tests:

CMD 1010B Load Processing - Load Command Validation
CMD 1020B Load Processing - Load Transmission

Memory Management Thread Tests:

CMD 1030B Memory Management
CMD 1040B Memory Dump Ingest

Real time Telemetry Monitoring Thread Tests:

TLM 1000B Data Quality Determination
TLM 1010B Context Dependent Decommutation
TLM 1020B CODA Reception & Storage
TLM 1030B Limits Processing
TLM 1040B Delta Limits Processing
TLM 1050B Limits Processing Based on Context Key
TLM 1060B Limits Sense Interval
TLM 1070B Telemetry Strip Chart Display
TLM 1080B Telemetry Schematic Display
TLM 1090B User Performance Data Request to the NCC
TLM 1100B Receive & Archive NCC Data
TLM 1110B Telemetry Archiving - Multiple Telemetry Streams

TLM 1120B Solid State Recorder (SSR) Receipt & Archive
TLM 1130B Telemetry Replay Processing & Display
TLM 1140B Telemetry Replay - Crossing Database Boundaries
TLM 1150B Telemetry Subsetting & Transmission to the FDF

Analysis Phase:

Telemetry History Thread Tests:

ANA 1000B Telemetry History Report - Display & Print

Systems Generated Stats for FDF Data Thread Tests:

ANA 1010B FDF Data Archiving & System Generated FDF Statistics

Statistics Thread Tests:

ANA 1020B User-Selected Statistics - Display & Print
ANA 1030B System Generated Statistics - Display & Print

Historical Requests Crossing D/B Boundary Thread Tests:

ANA 1040B Telemetry History Report - Crossing Database Boundaries
ANA 1050B Statistics Reporting - Crossing Database Boundaries

Customized User Reports Thread Tests:

ANA 1060B Reporting via the Report Template Builder

Standing Order Thread Tests:

ANA 1070B Standing Orders

Test No.: DBS 1000B

Test Title: Maintain PDB Time Window

Test Support: None

Test Dependencies: Validated PDB; DBA functionality

Test Description:

This test verifies the ability to store and maintain the PDB version number, generation date and effective date for each PDB version upon ingest. Several versions of the PDB are ingested into the DMS archive. Following ingestion, the PDB archive is accessed and the PDB generation date, version number and effective date for each version is extracted via SQL directive and/or DBA menu options. Test steps will be provided to compare version information to ensure unique database information is maintained and accessible for each database generated.

Input:

DBA/SQL entry to ingest/access PDB files.

Output:

Database file displays/printouts

Success Criteria:

All versions of the PDB residing in the DMS archive contain a version number, generation date, and effective date. This information may be accessed/browsed by authorized users. Version number, generation date and effective date match the information in the MMC-provided PDB.

Test No.: DBS 1010B

Test Title: Data Base Reporting (Basic)

Test Support: None

Test Dependencies: Validated PDB; DBA functionality

Test Description:

This test verifies the ability to report on PDB content by any authorized user. Access and browse of PDB files will be performed for command, telemetry, activity and constraint files through the use of DBA utility tools and/or SQL directives/PROCs. By keying on mnemonic name, the automatic search, display and report printouts of PDB information (i.e. polynomial conversion, limits, context dependent keys, etc.) is verified.

Input:

SQL directives to access, browse PDB files.

Output:

Database file displays/printouts

Success Criteria:

All files residing in the PDB may be accessed/browsed by authorized users. By specifying mnemonic name, all PDB files associated with that mnemonic are displayable/viewable/ printable. Any defined command, telemetry, constraint or activity file resident in the PDB may be accessed/browsed by any authorized user.

Test No.: DBS 1020B

Test Title: Constraint Definitions - Ingest, Modification & Validation

Test Support: None

Test Dependencies: Source data base provided by MMC including valid constraint definitions

Test Description:

This test verifies the ability to load the Martin Marietta provided Spacecraft data base into the FOS DMS server, and that associated constraint definition format files ingested into the DMS archive conform to format definitions specified in the FOS PDB Data Format Control Document (DFCD). Additionally, spacecraft, instrument, and operational mode transition constraint definitions are added, deleted, and modified, and subsequent validation of constraint files are performed following constraint modifications.

The test begins with the initiation of the data base ingest process at the DMS archive. Following verification of successful spacecraft data base ingest, ASCII printouts of constraint files are generated. Printouts of all ASCII files are analyzed post-test to ensure conformance of all constraint file types with the FOS PDB DFCD. Constraint files printed and verified post test include spacecraft constraint definitions, instrument constraint definitions, and operational mode transition definitions.

The second portion of the test deals with modifying constraint definitions, adding definitions, and deleting existing ones. Following modification, the validation of constraint files is performed, and the validation logs are printed.

Input:

ECL directives to ingest the source data base files. UNIX directives to access, view, print data base ASCII files.

Output:

ASCII printouts, validation log

Success Criteria:

Spacecraft, instrument, and operational mode transition constraint data base files loaded without affecting data integrity and comply with FOS PDB DFCD. Supplied user directives allow access/printout of any specified constraint definition file. Validation log includes all files failing the validation process. Constraint validation "catches" and reports each file input error entered during the constraint modification process.

Test No.: FUI 1000B

Test Title: User Authentication & Display

Test Support: Previously defined usernames/passwords for all EOC/IST user "types".

Test Dependencies: CSMS capabilities for providing security audit trails and reporting

Test Description:

This test verifies the ability to provide security login procedures to authenticate users signing on to the EOC and IST user stations and to allow for specific sets of default user station operability and data associated with defined privileges assigned to FOS user "types".

The test begins with users attempting sign on to EOC/IST user stations via username and password entry at the FOS login screen following user station initialization. A list of users and assigned user type(s) associated with the EOC are entered by the EOC manager (i.e. DOE username with command activity controller and ground configuration controller assigned types); the Principal Investigator/Team Leader (PI/TL) performs the same function at each IST (i.e. ESCIENTIST username assigned with instrument engineer and instrument analyst types). Following entering of USERNAME-TYPE assignments, steps are performed for the sign-on and subsequent attempts at utilizing default user station functionality and data associated with that particular user's assigned type(s). Both positive cases (i.e. sending commands by a user with command control assignment, configuring the ground system by a user with ground control assignment, etc.) and negative cases (attempting instrument planning activity by a user without instrument planning control assignment, attempting database updates by a user without database administrator assignment, etc.) will be performed during this test.

Input:

ECL directives for the initialization of user stations, use of default user station functionality, and entering USERNAME-TYPE assignments.

Output:

USERNAME-TYPE assignment printouts. EOC/IST user station displays. Event messages.

Success Criteria:

All EOC/IST users allowed one or more user type assignments. User types may be changed on-line by authorized users. All users allowed access to EOC and IST user stations via USERNAME/PASSWORD entry match those lists entered by the EOC manager and/or IST manager. Functionality allowed at the EOC/ISTs by authorized users matches that allowed by the users applied user types. EOC user type definitions include operations coordinator, operations controller, ground controller, spacecraft activity controller, instrument evaluator, spacecraft evaluator, flight systems supervisor, command management analyst, spacecraft planner, instrument planner, ground systems engineer, system specialist, database manager, and software maintenance engineer. Audit trail reports printed via the SMC, contain date and time of access to security controlled data and unsuccessful access attempts. EOC LAN filters all data

with invalid TCP socket number and protocol for internal/external interfaces. EOC file access limited to authenticated users only, and is based on USERNMAME/PASSWORD of IST users. Any attempt at reconfiguring or shutting down equipment via software provided measures is controlled by USERNAME/PASSWORD assignment.

Test No.: FUI 1010B

Test Title: Display Builder - Graphs & Tables

Test Support: None

Test Dependencies: String Configuration Capabilities, GUI display tools

Test Description:

This test is designed to verify the ability to build and manage graphs and tables in the user station desktop environment.

The test begins with the invocation of the Display Builder and Display Builder Palette tools at the EOC user station. Via the use of these tools, a combination of "drag and drop" graph and table building functions are performed, including the generation of graph/table background information (i.e. labels, horizontal/vertical separators), and the generation of graph/table foreground information (i.e. telemetry parameters, units, flags). Graph and table attribute definition and positioning are also performed during this test.

The "Data Source Selector" tool is invoked, and steps are provided to establish the data source (i.e. AM-1 operational configuration in mirror mode, AM-1 replay in tailored mode, PM-1 test in mirror mode) for each display. After generation of graphs and tables, and connecting data sources are established, the graphs/tables are saved, reinvoked from the DMS archive for redisplay, and printed at specified user station printers. Steps are then performed to change the display data source, individually and globally using the Data Source Selector and Data Source Global Switch tools. Following data source changes, graphs and tables are viewed to ensure changes made are mirrored in the graph/table displays.

Input:

ECL directives to display graphs, tables. keyboard/mouse selection of graph/table build, edit, delete, display options.

Output:

Graph/table content; page displays; Tool displays - Display Builder Palette, Display Builder, Data Source Selector, Data Source Global Switch

Success Criteria:

Dynamic graph/table background and foreground generated per user request; all drag and drop display generation activities match those input via display builder tools; all displays generated may be accessed and printed by any requesting user. FUI tools reflect exact string configuration, both before and after string reconfigurations. All graphs/tables generated are available from the room in which they are generated only. Graph/table connection matches that specified via the Data Source Selector and Data Source Global Switch tools.

Test No.: FUI 1020B

Test Title: Report Template Builder

Test Support: Archived data bases covering time periods of telemetry requests.

Test Dependencies: User Interface, Project Data Base

Test Description:

This test is designed to verify the ability to request customized user reports based on menu options supplied by the Report Builder Tool. Examples of reports requested as part of this test include power performance, propulsion performance, instrument performance, spacecraft/ instrument anomalies, memory comparison, memory image, memory map, and archived telemetry.

Following the display of the Report Template Builder Tool, a combination of customized and routing report requests are performed for each type of report listed above. Each field within each template is checked for functionality, followed by operations allowed for template management (i.e. editing, modifying, deleting, reinvoking). Report output formats are specified, including user specified fonts, report titles and margins; report formats are defined for each report, along with the output designation (i.e. default printer, designated printer, saved to a file, carry out, etc.). The second portion of the test involves issuing options or requesting information via Report Template Builder Tool options which cause error conditions (i.e. entering typos into menu option fields, leaving mandatory fields blank, etc.

Input:

ECL directives to initiate and control Report Template Builder tool and tool menus. ECL directives to display analysis status windows.

Output:

Analysis status windows, event display windows.

Success Criteria:

Report Template Builder Tool allows the request of all FOS generated reports listed above, including the selection of report output (i.e. fonts, author, report title, margins). Any completed template may be saved, edited or deleted by authorized users. Any typo or non-completed mandatory field results in an error message.

Test No.: SCH 1000B

Test Title: FDF Interface Connectivity & Receipt of FDF Planning Aids

Test Support: FDF Interface (or Simulation)

Test Dependencies: PAS, DMS, FOS User Interface

Test Description:

This test verifies the FOS capability to support interface connectivity with the Goddard Space Flight Center (GSFC) Flight Dynamics Facility (FDF). This test demonstrates the capability for an authorized user to perform a UNIX 'ftp' transfer of test files between the FOS and the FDF. The user is able to 'ftp' test files from the EOC to the FDF and verify that the files are received free of corruption. The user is then able to coordinate the 'ftp' transfer of test files from the FDF to the FOS. The user is able to verify that the files are received at the FOS in a corrupt free state.

In addition, this test demonstrates the FOS capability to support the 'ftp' transfer of FDF planning aids to the EOC/FOS. The user is able to coordinate with the FDF the 'ftp' transfer of planning aid files. The user is then able to verify the successful receipt of the planning aids in a corrupt free state.

Input:

User directives to invoke the 'ftp' transfer of test files between the FOS and FDF. User directives to invoke the 'ftp' transfer of planning aids from the FDF to the FOS.

Output:

User notification confirming the successful receipt of test files and planning aids

Success Criteria:

Analysis of test files and planning aids received to verify the successful receipt of corrupt free file contents.

Test No.: SCH 1010B

Test Title: Send FDF Planning Aids to ASTER

Test Support: ASTER ICC Interface (or Simulation)

Test Dependencies: PAS, Plan Tool, DMS, FOS User Interface

Test Description:

This test verifies the FOS capability to transfer FDF planning aids to the ASTER ICC. This test demonstrates that an authorized user is able to invoke the 'ftp' transfer of planning aid files to the ASTER ICC. Upon transfer from the FOS to the ASTER ICC, the ASTER IST user is able to successfully access the planning aids via the tools provided at the IST.

Input:

User directives at the EOC workstation to invoke the 'ftp' transfer of FDF planning aids to the ASTER ICC. User directives at the ASTER ICC/IST to access the planning aids and view the contents.

Output:

User notification that the 'ftp' transfer of the FDF planning aids to the ASTER ICC. IST display page updates upon the ASTER user's access to the planning aids contents.

Success Criteria:

Post-test review is performed to confirm the actual planning aids received at the ASTER ICC are consistent with the planning aids transferred from the FOS.

Test No.: SCH 1020B

Test Title: Schedule Spacecraft Subsystem BAPs

Test Support: None

Test Dependencies: PAS, DMS, FOS User Interface, Spacecraft Subsystem BAPs available for scheduling

Test Description:

This test verifies the FOS capability to support authorized user scheduling of a subsystem Baseline Activity Profile (BAP) over a user specified period of time. This test demonstrates that an authorized user is able to invoke the Activity Scheduler tool and select the specific subsystem they desire to schedule against. Upon selection of the subsystem, the user is provided with a list of BAPs available for scheduling. The user selects the appropriate BAP and specifies the period in which they desire the BAP to be scheduled. The BAP is converted into a list of activities over the user specified time period, checked for resource constraint violations and incorporated into the mission plan.

Input:

Valid subsystem BAPs available for scheduling. ECL directives to invoke the Activity Scheduler tool. User selection of the subsystem desired for scheduling. User selection of the subsystem BAP to be scheduled and selects the specific time period.

Output:

Activity Scheduler tool window display. List of available subsystems and BAPs to select from. Event messages and display window updates confirming the selected subsystem and BAP. Display window updates confirming the time period selected for scheduling. Event messages and display window updates confirming successful resource constraint check and/or constraint violations detected. Event messages and display window updates confirming the list of activities are incorporated into the mission plan.

Success Criteria:

Analysis of the mission plan to confirm that the activities incorporated correspond with the activities within the subsystem BAP that was selected for scheduling. Analysis to confirm that all resource constraint violations, if any, were detected prior to the activities being incorporated into the mission plan. Analysis to confirm the conflict-free activities have been correctly incorporated into the mission plan.

Test No.: SCH 1030B

Test Title: Check Activity Level Constraints

Test Support: None

Test Dependencies: Activity Constraint Definitions in FOS Database, Instrument/Subsystem Activities, Resource Model Application, PAS, DMS, FOS User Interface

Test Description:

This test verifies the FOS capability to support activity level constraint checking prior to activities being incorporated into the mission plan. This test demonstrates that an authorized user is able to invoke instrument and subsystem modeling tools, and identify any activities that violate hard and soft constraints as defined in the PDB. The resource model utility notifies the user of all activities that violate hard and soft constraints and additionally notifies the user of the particular constraints violated. The user is provided with the tools to proceed with scheduling of activities that have violated soft constraints. Testing verifies that under no circumstances is the user able to proceed with scheduling of activities that violate hard constraints.

Resource modeling during this test includes: spacecraft power subsystem, spacecraft data volume, nominal spacecraft attitude and attitude offsets, instrument state and mode changes as well as High Gain Antenna (HGA) pointing and slew rates.

Input:

Pre-test selected activities and/or BAPs. ECL directives and/or menu selection to initialize Activity Scheduler tool and Resource Model. ECL directives and/or menu selection to submit a list of activities to the Resource Model for constraint checking.

Output:

Event messages and display window updates confirming activities selected and submitted for constraint checking. Event messages and display window updates confirming activities that violated constraints defined in the PDB. Event messages and display window updates confirming which specific constraints are being violated including particulars such as hard, soft violations etc.

Success Criteria:

User notification of all activities that violate constraint definitions. User notification of specific constraints violated. User capability to allow soft constraint violations to be included in the mission plan. Activities that violate hard constraints are not incorporated into the mission plan regardless of user attempts to incorporate these activities.

Analysis of activity constraint check results in relation to known constraint violations introduced into the Activity list/BAP.

Test No.: SCH 1040B

Test Title: Check Command Level Constraints

Test Support: None

Test Dependencies: Command Constraint Definitions in FOS Database, Detailed Activity Schedule (DAS), CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the command-level constraint checking of an expanded Detailed Activity Schedule (DAS). This test demonstrates that an authorized user is able to invoke the tool(s) necessary to perform the command-level constraint check of the expanded DAS command list.

Constraint violations are introduced into the expanded command list. Upon detection of a hard constraint violation, this test demonstrates that the check process halts and returns a check fail status to the PAS authorized user. Upon detection of a soft constraint violation, this test demonstrates that the check process returns a pending status to the PAS authorized user and allows the user to respond on whether to continue processing with soft constraints included, or cease the constraint check process until soft constraint violations are removed.

Input:

Command list derived from expanded DAS. ECL directives and/or menu selection to initialize command-level constraint checking tool. ECL directives and/or menu selection to continue processing with soft constraint violations included or cease constraint check process until soft constraint violations are removed.

Output:

Event messages and/or display page updates confirming the command constraint check process has been invoked. Event messages and/or display page updates confirming any constraint violations, which hard or soft constraint has been violated, which command(s) caused the violation(s) and the state of the check process (i.e. ceased, pending etc.).

Success Criteria:

User notification of all commands that violate constraint definitions. User notification of specific constraints violated. User capability to allow soft constraint violations to remain in the command list. Commands that violate hard constraints are not processed regardless of user attempts to incorporate for load generation.

Test No.: SCH 1050B

Test Title: Network Control Center (NCC) Interface Connectivity

Test Support: NCC Facility (or Simulation)

Test Dependencies: PAS Communication Contact Scheduler Tool, User Planning System (UPS), DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support interface connectivity with the Goddard Space Flight Center (GSFC) Network Control Center (NCC). This test demonstrates that an authorized user is able to invoke the Communication Contact Scheduler Tool and transfer test schedules to the NCC. In response, the NCC is able to transfer test schedule acceptance/rejections to the FOS. Test schedules are transferred via the User Planning System (UPS).

Input:

ECL directives and/or menu selections to invoke the Communication Contact Scheduler and User Planning System. ECL directives/menu selections to send test schedules from the FOS to the NCC. Coordination with the NCC to receive test schedule acceptance/rejection at the FOS. ECL directives/menu selection at the conclusion of the test to terminate the Communication Contact Scheduler and User Planning System.

Output:

Event messages and display window updates that confirm the FOS-NCC interface has been enabled. Event messages and display window updates that confirm the transfer of test messages to the NCC. Event messages and display window updates that confirm the FOS receipt of test messages from the NCC.

Success Criteria:

Authorized user capability to successfully invoke the Communications Contact Scheduler and User Planning System (UPS). Authorized user capability to send test schedules from the EOC to the NCC. Analysis confirmation that the schedules received at the NCC are corrupt free and as expected when compared with the messages sent from the FOS.

FOS capability to receive and acknowledge test schedules sent from the NCC. Analysis confirmation that the schedules received and acknowledged at the FOS are as expected when compared with the schedule content sent from the NCC.

Test No.: SCH 1060B

Test Title: TDRSS Contact Schedule

Test Support: NCC Facility (or Simulation)

Test Dependencies: Communication Contact Scheduler Tool, User Planning System (UPS), DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support Tracking and Data Relay Satellite System (TDRSS) schedule creation, submission of the TDRSS schedule to the NCC for approval, and FOS ingest of NCC approved schedules.

This test demonstrates that an authorized user is able to invoke the necessary tools that allow for the creation of a valid TDRSS contact schedule.

Once the schedule has been created, testing demonstrates that an authorized user is able to invoke the tools necessary for transfer of the schedule to the NCC for approval. Transfer of the schedule to the NCC requires that the FOS-NCC interface be enabled.

Once the schedule has been transferred to the NCC, this test demonstrates that the FOS is capable of ingesting NCC schedule approvals and any schedule requests that have been rejected.

Input:

ECL directives/menu selections to enable the FOS-NCC interface. ECL directives and/or menu selections to invoke the PAS tool(s) necessary for TDRSS contact schedule creation. ECL directives and/or menu selections to transfer the TDRSS contact schedule to the NCC for approval. ECL directives and/or menu selections to configure the FOS for the ingest of NCC approved and rejected contact schedules.

Output:

Event messages and display window updates that confirm the FOS-NCC interface is enabled. Event messages and display window updates that confirm the TDRSS contact scheduling tool has been invoked. Display window updates and menu selections that allow for the creation of a FOS TDRSS contact schedule. Event messages and display window updates confirming that the TDRSS contact schedule has been transferred to the NCC for approval. Event messages and display window updates confirming the approved and rejected schedules have been ingested from the NCC.

Success Criteria:

Analysis of created TDRSS contact schedule to confirm that the schedule creation took place as expected relative to the inputs made during this test. Analysis of contact schedules received by the NCC to confirm that the schedules are received as expected relative to the actual schedules sent by FOS. Analysis of schedule approvals and rejections received by FOS to confirm that the approvals and rejections are received as expected relative to the actual data sent by the NCC.

Test No.: SCH 1070B

Test Title: Schedule Instrument Activity Deviations

Test Support: None

Test Dependencies: Instrument Activity Definitions in FOS database, Timeline, Activity Scheduler Tool, FOS User Interface

Test Description:

This test is designed to verify the FOS PAS capability to support scheduling of instrument activity deviations during the initial phase of scheduling. This test demonstrates that an authorized user is able to: modify existing activities in the mission schedule, incorporate instrument activity deviations into the mission schedule and if necessary, delete obsolete activities from the timeline upon incorporation of deviations. For those activities deleted from the mission schedule, this test verifies that those deleted activities are collected in an activity list for possible rescheduling at a later time.

Input:

Instrument activities that reside in the mission schedule. Instrument deviations for incorporation into the timeline. ECL directives and/or menu selections that modify activities that exist in the mission schedule. ECL directives and/or menu selections to incorporate activity deviations into the mission schedule. ECL directives and/or menu selections to delete activities from the mission schedule and collect in an activity list for possible rescheduling.

Output:

Mission schedule updates that reflect activity modifications, activity deviation incorporation and the deletion of activities. Appropriate event messages and display page updates confirming authorized user inputs and deviations.

Success Criteria:

Analysis of mission schedule to confirm that the schedule represents the modifications, incorporation and deletions performed during activity deviations testing.

Test No.: SCH 1080B

Test Title: Schedule Spacecraft Subsystem Activity Deviations

Test Support: None

Test Dependencies: Subsystem Activity Definitions in FOS database, PAS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS PAS capability to support scheduling of subsystem activity deviations during the initial phase of scheduling. This test demonstrates that an authorized user is able to: modify existing activities in the mission schedule, incorporate subsystem activity deviations into the mission schedule and if necessary, delete obsolete activities from the timeline upon incorporation of deviations. For those activities deleted from the mission schedule, this test verifies that those deleted activities are collected in an activity list for possible rescheduling at a later time.

Input:

Subsystem activities that reside in the mission schedule. Subsystem deviations for incorporation into the timeline. ECL directives and/or menu selections that modify activities that exist in the mission schedule. ECL directives and/or menu selections to incorporate activity deviations into the mission schedule. ECL directives and/or menu selections to delete activities from the mission schedule and collect in an activity list for possible rescheduling.

Output:

Mission schedule updates that reflect activity modifications, activity deviation incorporation and the deletion of activities. Appropriate event messages and display page updates confirming authorized user inputs and deviations.

Success Criteria:

Analysis of mission schedule to confirm that the schedule represents the modifications, incorporation and deletions performed during activity deviations testing.

Test No.: SCH 1090B

Test Title: Receive ASTER Instrument Activity Deviations

Test Support: ASTER ICC (or Simulation), ASTER activity deviations

Test Dependencies: ASTER activity definitions in FOS Database, PAS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the ingest of ASTER activity deviations and resource reservations from the ASTER ICC. This test demonstrates that upon enabling the FOS-ASTER interface, an authorized user is able to ingest the activity deviations and resource reservations for incorporation into the mission schedule.

Input:

ASTER activities that reside in the mission schedule. ASTER activity deviations and resource reservations for transfer from the ASTER ICC. ECL directives and/or menu selection to enable the FOS-ASTER interface and invoke the transfer of activity deviations and resource reservations from the ASTER ICC. ECL directives and/or menu selection to save the deviations and reservations to a directory location for post-test analysis.

Output:

Event messages and/or display page updates confirming the interface is enabled. Event messages and/or display page updates confirming the transfer of the deviations and reservations.

Success Criteria:

Deviations and reservation data transferred to FOS are saved to a file and compared to actual data saved by the ASTER ICC. Activities and reservations received by the FOS is identical to the data sent from ASTER and is in a format that allows for incorporation into the mission plan.

Test No.: SCH 1100B

Test Title: Schedule Microprocessor Load Uplink Activities

Test Support: None

Test Dependencies: PAS, Activity Scheduler Tool, Timeline, Plan Tool, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the scheduling of microprocessor load uplink activities. This test demonstrates the FOS capability to support a user request to uplink a microprocessor load during a specific uplink window. Upon receipt of a user request, the FOS provides the capability to verify the existence of the load specified in the uplink request and that the load is valid over the time period specified. Upon verification that the load exist and is valid for the time period specified, the FOS provides the tools necessary for merging the load into the mission timeline for uplink during the time period provided by the user's request.

Input:

ECL directives and menu selections to submit a user request to the FOS planning & scheduling subsystem. ECL directives and menu selections by the planning & scheduling user to verify the existence of the load with the appropriate FOS directory. ECL directives and menu selections by the planning & scheduling user to verify the load is valid for the uplink period requested. ECL directives and menu selections to merge the uplink of the load into the mission timeline for the operational period requested.

Output:

Event messages confirming the user request for microprocessor load uplink. Event message and display window updates confirming the load is available on the FOS system for uplink to the AM-1 spacecraft. Event messages and display window updates confirming the load is valid during the uplink period specified by the user. Event messages and display window updates confirming the merge of the load uplink into the mission timeline for the operational period requested.

Success Criteria:

Analysis of event history and display window snaps to confirm that only authorized user requests are processed by planning & scheduling. For uplink requests by authorized users, only loads that reside in the appropriate FOS directory that are valid during the uplink period are processed for merging into the mission timeline for uplink.

Test No.: SCH 1110B

Test Title: Schedule Flight Software Load Uplink Activities

Test Support: None

Test Dependencies: PAS, Activity Scheduler Tool, Plan Tool, Timeline, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the scheduling of flight software load uplink activities. This test demonstrates the FOS capability to support a user request to uplink a flight software load during a specific uplink window. Upon receipt of a user request, the FOS provides the capability to verify the existence of the load specified in the uplink request and that the load is valid over the time period specified. Upon verification that the load exist and is valid for the time period specified, the FOS provides the tools necessary for merging the load into the mission timeline for uplink during the time period provided by the user's request.

Input:

ECL directives and menu selections to submit a user request to the FOS planning & scheduling subsystem. ECL directives and menu selections by the planning & scheduling user to verify the existence of the load within the appropriate FOS directory. ECL directives and menu selections by the planning & scheduling user to verify the load is valid for the uplink period requested. ECL directives and menu selections to merge the uplink of the load into the mission timeline for the operational period requested.

Output:

Event messages confirming the user request for flight software load uplink. Event message and display window updates confirming the load is available on the FOS system for uplink to the AM-1 spacecraft. Event messages and display window updates confirming the load is valid during the uplink period specified by the user. Event messages and display window updates confirming the merge of the load uplink into the mission timeline for the operational period requested.

Success Criteria:

Analysis of event history and display window snaps to confirm that only authorized user requests are processed by planning & scheduling. For uplink requests by authorized users, only loads that reside in the appropriate FOS directory that are valid during the uplink period are processed for merging into the mission timeline for uplink.

Test No.: SCH 1120B

Test Title: Schedule RTS Load Uplink Activities

Test Support: None

Test Dependencies: PAS, Timeline, Scheduler Tool, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the scheduling of RTS load uplink activities. This test demonstrates the FOS capability to support a user request to uplink a RTS load during a specific uplink window. Upon receipt of a user request, the FOS provides the capability to verify the existence of the load specified in the uplink request and that the load is valid over the time period specified. Upon verification that the load exist and is valid for the time period specified, the FOS provides the tools necessary for merging the load into the mission timeline for uplink during the time period provided by the user's request.

Input:

ECL directives and menu selections to submit a user request to the FOS planning & scheduling subsystem. ECL directives and menu selections by the planning & scheduling user to verify the existence of the load within the appropriate FOS directory. ECL directives and menu selections by the planning & scheduling user to verify the load is valid for the uplink period requested. ECL directives and menu selections to merge the uplink of the load into the mission timeline for the operational period requested.

Output:

Event messages confirming the user request for RTS load uplink. Event message and display window updates confirming the load is available on the FOS system for uplink to the AM-1 spacecraft. Event messages and display window updates confirming the load is valid during the uplink period specified by the user. Event messages and display window updates confirming the merge of the load uplink into the mission timeline for the operational period requested.

Success Criteria:

Analysis of event history and display window snaps to confirm that only authorized user requests are processed by planning & scheduling. For uplink requests by authorized users, only loads that reside in the appropriate FOS directory that are valid during the uplink period are processed for merging into the mission timeline for uplink.

Test No.: SCH 1130B

Test Title: Schedule Table Load Uplink Activities

Test Support: None

Test Dependencies: PAS, Scheduler Tool, Plan Tool, Timeline, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the scheduling of Table load uplink activities. This test demonstrates the FOS capability to support a user request to uplink a Table load during a specific uplink window. Upon receipt of a user request, the FOS provides the capability to verify the existence of the load specified in the uplink request and that the load is valid over the time period specified. Upon verification that the load exist and is valid for the time period specified, the FOS provides the tools necessary for merging the load into the mission timeline for uplink during the time period provided by the user's request.

Input:

ECL directives and menu selections to submit a user request to the FOS planning & scheduling subsystem. ECL directives and menu selections by the planning & scheduling user to verify the existence of the load within the appropriate FOS directory. ECL directives and menu selections by the planning & scheduling user to verify the load is valid for the uplink period requested. ECL directives and menu selections to merge the uplink of the load into the mission timeline for the operational period requested.

Output:

Event messages confirming the user request for Table load uplink. Event message and display window updates confirming the load is available on the FOS system for uplink to the AM-1 spacecraft. Event messages and display window updates confirming the load is valid during the uplink period specified by the user. Event messages and display window updates confirming the merge of the load uplink into the mission timeline for the operational period requested.

Success Criteria:

Analysis of event history and display window snaps to confirm that only authorized user requests are processed by planning & scheduling. For uplink requests by authorized users, only loads that reside in the appropriate FOS directory that are valid during the uplink period are processed for merging into the mission timeline for uplink.

Test No.: SCH 1140B

Test Title: Check Command Level Constraints & Schedule ATC Uplink Activities

Test Support : None

Test Dependencies: Command Constraint Definitions in the FOS Database, ATC Load, CMS, DMS, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to support the selection of an uplink window for each ATC load. This test demonstrates the EOC users are provided with the capability to determine and schedule the uplink window for an ATC load and that the uplink window corresponds to a real-time communications contact with the spacecraft.

In addition, this test is designed to verify the FOS capability to support the scheduling of ATC load uplink activities. This test demonstrates the FOS capability to support a user request to uplink a ATC load during a specific uplink window. Upon receipt of a user request, the FOS provides the capability to verify the existence of the load specified in the uplink request and that the load is valid over the time period specified. Upon verification that the load exist and is valid for the time period specified, the FOS provides the tools necessary for merging the load into the mission timeline for uplink during the time period provided by the user's request.

Input:

User directives to initialize the EOC workstations into the FOS operational string. User directives to invoke the tool necessary to schedule the acceptable uplink window for a given ATC load based on the real-time contacts scheduled with the spacecraft via TDRSS. ECL directives and menu selections to submit a user request to the FOS planning & scheduling subsystem. ECL directives and menu selections by the planning & scheduling user to verify the existence of the load within the appropriate FOS directory. ECL directives and menu selections by the planning & scheduling user to verify the load is valid for the uplink period requested. ECL directives and menu selections to merge the uplink of the load into the mission timeline for the operational period requested.

Output:

Event messages confirming the uplink window scheduled for the ATC load. Reporting of any scheduling conflicts in determining the ATC load uplink window. Event messages confirming the user request for ATC load uplink. Event message and display window updates confirming the load is available on the FOS system for uplink to the AM-1 spacecraft. Event messages and display window updates confirming the load is valid during the uplink period specified by the user. Event messages and display window updates confirming the merge of the load uplink into the mission timeline for the operational period requested.

Success Criteria:

Successful scheduling of an uplink window for the ATC load that corresponds to a real-time contact with the spacecraft and does not pose any conflict. Analysis of event history and display window snaps to confirm that only authorized user requests are processed by planning & scheduling. For uplink requests by authorized users, only loads that reside in the appropriate FOS directory that are valid during the uplink period are processed for merging into the mission timeline for uplink.

Test No.: SCH 1150B

Test Title: Add ATC Load Uplink to Ground Schedule

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test verifies requirements related to the FOS capability to support the generation of a flight operations ground script based on the contents of a valid DAS as input. This test demonstrates that EOC users are provided the tools necessary to expand the DAS into a valid ground script using expansion definitions found in the project database. The generated ground script will be constraint checked against definitions in the project database. The conflict-free ground script will include directives to initiate an expected state check at the start of the spacecraft contact (i.e. at the beginning of the ground script execution). This state check is a comparison of the expected values of selected telemetry parameters, as predicted by the CMS, to actual values as real-time telemetry is received.

In addition, this test is designed to verify the FOS capability to support the merge of the ATC load uplink into the TD-1 ground script. This test demonstrates that an authorized user is provided the necessary tools to update the ground script for TD-1 to reflect the scheduling of uplink activities for an ATC load. The uplink of the ATC load is added to the ground script and reflects an uplink time within the user requested uplink window.

Input:

User directives to configure EOC workstations into the FOS operational string. User directives to invoke the tools necessary for DAS expansion into a flight operations ground script. User directives to invoke the necessary constraint check of the ground script against database definitions. Valid ATC load available for uplink scheduling. User scheduling request to uplink the ATC load during a given operational period. ECL directives and menu selections to schedule the ATC load uplink and update the corresponding ground script for TD-1. ECL directives and menu selections to view the ground script for TD-1.

Output:

Event messages confirming the expansion has been invoked and when the expansion is complete. Generated ground script residing at the appropriate directory location. Event messages confirming the constraint check of the ground script and a reporting of all constraint violations. Event messages and display window updates confirming the scheduling activities for the ATC load uplink. Event messages and display window updates confirming the ground script for TD-1 has been updated to include the uplink of the ATC load.

Success Criteria:

Successful expansion of DAS into ground script that corresponds to DAS activity and time period. Successful constraint check of the ground script with conflict resolution capability.

Review of ground script for TD-1 is conducted to confirm that the appropriate updates have been made to reflect the scheduling of the ATC load uplink during the corresponding operational period.

Test No.: SCH 1160B

Test Title: Receive Late Change Requests & Check Activity Level Constraints

Test Support: Instrument and Subsystem IST Capabilities (or Simulation)

Test Dependencies: PAS, Activity Scheduler Tool, Plan Tool, Timeline, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support authorized user requests to make late changes to the activity schedule for a given operational period. This test demonstrates that an authorized user is able to submit activity late changes to the planning and scheduling subsystem for processing and eventual merging into the mission schedule. Late change requests generated by unauthorized users are recognized by the FOS and rejected prior to any processing of the activity changes.

Activity late changes received by the authorized user are processed by the FOS and the necessary changes are made to the mission schedule. Changes to the mission schedule may include editing of activities presently scheduled, the generation of new activities for a given operational period that are merged into the mission schedule, and the removal of activities that are no longer valid from the mission schedule. The FOS performs the appropriate management to assure that only valid activities exist in the mission schedule after late change updates are complete.

In addition, this test is designed to verify the FOS capability to support command level constraint checking for late changes incorporated into the mission schedule and expanded into an ATC load. This test demonstrates that upon expansion for late change activities into absolute time commands, the FOS provides the user the tools necessary to verify the commands against command definitions that reside in the project data base (PDB). The user is provided with the tools necessary to include commands in the mission schedule that violate soft constraints. For commands that violate hard constraints, the user is provided with the tools necessary to make changes or delete the command associated with the violation. Testing confirms that the FOS does not allow commands to be included in the mission schedule if those commands violate hard constraint definitions in the PDB.

Input:

A valid mission schedule and valid activity late change requests available for this test case. ECL directives and menu selections to generate an authorized user request for activity late changes. ECL directives and menu selections to initiate the processing of late changes received from the authorized user. ECL directives and menu selections to expand the activities into corresponding absolute time commands. ECL directives and menu selections to invoke the tools necessary for command level constraint checking. ECL directives and menu selections to include or exclude in the ATC, any commands that are reported as violating soft constraints. ECL directives and menu selections to edit or delete from the ATC load those commands that are found to violate hard constraints.

Output:

Event messages and display window updates confirming the receipt of activity late changes from an authorized user. Event messages and display window updates confirming the processing of late changes has been initiated. Event messages and display window updates confirming the tool has been invoked for constraint checking of absolute time commands. Event messages and display window updates confirming all commands that violate constraints, the specific constraints violated and whether the constraints are defined as hard or soft. Event messages and display window updates confirming those commands that have been included in the ATC load regardless of soft constraint violations. Event messages and display window updates confirming user inputs to eliminate commands that violate hard constraint definitions.

Success Criteria:

A review of the mission schedule to confirm that the appropriate late changes have been incorporated. Activity updates, additions and activity deletions made during testing should be accurately reflected in the mission schedule. Review of the mission schedule to confirm that unauthorized late change requests made during testing did not impact the contents of the mission schedule. User capability to print a hardcopy of the constraint definitions residing in the PDB. User capability to print a hardcopy of command constraint violations detected during constraint check. User capability to print the contents of the ATC load. Analysis of hardcopy reports to confirm the following: all constraint violations have been detected, commands that violate hard constraints are not included in the ATC load, commands that violate soft constraints that the user has allowed to remain in the ATC load are resident in the load file, commands that violate soft constraints that the user does not allow to remain in the ATC load are not included in the ATC load.

Test No.: SCH 1170B

Test Title: Schedule ATC Uplink Activities for Late Changes

Test Support: None

Test Dependencies: PAS, Activity Scheduler Tool, Plan Tool, Timeline, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the uplink scheduling of ATC loads associated with valid late changes. This test demonstrates that an authorized user is provided with the tools necessary to request that the ATC load be uplinked during a particular operational period. Upon receipt of the uplink window request, the FOS provides capabilities to verify the existence of the load specified in the uplink request and verify that the load is valid over the time period specified in the uplink request. Upon verification that the load is available and valid over the time period specified, the ATC load is scheduled for uplink as requested.

Input:

Valid ATC load representing late changes available for uplink. ECL directives and menu selections to generate an authorized user uplink request. ECL directives and menu selections to verify that the ATC load requested for uplink exists in the load catalog. ECL directives and menu selections to verify that the ATC load requested for uplink is valid over the operational period of the uplink window. ECL directives and menu selections to schedule the valid ATC for uplink.

Output:

Event messages and display window updates confirming the initiation of a the valid uplink requests. Event messages and display window updates confirming the ATC load requested for uplink does exist in the load catalog file. Event messages and display window updates confirming the ATC load is valid for the operational period specified in the uplink request.

Success Criteria:

The FOS recognizes authorized user uplink requests versus unauthorized user uplink requests, processes all valid requests and rejects unauthorized uplink requests. Appropriate FOS reporting of ATC loads that exist in the load catalog file. Appropriate FOS reporting of ATC loads that are valid during the operational period specified in the uplink requests. Analysis of page snaps and event history reports may be necessary to confirm this information.

Test No.: SCH 1180B

Test Title: Load Management - Maintain of Microprocessor Catalog

Test Support : None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the load management maintenance of the microprocessor load catalog. This test demonstrates that the FOS provides the necessary tools for managing those microprocessor loads that exist at the EOC and are available for uplink to the AM-1 spacecraft. As microprocessor loads are added to and deleted from the FOS system, the load catalog directory shall update accordingly to reflect the actual loads available for uplink.

Input:

Valid microprocessor loads available for inclusion in the load catalog. ECL directives and menu selections to add a microprocessor load to the catalog for uplinking. ECL directives and menu selections to delete a microprocessor load from the catalog.

Output:

Event messages and display window updates confirming the load catalog has updated to reflect microprocessor loads that have been added and deleted from the catalog file.

Success Criteria:

Load catalog display window and event history report review to confirm that catalog maintenance is accurately reflecting the loads available for uplink.

Test No.: SCH 1190B

Test Title: Receive Flight Software Load Contents from SDVF

Test Support: SDVF (or Simulation)

Test Dependencies: FOS User Interface, DMS, CMS

Test Description:

This test is designed to verify the FOS capability to support the ingest of flight software load content files from the Software Development & Verification Facility (SDVF). This test demonstrates that an authorized user is provided the tools necessary to enable the FOS-SDVF interface and initiate the transfer of a valid flight software load content file to the FOS for uplink processing. Once transferred to the FOS, the user is provided with the appropriate menu options for saving the load contents to the necessary FOS directory for further processing.

Input:

Valid flight software load content available for transfer into the FOS command management subsystem. ECL directives and menu selections to invoke the FOS-SDVF interface. ECL directives and menu selections to invoke the transfer and storage of the flight software load contents from the SDVF.

Output:

Event messages and display window updates confirming that the FOS-SDVF has been initiated. Event messages and display window updates confirming the transfer of the flight software contents to the FOS. Event messages and display window updates confirming the flight software contents have been saved at the FOS for further uplink processing.

Success Criteria:

Analysis of the actual flight software load contents sent by the SDVF and the load contents file received by the FOS is performed to confirm that the contents were not corrupted during the transfer process.

Test No.: SCH 1200B

Test Title: Validate Flight Software Load Contents ID

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the validation of flight software loads that are received from the SDVF. This test demonstrates that an authorized scheduling user is provided the tools necessary to perform validation of the flight software load contents prior to uplink processing. The user is provided the capability to validate the source ID, destination ID, and the size of the binary format load content. The FOS provides appropriate notification to the user in the event that the load content fails the validation check.

Input:

ECL directives and menu selections by the authorized user to choose the load content file to be validated. ECL directives and menu selections by the authorized user to invoke the tool necessary to initiate the validation of the load content file.

Output:

Event messages and display window updates confirming the load content file selected for validation. Event messages and display window updates confirming the tool necessary for validation has been invoked. Event messages and display window updates confirming the results of the validation and any additional input required of the user to complete the validation process.

Success Criteria:

Analysis of the load contents file and validation report to confirm the FOS performed the validation process and reported all known validation failures.

Test No.: SCH 1210B

Test Title: Generate Flight Software Uplink Load

Test Support: None

Test Dependencies: CMS, DMS, PAS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the generation of a flight software uplink load from the flight software load contents received from the SDVF. This test demonstrates that an authorized user is provided with the tools necessary to select a flight software load content file and generate from the contents a flight software load in the appropriate format for uplink to the AM-1 spacecraft. The flight software load generated includes all of the necessary load control commands. Examples of load control commands may include: load initiate, select table, load commit and buffer switch.

Input:

ECL directives and menu selections to chose the flight software load content file to be used for uplink load generation. ECL directives and menu selections to initiate the generate the tools necessary for uplink load generation.

Output:

Event messages confirming the load content file selected, the initiation of the uplink load generation process and the notice to the user that the process is complete and the flight software load is available for uplink to the spacecraft.

Success Criteria:

Analysis of the uplink load generated and comparison of the final product to the AM-1 Interface Control Documents (ICDs) and CCSDS ICDs to confirm the uplink load has been generated in accordance with the formats defined in the above mentioned documents.

Test No.: SCH 1220B

Test Title: Load Management - Maintain of Flight Software Catalog

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the load management maintenance of the flight software load catalog. This test demonstrates that the FOS provides the necessary tools for managing those flight software loads that exist at the EOC and are available for uplink to the AM-1 spacecraft. As flight software loads are added to and deleted from the FOS system, the load catalog directory shall update accordingly to reflect the actual loads available for uplink.

Input:

Valid flight software loads available for inclusion in the load catalog. ECL directives and menu selections to add a flight software load to the catalog for uplinking. ECL directives and menu selections to delete a flight software load from the catalog.

Output:

Event messages and display window updates confirming the load catalog has updated to reflect flight software loads that have been added and deleted from the catalog file.

Success Criteria:

Load catalog display window and event history report review to confirm that catalog maintenance is accurately reflecting the loads available for uplink.

Test No.: SCH 1230B

Test Title: Validate RTS Load Contents

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the validation of RTS load contents generated by an authorized user. This test demonstrates that an authorized user is provided with the tools necessary to perform RTS load content validations prior to the contents being prepared for uplink to the spacecraft. Validation of the load contents includes a comparison of the command mnemonics against definition residing in the PDB, as well as check of the relative time commands against command constraints defined in the PDB. The user is notified of command level constraint violations and is provided the capability to allow soft constraint violations to remain in the RTS load. The FOS provides the capability to prohibit all hard constraint violations from remaining in the RTS load for uplink to the spacecraft.

Input:

RTS load content files available for validation. ECL directives and menu selections to invoke the tool necessary for RTS load content validation. ECL directives and menu selections to chose the RTS load content file to be validated. ECL directives and menu selections to override and soft constraint violations. ECL directives and menu selections to prohibit and edit and hard constraint violations detected in the content file.

Output:

Event messages and display window updates confirming the tool necessary for RTS validation has been invoked . Event messages and display window updates confirming the RTS content file selected for validation. Event messages and display window updates notifying the user of any violations detected during the validation process. Event message and display window updates confirming the completion of the validation process.

Success Criteria:

Analysis of the load content file and event history report in comparison to the RTS definitions that reside in the PDB. The analysis is to confirm that all violations are being detected by the FOS during validation.

Test No.: SCH 1240B

Test Title: Load Management - Maintain of RTS Uplink Load Catalog

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the management of RTS loads available for uplink to the spacecraft. This test demonstrates that the FOS is capable of maintaining a catalog of RTS loads that are available in the EOC for uplink to the spacecraft. An authorized user is provided with the tools necessary to generate an RTS Catalog Report listing the load content name associated with each RTS load available for uplink in the EOC. In addition to the RTS Catalog Report, an authorized user is capable of generating an RTS Map Report listing the name of the load content that is currently loaded into each RTS buffer.

Input:

ECL directives and menu selections to introduce new RTS loads to the FOS system and delete various RTS loads from the FOS system. ECL directives and menu selections to generate an RTS Catalog Report. ECL directives and menu selections to generate an RTS Map Report.

Output:

Event messages and display window updates confirming new RTS loads available for uplink and those RTS loads that have been deleted. Event messages confirming the generation of the RTS Catalog Report and RTS Map Report. Hardcopy printouts are generated for each report.

Success Criteria:

Analysis of the Event History Report, RTS Catalog and RTS Map Reports to confirm that the RTS loads available on the EOC for uplink to the spacecraft are being accurately managed by the command management subsystem. The RTS Catalog Report accurately reflects actual loads available and the RTS Map Report accurately reflects the actual load content that resides in each RTS buffer.

Test No.: SCH 1250B

Test Title: Validate Table Load Contents

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the validation of Table load contents generated by an authorized user. This test demonstrates that an authorized user is provided with the tools necessary to perform Table load content validations prior to the contents being prepared for uplink to the spacecraft. Validation of the table load contents includes a comparison of the table fields against definitions residing in the PDB. The user is notified of table definition violations.

Input:

ECL directives and menu selections to invoke the tool necessary for table load validation. ECL directives and menu selections to chose the table load being validated. ECL directives and menu selections in response to system prompts during table load validation.

Output:

Event messages and display window updates confirming the table load validation tool has been invoked and the appropriate load file has been selected. Event messages and display window updates confirming violations detected during load validation and the completion of the validation process.

Success Criteria:

Analysis of the load content report, event history report, constraint violations report and the constraint definitions report to confirm that the FOS is detecting all violations during the validation process.

Test No.: SCH 1260B

Test Title: Load Management - Maintain of Table Uplink Load Catalog

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the load management of Table Loads available in the EOC for uplink to the spacecraft. This test demonstrates that the FOS is capable of maintaining a catalog of loads available in the EOC for uplink and that this catalog is accurately updated upon the addition and deletion of Table loads from the FOS system. Authorized users are provided with the tools necessary to generate a Table Load Catalog Report listing load content name and valid uplink window associated with each table load available for uplink.

Input:

ECL directives and menu selections to introduce new Table loads into the FOS system and to delete various Table loads from the FOS system. ECL directives and menu selections to invoke the generation of a Table Load Catalog Report at various stages of this test.

Output:

Event messages and display window updates confirming the addition and deletion of Table loads from the FOS. In particular the Table Load Catalog display page is accurately reporting the current loads available for uplink at the EOC. Hardcopy of Table Load Catalog Report.

Success Criteria:

Analysis of Event History Report and Table Load Catalog Report to confirm that the FOS is accurately managing the current loads available for uplink to the spacecraft.

Test No.: SCH 1270B

Test Title: Display ATC & RTS Load Buffers

Test Support: None

Test Dependencies: FOS User Interface, DMS

Test Description:

This test is designed to verify the FOS capability to support ATC buffer and RTS buffer display capabilities. This test demonstrates that an authorized user is able to invoke a window display that provides command-to-memory map information for the ATC buffer. Likewise, an authorized user is able to invoke a similar window that displays the map of the RTS buffers.

Information that an authorized user is able to obtain from the ATC buffer display includes: executed commands, commands awaiting execution, command inhibit groups, ATC pseudo-ops, critical commands, hazardous commands, empty areas, instrument specific commands as well as subsystem specific commands.

Information that an authorized user is able to obtain from the RTS buffer display includes: critical commands, hazardous commands, instrument specific commands, subsystem specific commands and RTS ownership.

Input:

Valid ATC loads and RTS loads available for uplink. ECL directives and menu selections to invoke the ATC buffer display window. ECL directives and menu selections to invoke the RTS buffer display window. ECL directives and menu options to snap these displays

Output:

Snap hardcopy of the ATC buffer display and RTS buffer display

Success Criteria:

Analysis of the information included in the buffer display windows to confirm that the information provided for the user is in compliance with the associated level 3 and level 4 requirements.

Test No.: SYS 1000B

Test Title: Display Hardware/Software Status

Test Support: None

Test Dependencies: Concurrent logical string activity; logical string reconfigurations; EOC/IST connections to logical strings.

Test Description:

This test is designed to verify the display of hardware/software status at the EOC. This includes the display of FOS equipment status (i.e. "Real-time Server 1 on", "DMS Server 2 off", etc.) and user station displays showing the connection between each active user station and established ground system configurations.

Following real-time string initialization at the EOC, equipment configuration and software status displays are invoked. A real-time logical string is initialized in support of the operational configuration. Invoked status/equipment displays are printed to verify accurate mirroring of equipment and user station status following real-time string configuration.. These steps are repeated for concurrent string configuration, (i.e. adding simulation and replay strings in support of the operational, test and training modes). Specified user stations are then configured to support existing logical string configurations while others are reconfigured to support different configurations. Following each user station configuration/reconfiguration iteration, equipment and user station configuration displays are printed to verify accurate mirroring of EOC equipment and user station status.

Input:

ECL directives to sign-on, initialize and alter string equipment and configurations. ECL directives to display/print equipment and user station configuration displays.

Output:

Equipment and user station configuration displays/printouts.

Success Criteria:

Equipment and user station displays/printouts accurately mirror EOC configuration, both before and after each reconfiguration activity. This includes default equipment configuration, powering equipment on/off and equipment string reconfiguration assignments. String resource and user station configuration displays available at IST user stations and match status displays at the EOC.

Test No.: CMD 1000B

Test Title: Command Verification - Receipt Verification

Test Support: Telemetry Driver/Source

Test Dependencies: DMS, CMD, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to verify the receipt of real-time commands by the AM-1 spacecraft. This test demonstrates that an authorized user is provided with the necessary tools to verify the successful receipt of commands by the spacecraft. The user is able to verify the successful receipt of commands by the AM-1 spacecraft based on the Command Link Control Word (CLCW) bit(s) that is transmitted to the EOC as part of the CCSDS telemetry packets. Based on the CLCW bit(s) being set or not, the FOS is able to report the receipt of commands by the AM-1 spacecraft as either a success or failure.

Input:

Valid AM-1 spacecraft commands available for uplink. Valid telemetry data sets available to be transferred to the EOC and includes CLCW bit data. ECL directives and menu selections to initiate command uplink and telemetry data flow into the EOC. ECL directives and menu selections to display the command verification window at the EOC workstation.

Output:

Event messages and display window updates reporting the success or failure of real-time command uplink, and receipt by the spacecraft.

Success Criteria:

Analysis of CCSDS telemetry packets received by the FOS, event history reporting and snaps of command verification display windows to confirm that based on the CLCW data bit(s), the FOS is accurately reporting the status of command receipt by the AM-1 spacecraft.

Test No.: CMD 1010B

Test Title: Load Processing - Load Command Validation

Test Support: None

Test Dependencies: DMS, CMS, CMD, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the command validation checks performed by the command subsystem prior to uplink of a load to the spacecraft. This test demonstrates the command subsystem capability to verify the existence of a load upon receipt of a load uplink request from an authorized user. Upon verification that the load exist, the command subsystem performs validation checks by verifying pertinent load parameters to ensure proper load identification prior to uplink. Pertinent load parameters include spacecraft id, date and time of the uplink window and the destination id of the load. The authorized user is notified of all load validation failures detected by the command subsystem prior to any attempt to uplink the load to the spacecraft.

Input:

ECL directives and menu options to make an authorized request to uplink a valid load.

Output:

Event messages and display window updates confirming the load that is selected for uplink. Event messages and display window updates confirming all load validation failures detected by the command subsystem.

Success Criteria:

Analysis of event history report, validation report in comparison to the contents of the loads to be uplinked to confirm that all validation failures are being detected and reported to the user.

Test No.: CMD 1020B

Test Title: Load Processing - Load Transmission

Test Support: EDOS (or Simulation)

Test Dependencies: CMD, TLM, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support command transmission to the AM-1 spacecraft. This test demonstrates that an authorized user is provided the tools necessary to transmit command in the correct EDOS/CCSDS format to the AM-1 spacecraft. Testing verifies the uplink transmission of Absolute Time Commands (ATCs), Relative Time Sequences (RTS), flight software loads, table loads, instrument microprocessor loads and real-time critical/hazardous commands. Command transmission is performed by the authorized user via ground script execution, command procedures and manual entry at the CAC workstation. All commands and loads are merged into one telemetry stream for uplink to the spacecraft and the user is notified as to the success or failure of the transmission.

Input:

Valid instrument and spacecraft commands available for uplink. Valid instrument and spacecraft loads with associated ground script available for execution/uplink. ECL directives and menu selections to enable the FOS-EDOS interface if necessary. ECL directives and menu selections to chose various real-time commands and initiate the command transmission process. ECL directives and menu options to select various loads for command transmission via ground script control.

Output:

Event message and display window updates confirming the status of the FOS-EDOS interface. Event message and display window update confirming the commands/loads that have been selected for uplink to the spacecraft. Event message and display window updates confirming the status of command transmission to EDOS as a success or failure.

Success Criteria:

Analysis of the command blocks captured at the EDOS/AM-1 (SIM) to compare to the command blocks transmitted from the FOS to confirm that commands are being transmitted and received in the EDOS/CCSDS packet format and are in compliance with the interface requirements as detailed in the Interface Control Document/Interface Requirements Document (ICD/IRD).

Test No.: CMD 1030B

Test Title: Memory Management

Test Support : None

Test Dependencies: CMS, DMS, CMD, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the creation and maintenance of a ground reference image for spacecraft memory. This test demonstrates that the FOS provides the tools necessary to accurately maintain a ground reference image of the expected contents of spacecraft memory. The FOS is capable of updating the ground master image by overwriting the appropriate portion of the ground reference image with a load image when the load has been successfully uplinked.

In addition this test demonstrates that the FOS is capable of maintaining an ATC command-to-memory map that consist of the contents of each location in the ATC buffer. The FOS is capable of updating the ATC command-to-memory map when an ATC load has been successfully uplinked.

Testing verifies that an authorized user is able to display the ground reference image and ATC buffer image at an EOC workstation. In addition, the user is able to invoke the print-out of reports for the image and buffer contents.

Input:

Valid image and buffer content information for population of the ground reference image and ATC command-to-memory map. Various ATC loads and commands for uplink to the AM-1 spacecraft. ECL directives and menu options to uplink loads and commands to the spacecraft. ECL directives and menu options to select window displays for command uplink and reference image contents. ECL directives and menu options to select the printout of the ground reference image and ATC command-to-memory map.

Output:

Event messages and display window updates confirming the uplink of loads and commands. Event messages and display window updates confirming the update of the ground reference image and ATC buffer image as loads and commands are successfully uplinked and loaded. Hardcopy reports of reference image and ATC buffer image when invoked by an authorized user.

Success Criteria:

Analysis of the contents of the ground reference image and ATC buffer image (hardcopy printouts) in comparison to a dump of the spacecraft memory to confirm that the images accurately reflects the loads and commands that have been uplinked to the spacecraft.

Test No.: CMD 1040B

Test Title: Memory Dump Ingest

Test Support: Memory Dump Driver

Test Dependencies: DMS, CMD, CMS, TLM,

Test Description:

This test is designed to verify the FOS capability to support a spacecraft memory dump request, processing of the dump telemetry and performance of a memory dump compare against the contents of the ground reference image. This test demonstrates that an authorized user is provided the tools necessary to invoke a memory dump request. The FOS is capable of detecting and notifying the user of the start of a spacecraft computer memory dump and storing the computer memory dump collection separately from other down linked telemetry. The FOS is capable of notifying the user when the dump collection is complete and allows the authorized user to invoke a comparison of the dump data collected against the ground reference image that is maintained by the command management subsystem.

Input:

ECL directives and menu options to initiate a spacecraft computer memory dump request. ECL directives and menu options to configure the FOS for memory dump processing and receipt of dump telemetry.

Output:

Event message and display window updates confirming that the FOS has detected the start of the memory dump collection. Event message and display window updates confirming the FOS has detected the completion of the memory dump collection.

Success Criteria:

Analysis of the dump files collected and event history report to confirm that the entire dump has been collected by the FOS and that the memory dump collected has been stored to a separate file from other telemetry processed.

Test No.: TLM 1000B

Test Title: Data Quality Determination

Test Support: ETS or data driver with capability of scripting bad quality data.

Test Dependencies: Depth of test depends on level of bad quality data filtering performed by EDOS.

Test Description:

This test is designed to verify the ability to report on telemetry packets containing bad quality status. Following sign-on, alphanumeric telemetry pages which include parameter Decom value and associated flag display are invoked at the EOC. The telemetry data driver is initiated, broadcasting housekeeping telemetry onto the FOS LAN in the form of EDUs. As packets marked as bad quality are received from EDOS, alphanumeric and event displays are viewed/printed. Parameter flag values residing on alphanumeric displays and event messages are analyzed post-test to ensure quality flags displayed are for parameters residing in bad quality packets, and that event messages/alarms are generated during the bad quality data receipt condition(s). The above steps are repeated for health & safety telemetry.

Input:

ECL directives to configure the EOC for telemetry processing and to print displays.

Output:

Alphanumeric and event page displays/printouts. Housekeeping and health & safety packet dumps.

Success Criteria:

Quality flags are displayed for all housekeeping/health & safety parameters residing in a bad quality packet. For each parameter, upon the first instance of good quality data for that parameter, the bad quality flag is overwritten with the "active" flag. Event messages reflect accurate bad quality data - good quality data transitions.

Test No.: TLM 1010B

Test Title: Context Dependent Decommutation

Test Support: ETS or data driver with data scripting capabilities.

Test Dependencies: Validated PDB with context dependent definitions supporting up to 16 context switch combinations. Scripted housekeeping and health & safety telemetry packets including the entire range of context values for specified parameters; Scripted telemetry data including bad quality data packets. Alphanumeric display pages containing context dependent and associated parameters.

Test Description:

This test is designed to verify the ability to decommutate telemetry parameters which are dependent upon the value of other defined telemetry parameters (i.e. word (Y) in location packet (X) represents several different parameters, depending on the current value of its key parameter (Z)).

Following sign-on, alphanumeric telemetry pages which include parameter and associated context dependent parameter Decom/EU values are invoked at the EOC user station. Housekeeping telemetry packets in the form of EDUs are broadcast onto the FOS LAN in the form of EDUs. As the packets are decommutated, and the values of parameters and associated context switches change, alphanumeric pages are printed and analyzed off-line. Bad quality packets are transmitted causing bad quality and/or static conditions for context switch keys and associated parameters. Alphanumeric page displays are printed and analyzed off-line to assure decommutation and associated EU conversion does not take place for these parameters.

Input:

ECL directives to configure the EOC for telemetry processing, and to display/print alphanumeric display pages.

Output:

Alphanumeric page displays/printouts.

Success Criteria:

The decommutated/EU value displayed for each context dependent parameter matches the PDB conversion definition based on its associated key parameter value. Any context dependent parameter or key parameter with an associated "bad quality" or "static" flag is not decommutated.

Test No.: TLM 1020B

Test Title: CODA Reception and Storage

Test Support: NCC Interface

Test Dependencies: NCC interface functionality

Test Description:

This test is designed to verify the ability to receive CODA reports from EDOS and store the report information in the DMS archive during a TDRSS Support Session (TSS).

The test begins with initialization of the EOC and real-time string configuration. CODA file transmission is initiated from EDOS, simultaneous to transmission of real-time telemetry. As CODA files are received, event message displays are viewed to verify incoming CODA files. Following file transmission, the associated CODA directory residing in the DMS is browsed to verify archiving and management of all incoming CODA files received by the FOS.

Input:

ECL directives to initialize the EOC, and to perform DMS browse functions.

Output:

DMS archive directories

Success Criteria:

The reception of all CODA files is marked by an event message, displayed at all connected user stations. All CODA files received are archived in the DMS, in the associated CODA directory. No data integrity loss of CODA files during the transmission and archiving process.

Test No.: TLM 1030B

Test Title: Limits Processing

Test Support: ETS or data driver with data scripting capabilities.

Test Dependencies: Validated PDB with red/yellow limit set definitions for health & safety, housekeeping parameters. Scripted housekeeping and health & safety telemetry packets including raw values corresponding to the entire range of corresponding limit sets for specified parameters; Scripted telemetry data including bad quality data packets. Alphanumeric display pages containing parameters and flag information pertinent to this test.

Test Description:

This test is designed to verify the ability to limit check telemetry parameters during the decommutation process based on limits definitions in the operational PDB and report on limits violations via event message and alphanumeric page display flag fields.

Following sign-on, alphanumeric telemetry pages are displayed at the EOC. Scripted housekeeping telemetry packets containing raw values causing parameter limit violations are transmitted onto the FOS LAN. As the packets are decommutated, and the Decom values of parameters and associated limits flags change, alphanumeric pages are printed and analyzed off-line to ensure displayed limit flag fields match PDB definitions for the displayed raw or EU value. Event pages are printed and analyzed off-line to ensure all limits violations are reported, for instances where individual parameters violate limit definitions, and when individual parameters come back within defined limit bounds.

Input:

ECL directives to configure the EOC for telemetry processing, and to display/print alphanumeric display pages.

Output:

Alphanumeric page displays and event page displays/printouts.

Success Criteria:

All limits violation flags as seen on alphanumeric telemetry displays match raw or EU limit definitions as defined in the AM-1 PDB. All limits in the "warning range" (i.e. yellow limits low, yellow limits high) result in a yellow limits flag. All limits in the "alarm range" (i.e. red limits low, red limits high) result in a red limits flag. Limit violation messages are displayed for each occurrence of a limit violation by any of the decommutated parameters valid for the decommutated telemetry stream/format - a warning message for all yellow limits violations and an alarm message for all red limits violations. All parameters decommutated from bad quality data packets are not limit checked.

Test No.: TLM 1040B

Test Title: Delta Limits Processing

Test Support: ETS or data driver with data scripting capabilities.

Test Dependencies: Validated PDB with delta limit definitions for health & safety, housekeeping parameters. Scripted housekeeping and health & safety telemetry packets including raw values corresponding to delta limit violations for specified parameters; Scripted telemetry data including bad quality data packets. Alphanumeric display pages containing parameters and flag information pertinent to this test.

Test Description:

This test is designed to verify the ability to delta limit check telemetry parameters during the decommutation process based on delta limits definitions in the operational PDB and report on delta limit violations via event message and alphanumeric page display flag fields.

Following sign-on, alphanumeric telemetry pages are displayed at the EOC. Scripted housekeeping telemetry packets containing raw values causing parameter delta limit violations are transmitted onto the FOS LAN. As the packets are decommutated, and the Decom values of parameters and associated limits flags change, alphanumeric pages are printed and analyzed off-line to ensure displayed delta limit flag fields match PDB definitions for the displayed raw or EU value. Event pages are printed and analyzed off-line to ensure all delta limits violations are reported, for instances where individual parameters violate delta limit definitions, and when individual parameters comes back within defined delta limit bounds.

Input:

ECL directives to configure the EOC for telemetry processing, and to display/print alphanumeric display pages.

Output:

Alphanumeric page displays and event page displays/printouts.

Success Criteria:

All delta limit violation flags as seen on alphanumeric telemetry displays match raw delta limit definitions as defined in the AM-1 PDB. Delta limit violation messages are displayed for each occurrence of a delta limit violation by any of the decommutated parameters valid for the decommutated telemetry stream/format. All parameters decommutated from bad quality data packets are not delta limit checked.

Test No.: TLM 1050B

Test Title: Limits Processing Based on Context Key

Test Support: ETS or data driver with data scripting capabilities.

Test Dependencies: Validated PDB with limit definitions based on context parameters. Scripted housekeeping, health & safety, diagnostic telemetry packets including the raw values to switch limits boundaries. Scripted telemetry data including bad quality data packets. Alphanumeric display pages containing parameters associated with this test.

Test Description:

This test is designed to verify the ability to provide limit checking using defined limit boundaries based on an associated key parameter value.

Following sign-on, alphanumeric telemetry pages are displayed at the EOC. Scripted housekeeping telemetry packets containing raw values causing parameter limit violations and key parameter value changes are transmitted onto the FOS LAN. As the packets are decommutated and values of parameters and associated limits flags change, alphanumeric pages are printed and analyzed off-line to ensure displayed limit flag fields match PDB limits definitions when the value of its context key is applied. The above steps are repeated for health & safety and diagnostic telemetry.

Input:

ECL directives to configure the EOC for telemetry processing, and to display/print alphanumeric display pages.

Output:

Alphanumeric page displays and event displays/printouts.

Success Criteria:

All limits violation flags as seen on alphanumeric telemetry displays match raw or EU limit definitions as defined in the AM-1 PDB when applying the context dependent limit set. All limits in the "warning range" (i.e. yellow limits low, yellow limits high) result in a yellow limits flag. All limits in the "alarm range" (i.e. red limits low, red limits high) result in a red limits flag. Limit violation messages are displayed for each occurrence of a limit violation by any of the decommutated parameters valid for the decommutated telemetry stream/format.

Test No.: TLM 1060B

Test Title: Limits Sense Interval

Test Support: ETS or data driver with data scripting capabilities.

Test Dependencies: Validated PDB with red/yellow/high/low limit set definitions for health & safety, housekeeping parameters. Scripted housekeeping and health & safety telemetry packets including raw values corresponding to the entire range of corresponding limit sets for specified parameters. Alphanumeric display pages containing parameters and flag information pertinent to this test.

Test Description:

This test is designed to verify the ability to alter the reporting of limit violation messages without affecting the flagging of limit messages.

Following sign-on, alphanumeric telemetry pages are displayed at the EOC. Scripted housekeeping telemetry packets containing raw values causing parameter limit violations are transmitted onto the FOS LAN. Limit sense changes are performed by the EOC ground controller, both on a parameter level and on spacecraft/subsystem levels. As data packets are decommutated, and the Decom values of parameters and associated limits flags change, alphanumeric pages are printed and analyzed off-line; the comparison of UTC time fields of sequential limit event messages associated with a given parameter ensure accurate limit sensing intervals. Limit flags associated with displayed parameters are compared against limit event/alarm messages to ensure alphanumeric limit flag displays are not affected by the selected sense interval.

Input:

ECL directives to configure the EOC for telemetry processing, to display/print alphanumeric display pages, and to change the limit sense interval

Output:

Alphanumeric page displays and event page displays/printouts.

Success Criteria:

Limit event/alarm messages are issued at the default rate for each parameter until the limit sense interval is changed. Following the interval change, limit event/alarm message output for each associated violated parameter matches the sense interval. Sense interval selection may be made for a selected parameter, selected instrument or selected spacecraft subsystem. Only parameters associated with the selected subsystem/spacecraft are affected by the interval change; limit event/alarm message display for other parameters continues at the default rate. Alphanumeric page display of flag information is not affected by the limit sense interval changes, and limit flags match violations at each limit violation occurrence.

Test No.: TLM 1070B

Test Title: Real-time Telemetry Strip Chart Display

Test Support: ETS or data driver with data scripting capabilities.

Test Dependencies: Validated operational telemetry data

Test Description:

This test verifies the ability to display real-time spacecraft and instrument telemetry via strip chart display pages, which allow the user to plot telemetry data parameters from different times on the same graph.

The test begins with the initialization of a real-time logical string, initialization of an EOC user station in support of the real-time string and selection of the strip chart function via ECL directive or menu selection. Several strip charts are displayed, with parameters selected in support of decommutated housekeeping, health & safety and standby telemetry formats. Following parameter selection, the telemetry data driver is initialized, broadcasting housekeeping data packets. As strip charts are updated with real-time decommutated/EU values, the strip charts are printed at various time intervals. Via post-analysis, strip chart values are compared with scripted telemetry values to ensure data integrity and accurate representation of telemetry Decom/EU on the strip chart displays. The above steps are repeated for the charting of health & safety telemetry and diagnostic telemetry.

Input:

ECL directives to configure the EOC, select telemetry strip chart display and parameter selection options. UNIX directives to configure and control the Telemetry Data Driver.

Output:

Strip chart and alphanumeric page displays and printouts.

Success Criteria:

All telemetry values represented on strip chart displays match real-time scripted values for the charted time period. Strip charts, as well as parameter selection options available via user interface menu and/or ECL directive options. All selected strip chart attributes selected from menu options are reflected on the real-time strip chart display.

Test No.: TLM 1080B

Test Title: Telemetry Schematic Display

Test Support: ETS or data driver with data scripting capabilities.

Test Dependencies: Validated operational telemetry data

Test Description:

This test verifies the ability to display real-time spacecraft and instrument telemetry via telemetry schematic displays, which allow the user to plot telemetry data parameters on a two-dimensional schematic drawing using assigned visual items such as rectangles, lines, circles, points, etc.

The test begins with the selection of several schematic diagrams via ECL directive and user interface menu selection. Several schematics are displayed whose subsystems support parameters scripted in the housekeeping, health & safety and standby telemetry formats. Following schematic display the telemetry data driver is initialized, broadcasting housekeeping data packets. As the displayed schematics are updated with real-time decommutated/EU values, they are printed at specified time intervals. Selected parameters are scripted for out-of-limits conditions, driving the schematic to display those out-of-limits values by a red or yellow color code, depending on the limit definition violated. The schematic drawings are saved, and then printed. The snapshosts are analyzed off-line to ensure understandable representation of subsystems via the combination of points, lines, icons, text, circles, rectangles, ellipses and polygons, as well as accurate representation of decommutated/EU values and limit violations. The above steps are repeated for the charting of health & safety telemetry and diagnostic telemetry, with different schematics used for each telemetry format.

Input:

ECL directives/selection of menu options to display and print schematics. UNIX directives to configure and control the Telemetry Data Driver.

Output:

Schematic displays and printouts.

Success Criteria:

All telemetry values portrayed on schematics match scripted values. Schematic drawings are comprehensible and match previously saved definitions. Any schematic saved may be redisplayed or printed upon user request. Displayed update rate matches user selected update rate. Color codes of displayed components is driven by associated telemetry parameter limits and values.

Test No.: TLM 1090B

Test Title: User Performance Data Request to the NCC

Test Support: NCC or NCC emulator

Test Dependencies: NCC Interface functionality

Test Description:

This test verifies the ability to send User Performance Data Request messages to the NCC via the NASCOM interface. Following initialization of the EOC/NCC link and the exchange of test messages, User Performance Data Request messages are transmitted to the NCC. Event and NCC display pages provide verification of messages sent and acknowledgment messages transmitted from the NCC.

Input:

ECL directives to initialize the EOC/NCC interface, to transmit test messages and User Performance Data Request messages and to display event and NCC display pages.

Output:

NCC and event displays. Event messages.

Success Criteria:

User Performance Request messages transmitted to the NCC and acknowledgment messages received at the EOC match formats as specified in the ICD Between the NCC and MOC (530-ICD-NCCD April, 1995). All interface message transmission and receipt is mirrored in event messages displayed via the event and/or NCC display pages.

Test No.: TLM 1100B

Test Title: Receive & Archive NCC Data

Test Support: NCC or NCC Emulator

Test Dependencies: NCC Interface functionality

Test Description:

This test verifies the ability to archive data sent from the NCC in chronological order, including Communication Test messages, Acquisition Failure Notification, GCM Status, and GCM Disposition messages.

Input:

ECL directives to initialize the EOC/NCC interface, to enable archiving, and to display event page and NCC alphanumeric displays.

Output:

NCC and event displays. Event messages.

Success Criteria:

Communication Test messages, Acquisition Failure Notification, GCM Status, and GCM Disposition messages archived in the DMS archive in chronological order. Subsequent reports on NCC data are accessible, displayable and printable at EOC user stations.

Test No.: TLM 1110B

Test Title: Telemetry Archiving - Multiple Telemetry Streams

Test Support: ETS or data driver with data scripting capabilities

Test Dependencies: Event message display capabilities

Test Description:

This test is designed to verify the ability to archive AM-1 telemetry data, including housekeeping and health & safety telemetry packets as received from EDOS.

Following sign-on and initialization of a real-time string in support of telemetry processing, telemetry archiving is turned on by the ground controller. Alphanumeric telemetry pages which include parameter and associated parameter Decom value displays are invoked at the user stations supporting the real-time string. The telemetry data driver is initiated, broadcasting housekeeping telemetry onto the FOS LAN in the form of EDUs. As telemetry packets are received and the telemetry information decommutated, alphanumeric displays are printed at specified times. Telemetry archive file dumps are printed, and compared off-line to alphanumeric displays and scripted data source to ensure no data integrity loss during the archive process. During telemetry receipt, archiving is turned off/on by the ground controller. Archived data time stamps are compared against archive directive UTC time stamps to ensure archive enable/disable functionality. The above steps are repeated for health & safety telemetry and diagnostic telemetry, at rates up to 50 kbps, as well as those combinations of real-time telemetry received simultaneously from EDOS (i.e. diagnostic and health & safety telemetry packets, diagnostic and housekeeping telemetry packets, etc.).

Input:

ECL directives to sign on and initialize strings, to display alphanumeric and event message displays, and to enable/disable archiving function.

Output:

Telemetry archive file dumps, alphanumeric and event displays.

Success Criteria:

All telemetry received on the FOS LAN is archived during "archive enabled" time periods; no broadcast telemetry is archived when archiving is disabled. All telemetry packets archived are in UTC time order. Archive enable/disable function allowed by those users with ground control authority only. No data integrity loss during the archiving of multiple telemetry streams.

Test No.: TLM 1120B

Test Title: Solid State Recorder (SSR) Receipt & Archive

Test Support: EDOS/EBnet or ETS/EBnet support of SSR transmission at 256 kbps, 512 kbps, 1.544 mbps.

Test Dependencies: User Interface provided SSR analysis tools

Test Description:

This test is designed to verify the ability to receive recorded SSR dumps from EDOS at a rate up to 1.544 kbps and archive SSR packets in the DMS archive upon receipt.

Following sign-on and initialization of a real-time string in support of dump processing, event SSR display pages, and SSR buffer monitoring displays are invoked at the user stations supporting the real-time string. The SSR dump is initiated, broadcasting SSR data packets onto the FOS LAN. As SSR packets are received, event, SSR buffer displays are printed at specified times. Specified SSR packets residing in the archive are printed, and compared off-line to SSR packets transmitted to ensure no data integrity loss during the SSR archive process. An RF failure is initiated, affecting the receipt of SSR packets. Throughout the recovery period, both analysis SSR buffer displays and planning & scheduling displays are printed and compared to ensure each subsystem mirrors the same SSR buffer information. Recommended recovery procedures are invoked, another dump is initiated, and buffer displays are again printed and analyzed. Steps are also provided to verify the receipt of SSR buffer dumps at rates of 256 and 512 kbps.

Input:

ECL directives to sign on and initialize strings, to display SSR displays, SSR buffer displays, planning & scheduling displays, and event message displays.

Output:

SSR file dumps, SSR displays, SSR buffer displays and event displays.

Success Criteria:

All SSR packets broadcast on the FOS LAN are archived, in sequentially decrementing UTC order. No data integrity loss during the archiving of SSR packets, regardless of incoming data rate. An event message is generated and displayed upon the receipt of the first SSR packet (i.e. SSR dump start), upon the last SSR packet received (i.e. SSR dump complete), and upon the initiation of the RF failure. SSR playback state is reported at the time of the RF failure, and at the end of a contact. Planning & scheduling subsystem has access to all SSR status reports for subsequent scheduling of SSR downlink activities.

Test No.: TLM 1130B

Test Title: Telemetry Replay Processing & Display

Test Support: None

Test Dependencies: Previously Archived housekeeping, health & safety, and diagnostic telemetry

Test Description:

This test verifies the ability to replay stored real-time and spacecraft recorder telemetry via menu options provided by the Replay Controller Tool and other user interface supplied menu options. A secondary objective is to ensure processing of replayed data mimics real-time telemetry processing including decommutation, EU conversion, limit/delta limit checking, data quality checking and subsequent display of parameter values and flags.

The test begins with the initialization of the replay logical string, and initialization of several EOC user stations in support of the replay string. The Replay Controller tool is invoked, and pre-defined replay alphanumeric telemetry pages, telemetry plots, telemetry strip charts and telemetry schematics are displayed at various user stations. Replay information (i.e. spacecraft ID, start/stop time, data type, replay time) is entered via selected Replay Controller menu options. The replay of housekeeping telemetry is initiated and display pages, plots, graphs and schematics are displayed and printed. They are analyzed and compared post-test against telemetry archive file dumps (and against each other) to ensure accurate parameter value (raw or EU) and/or flag display (i.e. static, limits, delta limits, quality). Steps are provided to pause and resume the replay at a new begin time via the selection of Replay Controller options. The above steps are repeated for the replay of health & safety and diagnostic telemetry packets.

Input:

ECL directives to configure the EOC string configuration, to display/print replay pages, plots, strip charts, schematics, Mouse/keyboard selection of Replay Controller tool options.

Output:

Telemetry replay pages, plots, strip charts, schematics. Telemetry archive file dumps.

Expected Results:

Via off-line analysis, parameter values (raw or EU) and parameter status information (i.e. applicable parameter flags, UTC, spacecraft time, current orbit number, data source, current major/minor cycle counts, current telemetry format, current telemetry rate, spacecraft ID) from replay pages, plots, strip charts and/or schematics matches values in the replay data stream. The database ID matching the replay data time period is automatically loaded and used for replay data processing. All replay displays provide a visual indication of the start time, stop time, and position of current time during the replay. Each user, once assigned to the replay logical string, may view the initiated replay by displaying replay pages, plots, strip charts, and/or schematics. Packet replay matches start/stop time specified, and is replayed at the replay rate. Replay pause

causes replay telemetry pages to discontinue updating. Resumption of the replay results in the processing of historical packets at the point where the pause occurred.

Test No.: TLM 1140B

Test Title: Telemetry Replay Crossing Data Base Boundaries

Test Support: None

Test Dependencies: Archived housekeeping, health & safety, and diagnostic telemetry;

Test Description:

This test verifies the ability to replay archived telemetry which crosses database boundaries. A secondary objective is to ensure processing of replayed data mimics real-time telemetry processing (i.e. decommutation, EU conversion, limit/delta limit checking, data quality checking and subsequent display of parameter values and flags) and that telemetry processing uses the associated database for the entire replay period (e.g. historical Decom process allows for the switching of telemetry database files as part of the replay process).

The Replay Controller tool is invoked, and pre-defined replay alphanumeric telemetry pages, telemetry plots, telemetry strip charts and telemetry schematics are displayed at various user stations. Replay information (i.e. spacecraft ID, start/stop time, data type, replay time) is entered via selected Replay Controller menu options. The replay of housekeeping telemetry is initiated and display pages, plots, graphs and schematics are displayed and printed throughout the replay period. Selected parameters with different EU curves in each database are analyzed to ensure that historical data is processed using the associated database, both before and after the crossover.

Input:

ECL directives to configure the EOC string configuration, to display/print replay pages, plots, strip charts, schematics, Mouse/keyboard selection of Replay Controller tool options.

Output:

Telemetry replay pages, plots, strip charts, schematics.

Expected Results:

Via off-line analysis, parameter values (raw or EU) and parameter status information (i.e. applicable parameter flags, UTC, spacecraft time, current orbit number, data source, current major/minor cycle counts, current telemetry format, current telemetry rate, spacecraft ID) match the database definitions, both before and after the crossover (e.g. the database ID matching the replay start time period is automatically loaded and used for replay data processing until the crossover time, then the replay is paused while the database switch is made, and the replay resumes). All replay displays provide a visual indication of the start time, stop time, and position of current time during the replay. Resumption of the replay results in the processing of historical packets at the point where the pause occurred, and no data loss occurs before or after the crossover period.

Test No.: TLM 1150B

Test Title: Telemetry Subsetting and Transmission to the FDF

Test Support: FDF or FDF Emulator

Test Dependencies: Archived housekeeping, health & safety telemetry; archived SSR data packets; FDF Interface functionality

Test Description:

This test verifies the ability to collect attitude and related spacecraft data from real-time housekeeping telemetry and transfer collected data to the Flight Dynamics Facility (FDF). Information collected with each sampled parameter includes parameter mnemonic, parameter value, parameter format indicator (raw or EU), parameter quality indicator, and time tag.

Following initialization of the real-time string and EOC user station sign-on, real-time housekeeping data is broadcast onto the FOS LAN. FDF subset collection based on a predefined subset of parameters and specified time period is enabled by the EOC ground controller for automatic transmission to the FDF. Printouts of Event and FDF alphanumeric display pages are generated at specified times during the transmission of subsets. The printouts are analyzed off-line to ensure accurate representation of subset data volume transmitted, and event message reflection of the status of subset transmission (i.e. subsetting started, subsetting complete, etc.).

Input:

ECL directives to configure the EOC string configuration, to display/print Event and FDF display pages, and to enable subsetting for a specified time period.

Output:

FDF and Event display pages. Subset file dumps from the FDF.

Expected Results:

Subsetted information sent to the FDF matches 1): the associated data received in the broadcast telemetry packets and accurate representation of parameter EU value as defined by the operational PDB, 2) the predefined FDF subset definition and collection period as specified by the user, 3) the subset format as specified in the EOS-AM1 Flight Dynamics Facility (FDF)/EOS Operations Center (EOC) Interface Control Document (ICD). Event messages generated during the subsetting and transmission reflect actual subset/transmission activity.

Test No.: ANA 1000B

Test Title: Telemetry History Report Display & Print

Test Support: None

Test Dependencies: Archived housekeeping, health & safety, diagnostic telemetry, SSR playback data. Historical data base covering time periods of telemetry requests.

Test Description:

This test is designed to verify the ability to print a telemetry history report based on a dataset generation request or previously built dataset via the Report Template Builder. The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and an historical request of housekeeping data is generated, with selected options including request name, start/stop time interval, parameter names, and sampling rates. The request is saved and submitted for dataset generation. Following the completion of the dataset, several iterations of printing the report take place. This includes specifying different start/stop times contained within the dataset and specifying different raw and EU requests per parameter. The reports are analyzed off-line to ensure report content matches archived data values for each reported parameter over the requested time period. Reports based on housekeeping, health & safety, and diagnostic telemetry are including in the reports generated during this test.

Input:

Keyboard/mouse selection of analysis tools, selection of telemetry history options and for display/ printout of reports.

Output:

Analysis status windows, displays/printouts of reports based on generated datasets.

Success Criteria:

Via off-line analysis, report displays and printouts match parameter values as specified in the dataset, or in the case of EU values, match PDB conversion definitions. Flag information (i.e. limits, quality, static indicators) match PDB definitions for associated data. Each parameter specified in the report request is displayed/printed on the report. Report generation is cancelable via user request. All report requests containing erroneous information (i.e. time periods not contained in the dataset, incomplete menu field selections, etc.) result in error messages.

Test No.: ANA 1010B

Test Title: FDF Data Archiving and System Generated FDF Statistics

Test Support: FDF or FDF Emulator

Test Dependencies: Report Browser and Time Selector Utilities

Test Description:

This test verifies the ability to receive and store data provided by the FDF (i.e. EOS Brouwer-Lyddane Elements, Oscillator Frequency Reports, and Mass and Center of Mass Location Estimates) and compute and store statistics for the FDF supplied data.

Following initialization of the FDF interface, the sequential transmission of FDF data products to the EOC begins. Several versions of previously defined and generated files for Brouwer-Lyddane Elements, Oscillator Frequency Reports and Mass and Center of Mass Location Estimates are transmitted to the EOC. Following successful transmission of each FDF provided data product, statistical informational displays are invoked; FDF statistics reports are requested via a combination of user-supplied selections from the Time Selector Tool and Report Browser utilities provided by the user interface. Another set of FDF products are transmitted and a new set of statistical reports generated. Both sets of reports are analyzed post-test against associated FDF archive data to ensure complete and accurate FDF statistics generation and reporting capabilities.

Input:

ECL directives to configure the FDF, to display/print statistical information. Mouse/keyboard input of Time Selector and statistical report generator menus.

Output:

FDF and Event display pages. FDF archive file dumps. FDF Statistical Reports and displays.

Expected Results:

Statistic report information includes minimum value and time of occurrence, maximum value and time of occurrence, mean, standard deviation and number of samples for parameters associated with each statistical report. Statistical values as displayed on each report are accurate (i.e. all associated archive files are used in each statistical calculation, and each calculation is error-free). FDF statistical displays match statistical report output.

Test No. ANA 1020B

Test Title: System Generated Statistics Display & Print

Test Support: None

Test Dependencies: Historical data base covering time periods of telemetry requests; Archived housekeeping, health & safety, diagnostic telemetry, SSR playback data

Test Description:

This test is designed to verify the ability to report on system generated statistics based on archived real-time and playback telemetry. The test also verifies the ability of the analysis software to automatically generate statistics for all analog and discrete telemetry parameters for orbital nights, orbital days, and life of the mission.

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and a System Selected Report is requested using a combination of user interface and analysis tool menu options. Menu options selected include request name, parameter names, and start/stop time intervals. Examples of statistics reports based on different orbital days, different orbital nights, and life of the mission are generated as part of this test. Each is analyzed off-line to ensure accurate statistics computations for parameter minimum value and time of minimum value, maximum value and time of maximum value, mean value, standard deviation value, and number of samples for each parameter.

Input:

Keyboard/mouse selection of analysis tools and selection of System Selected Statistics Report options.

Output:

Analysis status windows, report displays and printouts.

Success Criteria:

Via off-line analysis, each report display/printout matches request options entered by the user (i.e. start/stop time interval, selected parameters, and type of statistic requested (i.e. minimum, maximum mean, standard deviation). Archived telemetry processing utilizes the database associated with the report start/stop time selected. Computations for selected parameters utilize all samples for the selected time period. All computations are accurate based on data base telemetry/SSR data information.

Test No.: ANA 1030B

Test Title: System Generated Statistics Display & Print

Test Support: None

Test Dependencies: Telemetry Archive and retrieval; all telemetry formats supported in the archive and within start/stop boundaries of the operational database.

Test Description:

This test is designed to verify the ability to display and print system generated statistics requests via the combination of user interface and analysis tool options.

The test begins with the initialization of the EOC to support off-line analysis processing. The Analysis Request and Time Selector windows are displayed, and a statistics requests are generated, with selected options including request name, parameter names, start/stop time interval (i.e. orbit, daily, monthly, mission to date) and statistic type (i.e. minimum, maximum, mean and standard deviation). Requests are saved, and then submitted for display and printing at designated line printers. Displays and printouts are generated and analyzed off-line to ensure reports match dataset statistic content. Time tagging of all statistics are time tagged to a 1 millisecond granularity.

Input:

Keyboard/mouse selection of analysis tools and selection of statistical request options. ECL and/or mouse/keyboard selections of report/display options.

Output:

Statistics report printouts

Success Criteria:

User interface/analysis menus supporting system-generated statistics options include options for displaying and printing system generated statistics. Via off-line analysis, it is determined that system generated statistic request options selected from the combination of user interface and analysis menus match associated dataset content. Statistics computations are accurate and based only on associated start/stop time interval, and data integrity is not compromised during the display and printouts of reports based on statistical data. The number of samples listed for each statistical computation match the number of samples available in selected start/stop time interval.

Test No.: ANA 1040B

Test Title: Telemetry History Report - Crossing Database Boundaries

Test Support: None

Test Dependencies: Archived housekeeping, health & safety, diagnostic telemetry, SSR playback data. Archive telemetry for time periods covered by two operational databases.

Test Description:

This test is designed to verify the ability to generate a telemetry history report based on a dataset generated over multiple databases. The test begins with the display of the Analysis Request and Time Selector windows. An historical request of archived data is generated, using selected menu options including request name, start/stop time interval, parameter names, and sampling rates. The request is saved and submitted for dataset generation. Following the completion of the dataset, several iterations of printing the report take place (i.e. printing the portion of the report prior to the database crossover, printing portions of the report before and after the crossover, etc.). The reports are analyzed off-line to ensure parameters with different EU conversions in each database are processed from the associated database, both before and after the crossover period. Reports based on housekeeping, health & safety, and diagnostic telemetry are including in the reports generated during this test.

Input:

Keyboard/mouse selection of analysis tools, selection of telemetry history options and for display/ printout of reports.

Output:

Analysis status windows, displays/printouts of reports based on generated datasets.

Success Criteria:

Via off-line analysis, report displays and printouts match parameter values as specified in the dataset, or in the case of EU values, match PDB conversion definitions, both before and after the crossover period. Flag information (i.e. limits, quality, static indicators) also matches PDB definitions for associated data.

Test No.: ANA 1050B

Test Title: Statistics Reporting - Crossing Database Boundaries

Test Support: None

Test Dependencies: Archived housekeeping, health & safety, diagnostic telemetry, SSR playback data. Archive telemetry and statistics for time periods covered by two operational databases.

Test Description:

This test is designed to verify the ability to 1) automatically generate statistics for data crossing data base boundaries during routine analysis and 2) generate user specified statistics for data crossing database boundaries.

The test begins with the display of the Analysis Request and Time Selector windows. Historical requests of archived statistics are generated, using selected menu options including request name, start/stop time interval, and parameter names. The start/stop times entered for all requests ensure statistic computations and reporting based on data associated with more than one database. Each request is saved and submitted for dataset generation. Following the completion of each dataset, the statistics report is printed and analyzed off-line to ensure statistics for parameters with different EU conversions in each database are calculated using the associated database conversions, both before and after the crossover period. Statistical reports for crossover periods, and based on housekeeping, health & safety, and diagnostic telemetry are including in the reports generated during this test.

Input:

Keyboard/mouse selection of analysis tools, selection of statistics generation and reporting options and for display/printout of reports.

Output:

Analysis status windows, displays/printouts of reports based on generated datasets.

Success Criteria:

Via off-line analysis, statistical computations for parameters in each dataset are performed using the associated database conversion information only, both before and after the crossover period. Any parameter requested for statistical dataset generation and/or reporting not residing in one or more of the datasets used for computation, results in an error message; parameters not residing in one or more of the associated databases does not affect the generation of the dataset or reporting of dataset content.

Test No.: ANA 1060B

Test Title: Reporting via the Report Template Builder

Test Support: None

Test Dependencies: Previously defined files (i.e. load catalog, command mnemonic lists, etc.), screen display definitions

Test Description:

This test is designed to verify the ability to request and print customized user reports based on menu options supplied by the Report Builder Tool. Examples of reports requested, generated or printed as part of this test include event history reports, ASCII files, screen display snaps and predefined blocks of text.

Following the display of the Report Template Builder Tool, a combination of customized and routine report requests are performed for each type of report listed above. Each field within each template is checked for functionality, followed by operations allowed for template management (i.e. editing, modifying, deleting, reinvoking). Report output formats are specified, including user specified fonts, report titles and margins; report formats are then defined for each report, along with the output designation (i.e. default printer, designated printer, saved to a file, carry out, etc.). The second portion of the test involves issuing options or requesting information via Report Template Builder Tool options which cause error conditions (i.e. entering typos into menu option fields, leaving mandatory fields blank, etc.

Input:

ECL directives to initiate and control Report Template Builder tool and tool menus. ECL directives to display analysis status windows.

Output:

Analysis status windows, event display windows, report printouts.

Success Criteria:

Report Template Builder Tool allows the request of all FOS generated reports listed above, including the selection of report output (i.e. fonts, author, report title, margins). Any completed template may be saved, edited or deleted by authorized users. Any typo or non-completed mandatory field results in an error message. Up to 10 simultaneous requests for analysis may be queued at any given time at a requesting EOC/IST user station; Each request shall contain a processing status (i.e. request submitted, request waiting in queue, request being processed, request complete). Any request deleted from the queue results in the requeuing of submitted jobs, (i.e. first in, first out). Each request Via off-line analysis, report output matches input specifications created by the user; no loss in data integrity during the reporting process.

Test No.: ANA 1070B

Test Title: Standing Orders

Test Support: None

Test Dependencies: Standing Order Browser, previously generated datasets

Test Description:

This test is designed to verify the capability of performing and managing repetitive analysis activities automatically via the Standing Order Manager and Standing Order Monitor tools.

Following the initialization of several user stations in support of off-line analysis functions, several analysis requests for specified datasets and reports based on datasets are requested via the Standing Order Manager Tool. Examples of requests include datasets/reports based on archived telemetry, datasets/reports based on user-specified statistics, datasets/reports based on system supplied statistics. The requests are generated by specifying a start and stop date, request interval, number of hours of data to analyze and report templates to utilize for output products. During this time, the Standing Order Browser Tool is displayed in order to view the status of all analysis requests in the queue. Following display of the Standing Order Browser, test steps are provided to suspend, resume, delete, and sort requests in the queue, and modify interval times for dataset/report generation. During the test, the status of each analysis request is monitored by displaying/viewing/printing the Standing Order Manager Tool display following each queue management function.

Input:

Mouse/keyboard selection of Standing Order Manager and Standing Order Browser functions

Output:

Standing Order Manager and Standing Order Browser Displays; Analysis reports and datasets.

Success Criteria:

All analysis requests entered via the Standing Order Manager must include request interval specified start date, specified stop date and author. Intervals supported include every n passes, every n orbits, every n hours, every n days, every n weeks, every n months. The status of each request is displayable via the Standing Order Manager. Each analysis request residing in the Standing Order Manager includes request name, next interval start time, standing order status (i.e. active, halted, processing, completed), and requesting author name. Analysis requests in the queue may be sorted based on request name, next interval time, standing order status or author. Any request interval time may be changed and any request may be suspended, resumed or deleted.

7. FOS Release B Turnover 2 Test Cases

The following Release B Turnover 2 test cases are provided in this section:

Infrastructure/Support Phases:

Data Base Thread Tests:

DBS 2000B Operational Data Backup/Restore

File Management Thread Tests:

FMG 2000B SDPS Data Backup/Restore
FMG 2010B Data Mover

Events Thread Tests:

EVT 2000B Quick Message
EVT 2010B Event History Report - Display & Print

General User Interface Thread Tests:

FUI 2000B User Customization

User Interface Tool Thread Tests:

FUI 2010B Document Reader
FUI 2020B E-Mail
FUI 2030B HELP Utility (Complete)
FUI 2040B Display Builder - Schematics

Scheduling Phase:

Initial Scheduling Thread Tests:

SCH 2000B Long Term Plan Ingest via CSMS MSS
SCH 2010B FDF Planning Aids to SDPS

Daily Scheduling Thread Tests:

SCH 2015B Generation of Timeline
SCH 2020B Elimination of Conflicting Activities from the DAS
SCH 2030B Generate ATC Uplink Load
SCH 2040B Update Ground Schedule & Generate Integrated Report

Late Changes Thread Tests:

SCH 2050B Generate ATC Uplink Load for Late Changes
SCH 2070B Add ATC Stored Command Verification to Ground Schedule
SCH 2080B Build ATC Patch Load for Late Changes
Load for Late Changes
SCH 2090B Generate ATC Patch Uplink Load & Schedule ATC Patch

Uplink
SCH 2100B Addition of ATC Patch Load Uplink to Ground Schedule & Generation of Integrated Report

What-if Planning Thread Tests:

SCH 2105B What-if Planning & Scheduling

Load Management Thread Tests:

SCH 2110B Generate FDF Table Loads
SCH 2120B Generate Load Reports

Real-time Phase:

System/String Configuration Thread Tests:

SYS 2000B String Reconfiguration & Termination
SYS 2010B Network Failure Recovery
SYS 2020B Real-time Server Failure Recovery
SYS 2030B Data Server Failure Recovery
SYS 2040B User Station Failure Recovery

Configuration Monitor Thread Tests:

SYS 2050B Configuration Monitor

Command Configuration:

CMD 2000B Command Mode - FOP Configuration
CMD 2010B Command Modes - Prerequisite State Check Configuration

Commanding Thread Tests:

CMD 2020B Command Verification - Telemetry Verification
CMD 2030A ASTER Command Notification
CMD 2040B Command Requests

Load Processing Thread Tests:

CMD 2050B Load Criticality
CMD 2060B Load Verification

Real-time Telemetry Monitoring Thread Tests:

TLM 2000B Derived Parameter Processing
TLM 2010B User Adjustment of Limits & Limit Set Definitions
TLM 2020B User Adjustment of EU Conversion Algorithms & Coefficient

Multiple Real-time Contacts Monitoring Thread Tests:

TLM 2030B Multiple Source Telemetry Display
TLM 2040B Ground Telemetry Storage & Retrieval

Dedicated Replay Thread Tests:

TLM 2050B User Adjustment of Telemetry Replay
TLM 2060B Telemetry Replay - Derived Parameter Processing

Telemetry Merge Thread Tests:

TLM 2070B Telemetry Merge

Analysis Phase:

Special Processing Algorithm Thread Tests:

ANA 2000B Special Processing Algorithms

Customized User Report Thread Tests:

ANA 2010B Report Browser/Editor

Triggers Thread Tests:

ANA 2020B Dataset Generation Based on Triggers

Checking Spacecraft State Thread Tests:

ANA 2030B Spacecraft State Reporting

Clock Correlation Thread Tests:

ANA 2040B Spacecraft Clock Correlation based on RDD Method
ANA 2050B Spacecraft Clock Correlation based on USCCS Method

Segment Support Thread Tests:

SEG 2000B Concurrent Operations
SEG 2010B Spacecraft Activity Log

Test No.: DBS 2000B

Test Title: Operational Data Backup & Restore

Test Support: Backup media

Test Dependencies: Project database including telemetry, command, constraint and activity definitions. Database backup/restore menu capabilities

Test Description:

This test is designed to verify the ability to backup FOS operational data and restore the data following backup.

The test begins with the selection and display of database menu options for selecting operational backup operations. Global operational data backup functions (i.e. backing up all operational data files to tape, disk, etc.), as well as single operational backup functions (i.e. backing up telemetry data tables to tape/disk, etc.) are initiated sequentially. Following each backup operation, steps are provided to restore the operational data via database menu options. Restored operational data is compared to the same data before backup operations occurred to ensure data integrity is not violated during the backup/restore processes.

Input:

SQL and/or DBA menu selections/directives to initiate backup and restore functions. SQL directives to compare operational data files to restored operational data files. Combination of SQL directives and DBA options to view database files.

Output:

Comparison reporting between operational/restored files. DBA Utility displays.

Success Criteria:

PDB backup functions allowable globally or on individual operational data type (i.e. command, telemetry, constraint, activity) basis. Comparisons between operational data files and associated restored files result in no data integrity loss. Operational version number and effective dates are maintained during the backup/restore processes. Only those files selected for backup are available on the backup media following the backup process. Only those files selected for restore are available in the DMS following the restore operation. Any attempt at selecting files for backup or restore operations which are unavailable from the selected media result in error messages.

Test No.: FMG 2000B

Test Title: SDPS Data Backup/Restore

Test Support: SDPS interface (GSFC DAAC) or emulator

Test Dependencies: SDPS (GSFC DAAC) interface capabilities

Test Description:

This test verifies the ability to transmit archived data to the SDPS for long term storage and receive archived data from the SDPS upon request, for the generation of analysis data products. Data transmitted to the SDPS consists of telemetry, events, operations data (i.e. orbital data from the FDF, EDOS CODA reports, etc.), configuration data and mission schedules. Data requested from the archive includes housekeeping, diagnostic and SSR data packets.

Following EOC user station initialization, the EOC/SDPS interface is initialized by the ground controller. Following interface initialization, test messages are transmitted to the SDPS and from the SDPS to the EOC. Following receipt of incoming data to FOS (i.e. real-time telemetry, SSR packets, FDF orbital data, EDOS status, etc.), automatic transmission of these files to the GSFC DAAC is verified; using SDPS provided user interface/time selector windows, each type of transmitted file listed above is searched and dumped at the GSFC DAAC. These dumps are compared to dumps of the same data performed at the DMS archive. Steps are then provided to verify that previously transmitted files older than seven days are automatically deleted from the DMS archive. Unsuccessful receipt of files by the SDPS is simulated in order to verify file retransmission, event message generation, and DMS flagging of those files not yet archived at the GSFC DAAC. The last portion of the test deals with the generation of analysis requests which require data not available at the DMS archive (e.g. telemetry data archived at the GSFC DAAC only). Data received from the GSFC DAAC is then used for the subsequent generation of datasets; the datasets will then be used to generate analysis output products (i.e. downlink order report, parameter out of limit report, etc.) for display.

Input:

ECL directives to configure the EOC and EOC/SDPS interface. ECL directives to view the EOC archive.

Output:

DMS archive displays, event display window, configuration display windows.

Success Criteria:

EOC/SDPS interface initialized following EOC configuration. Test messages transmitted by the EOC are received at the SDPS. Each test message received at the EOC is reflected by an event message. All file types described above successfully transmitted to the SDPS with no data integrity loss. All files unsuccessfully transmitted are retransmitted until reception by the SDPS is successful; no files are deleted from the EOC archive until the SDPS has notified the EOC of successful storage of associated files. All successfully transmitted files are automatically deleted

from the EOC archive. All requested files for analysis are received from the SDPS upon request; no data integrity loss during the transfer or re-archiving of data from long-term storage. In cases where a file is not available at the SDPS in reference to an analysis request, an event message is generated and displayed.

Test No.: FMG 2010B

Test Title: Data Mover

Test Support: ASTER ICC, SDVF, FDF, NCC, SMC

Test Dependencies: Default room definitions; Previously generated files defined as subsystem, instrument and user files residing at user station local work areas and data servers supporting logical string assignments.

Test Description:

This test is designed to verify the ability to transfer files containing spacecraft, instrument and ground system information to EOC/IST user stations, data servers, and FOS interface destinations while at the same time managing local user station file space via the Data Mover Tool.

The test begins with the sign-on and initialization of EOC and IST user stations supporting real-time and simulation strings. The Data Mover Tool is used at EOC and IST user stations in the selection of files from specific categories (i.e. subsystem, instrument, user) and initiation of file transfer to selected user station and/or data server. The Data Mover Tool is then utilized to request data transfers from other user stations, and to request multiple file transfers to multiple locations. Finally, selected files chosen for transfer are deselected and transfers in progress are performed using the Data Mover Tool.

Input:

ECL directives to initialize logical strings, EOC and IST user stations. Keyboard/mouse selection of Data Mover menu options.

Output:

Data Mover Displays. File Displays/printouts.

Success Criteria:

Any subsystem, instrument, or user file may be transferred to any physically connected EOC, IST, data server, ASTER ICC, SDVF, FDF, NCC or SMC user regardless of logical string assignment. All subsystem, instrument, and user files are listed in the Data Mover File List and are selectable via mouse/keyboard selection. Any available file requested for transfer from any physically connected EOC/IST user station or data server results in successful transfer to requesting user station. During the file transfer, the initiating user is notified of file transfers in progress, file transfers completed, and unsuccessful file transfers.

Test No.: EVT 2000B

Test Title: Quick Message Generator

Test Support: None

Test Dependencies: Event archiving, event history report

Test Description:

This test is designed to verify the ability to generate event messages at the EOC/IST user stations using the Quick Message Generator tool provided by the FOS user interface.

The test begins with the invocation of the Quick Message Generator Tool, followed by the generation of events corresponding to each event type (i.e. informational, alarm, and emergency). Following the generation of each message, the events page display is viewed in order to verify event message content, including event message header, event message text, and event display color (i.e. red for emergency, yellow for alarm, and white for informational). The broadcast of generated event messages is verified by viewing event page displays at all configured EOC and IST user stations. An event history report is requested to ensure all messages generated are logged in the DMS archive and available for reporting. Finally, the Quick Message Generator Tool menu options and corresponding functions are verified and include accessing the HELP menu option, and canceling an event message generation in progress.

Input:

Keyboard/mouse selections of quick message menu options; keyboard input of message text.

Output:

Quick Message Generator Tool menu display; event message displays, event history printouts.

Success Criteria:

Informational, alarm and emergency events generated are displayed at all connected EOC and IST user stations unless the message type is filtered. Messages generated match those specified by the quick message tool; event header matches the event type, time of event message, and event color. All messages generated are available for display at all user stations (EOCs and ISTs) assigned to the string configuration. All messages generated, despite any filtering of events by the individual user stations, reside in the DMS archive and are available via the event history report.

Test No.: EVT 2010B

Test Title: Event History Report Display & Print

Test Support: None

Test Dependencies: Archived events pertaining to separate spacecraft, subsystems, event types, and time periods.

Test Description:

This test is designed to verify the ability to print a telemetry history report based on a dataset generation request or previously built dataset via the Report Template Builder. The test begins with the initialization of the EOC to support off-line analysis processing. The Report Template Builder Tool is displayed, and specified historical event history requests of archived events data are generated, including event reporting based on start/stop time interval, event type, spacecraft ID, instrument and spacecraft subsystem. Each report is displayed and printed via input, and analyzed off-line to ensure event history reporting accuracy.

Input:

Keyboard/mouse selection of analysis tools, selection of event history options and for display/ printout of reports.

Output:

Analysis status windows, displays/printouts of event history reports based on generated datasets.

Success Criteria:

Via off-line analysis, event history report displays and printouts match event archive content. Specified filters (i.e. spacecraft, ground system, instrument, spacecraft subsystem, event type, and time period) are reflected in each report displayed and printed. Events appear in chronological UTC order, from latest to earliest. Event history datasets may be stored/saved and listed for later retrieval purposes.

Test No.: FUI 2000B

Test Title: User Customization

Test Support: None

Test Dependencies: ECL directive entry

Test Description:

This test is designed to verify the ability to customize and manage areas common to user station windows and rooms. This includes choosing 1) default printer, 2) default data directories, 3) type of screen snap, 4) default color intensities for real-time windows, 5) default colors for non real-time windows, 6) default font styles and 7) default room definitions.

Upon initialization of the real-time string, various EOC/IST user stations are initialized. Default settings are viewed via the quick access menu options in order to verify loading of EOC/IST default room and window settings listed above. Steps are then provided for the changing of default information via the quick access room selections in the control window.

Input:

ECL directives to configure EOC/IST user stations, request room quick access menu options. Keyboard/mouse selection of menu options.

Output:

Room and window displays, quick access menu displays.

Success Criteria:

Default printer, default data directories, default screen snap (i.e. snap to a printer, snap to a file), default real-time color intensities, default window colors, default font styles, and default room selections are invoked upon EOC/IST initialization. Any of the above defaults may be changed via quick access menu selection of available options. Upon user station sign-off and reinitialization, previously set defaults are loaded automatically.

Test No.: FUI 2010B

Test Title: Document Reader

Test Support: None

Test Dependencies: On-line documentation - user guides, operational procedures, instrument commands, spacecraft/instrument technical documentation

Test Description:

This test is designed to verify the ability to browse on-line documentation, including user guides, operational procedures, instrument commands, and spacecraft/instrument technical documents via the Document Reader Tool.

Upon initialization of the real-time string, EOC and IST user stations are initialized and the Document Reader function is invoked. Various documents are selected for browsing, including user guides, operational procedures, command lists, and spacecraft/instrument documents. Navigational options provided by the tool are used in browsing the various documents. Search options utilized include hypertext forward/backward, page forward/backward/jump to home page, and search forward/backward based on a selected keyword. Specific documents are then edited, deleted, and added using the Document Reader Tool.

Input:

ECL directives to configure EOC/IST user stations. Keyboard/mouse selection of document reader menu options.

Output:

Document reader menu displays.

Success Criteria:

On-line documentation including user guides, operational procedures, instrument commands, and spacecraft/instrument technical documentation may be invoked, browsed, edited, deleted and saved using the Document Reader Tool. All reports may be navigated using menu provided options (i.e. hypertext forward/backward, page forward/backward, search document for a specified keyword). More than one document may be browsed at a time (i.e. more than one Document Reader window may be displayed at any given time). Inputting Documents not currently residing in document directories may be performed by users with FOT document manager status only.

Test No.: FUI 2020B

Test Title: E-Mail

Test Support: None

Test Dependencies: Room/window FUI displays

Test Description:

This test is designed to verify the ability to send and receive mail electronically at EOC and IST user stations via the E-mail Tool.

The E-mail menu is displayed at initialized EOC and IST user stations. Several mail transmission iterations are performed at EOC/IST user stations, including generating and transmitting mail messages to individual users, user positions, and selected users within a site. Files transmitted are comprised of text files and text files with attached files. E-mail editing capabilities are utilized for message generation and include text cutting/copying/pasting/ deleting/undoing. Following reception of transmitted messages, replies are generated and transmitted to the original sender.

Input:

Keyboard/mouse selection of E-mail display and menu options.

Output: E-mail Display menus/display area.

Success Criteria:

E-mail messages issued to users, positions, or sites are received by the designated addressee(s). Any received E-mail message may be replied and transmitted back to the original issuer via selection of E-mail menu options. E-mail messages may be cut, copied, pasted, deleted and text selected/unselected via E-mail menu options. Any saved E-mail message may be viewed on the E-Mail display screen. Saved messages may be searched by date, author, or subject keyword designation.

Test No.: FUI 2030B

Test Title: Help Utility (Complete)

Test Support: None

Test Dependencies: Room/window FUI displays

Test Description:

This test is designed to verify the ability to utilize navigational schemes when utilizing the HELP Utility Menus at EOC and IST user stations.

Following sign on to an EOC and IST user stations, several FOS activities are initiated (i.e. logical string configuration, event and window display, etc.). As activities are initiated, HELP windows are selected to display HELP information pertinent for the particular activity taking place. Displayed HELP windows are navigated using hypertext forward/backward, page forward/backward, search HELP text via keyword, and jump back to the HELP home page.

Input:

ECL directives to initiate EOC/IST user station functions; keyboard/mouse selection of HELP menu options.

Output:

HELP utility displays.

Success Criteria:

HELP utilities are accessible from any user station window. HELP text is pertinent to the activity taking place in the selected window area. All help menus associated with a given FOS function may be searched based on a designated keyword. Hypertext and paging options mirror options selected by the user and are available for all HELP window areas, including EOC and IST user station positions.

Test No.: FUI 2040B

Test Title: Display Builder - Schematics

Test Support: None

Test Dependencies: String Configuration Capabilities, GUI display tools

Test Description:

This test is designed to verify the ability to build and manage schematics in the user station desktop environment.

The test begins with the invocation of the Display Builder and Display Builder Palette tools at the EOC user station. Via the use of these tools, a combination of "drag and drop" schematic building functions are performed, including the generation of schematic drawings (i.e. points, lines, icons, text, circles, rectangles, ellipses, and polygons). The "Data Source Selector" tool is invoked, and steps are provided to establish the data source (i.e. AM-1 operational configuration in mirror mode, AM-1 replay in tailored mode, PM-1 test in mirror mode) for each display. After generation of schematics, and connecting data sources are established, the schematics are saved, reinvoked from the DMS archive for redisplay, and printed at specified user station printers. Steps are then performed to change the display data source, individually and globally using the Data Source Selector and Data Source Global Switch tools. Following data source changes, schematics are viewed to ensure changes made are mirrored in the schematic displays.

Input:

ECL directives to display schematics. keyboard/mouse selection of schematic build, edit, delete, display options.

Output:

Schematic displays. Tool displays - Display Builder Palette, Display Builder, Data Source Selector, Data Source Global Switch

Success Criteria:

Schematics generated per user request; all drag and drop display generation activities match those input via display builder tools; all displays generated may be accessed and printed by any requesting user. All schematics generated are available from the room in which they are generated only. Schematic connection matches that specified via the Data Source Selector and Data Source Global Switch tools.

Test No.: SCH 2000B

Test Title: Long Term Plan Ingest via CSMS MSS

Test Support : CSMS MSS (or Simulation)

Test Dependencies: LTSP and LTIP files, Long Term Plan Ingester Tool, FUI Report Browser/Editor Tool

Test Description:

This test verifies requirements related to the FOS capability to accept LTSP and LTIP files that have been placed in an input directory via the CSMS MSS. This test demonstrates that an authorized user is capable of invoking the Long Term Plan Ingester Tool in order to locate the LTSP and LTIP files in a specified directory that allows the files to be pulled into an FOS directory for authorized user viewing and store in the FOS database. The authorized user is provided the capability to view the plans via the FUI Report Browser/Editor Tool.

This test also verifies that the capabilities exist that allow an authorized IST user to request a copy of the LTIP for viewing at the IST workstation. The request for a copy of the LTIP at the IST user workstation invokes the transfer of a copy via the FUI Data Mover Tool. Once the LTIP has been copied to the IST workstation, testing confirms that the IST user is able to invoke the FUI Report Browser and view the LTIP.

Input:

User directives and menu selections to invoke the Long Term Plan Ingester and verify the CSMS MSS has moved an LTSP and/or LTIP to the designated directory. User directives and menu selections as needed to save the LTSP/LTIP as the current version in the FOS database. User directives and menu selections to invoke the FUI Report Browser Tool and view the current LTSP and LTIP. User directives and menu selections at the IST workstation to request a copy of the LTIP. User directives and menu selections at the IST to invoke the FUI Report Browser Tool for viewing the current LTIP.

Output:

Event messages and user notification confirming the Long Term Plan Ingester Tool has been invoked. Event messages and user notification verifying the LTSP and LTIP have been renamed as the current version and saved to the FOS database. Report Browser Tool display of the LTSP and LTIP contents at the user workstation. Event messages and user notification at the IST workstation confirming the request for a copy of the LTIP. Report Browser Tool display at the IST workstation of the LTIP contents.

Success Criteria:

Successful transfer of LTSP and LTIP text files from the CSMS MSS to the FOS database. Successful display and hardcopy print-out of both reports for examination and confirmation that contents are in agreement with the LTSP and LTIP as developed at the CSMS MSS. Successful display of plan contents at the EOC and IST user workstations.

Test No.: SCH 2010B

Test Title: FDF Planning Aids to SDPS

Test Support: SDPS (or Simulation)

Test Dependencies: DMS, PAS,

Test Description:

This test is designed to verify the FOS capability to support the transfer of FDF planning aids to the SDPS. This test demonstrates that an authorized user is provided with the necessary tools to invoke the 'ftp' transfer of the planning aids to the SDPS.

Input:

Valid planning aid information available for transfer to the SDPS. ECL directives and menu options to select the particular information to be transferred. ECL directives and menu options to invoke the transfer of the data to the SDPS.

Output:

Event messages and display window updates confirming the particular information selected by the FOS user for transfer. Event messages and display window updates confirming the transfer of the planning aids to the SDPS.

Success Criteria:

Analysis of the actual planning aids data sent by the FOS in comparison to the data received and saved at the SDPS to confirm that a complete and corrupt free transfer is taking place.

Test No.: SCH 2015B

Test Title: Generation of Timeline

Test Support : None

Test Dependencies: PAS Resource Model, DMS, FUI, Timeline Tool

Test Description:

This test is designed to verify the FOS capability to provide an authorized user a Timeline Tool for the display of events and activities which will occur on a given resource over a given time interval. The user is provided the capability to filter which events and/or activities they wish to view for each resource, as well as select the time range to view and resources to display. The timeline also provides the ability to determine which time ranges and resources are currently being modified by other users.

Prior to scheduling an activity, the user must create an access on the resource they are scheduling. Testing demonstrates that the user is able view resource accesses and create an access for the total time the plan has been opened. Once an access is created, a planner may view the schedule by selecting the "Activities" view. The user is then able to select and modify an activity with the given menu options. Once the activity has been scheduled and constraint checked within the resource model, the resultant state change is sent to the timeline.

Input:

User directives and menu options to initialize the timeline application. User directives and menu options to open a plan using the plan manager. User directives and menu options to update the timeline for a given resource with an activity over a specific time period.

Output:

User notification and window display updates confirming the timeline application has been initialized. User notification and window display updates confirming the activity scheduling for a given resource. Timeline display updates in accordance with user scheduling input.

Success Criteria:

Analysis of the Timeline updates to confirm the scheduled activities have been incorporated in accordance with the input selections made by the user.

Test No.: SCH 2020B

Test Title: Elimination of Conflicting Activities from DAS

Test Support: None

Test Dependencies: FOS User Interface, Activity Scheduler, Plan Tool

Test Description:

This test is designed to verify that the FOS is capable of supporting the resolution of activity conflicts that occur as activities are incorporated into the Detailed Activity Schedule. This test demonstrates that an authorized user is provided with the tools necessary to schedule activities in a scheduling environment that notifies the user of activities that are not allowed to be incorporated into the DAS. Activities may not be allowed in the DAS because of resource limitations or constraint violations. Upon notification of the activity conflict, the FOS allows the user to take the corrective action for resolution of the conflict thus creating a conflict-free DAS.

Input:

Valid activities available for incorporation into the DAS. Activities available for incorporation that create certain conflicts within the DAS. ECL directives and menu options to invoke the activity scheduling tools and initiate the incorporation of activities into the DAS.

Output:

Event messages and display window updates reporting all conflicts detected during the activity scheduling process.

Success Criteria:

Analysis of the timeline to confirm that all activity conflicts have been resolved. Confirmation that the Detailed Activity Schedule does not include and activity conflicts prior to being expanded into an associated ATC.

Test No.: SCH 2030B

Test Title: Generate ATC Uplink Load

Test Support: None

Test Dependencies: DMS, CMS, PAS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support ATC uplink load generation. This test demonstrates that an authorized user is provided with the tools necessary to expand the DAS into the associated absolute time commands and format the commands into the necessary load format for uplink to the spacecraft.

Input:

Valid DAS available for expansion into absolute time commands. ECL directives and menu options to invoke the expansion of the DAS and initiate the generation of the ATC uplink load.

Output:

Valid ATC uplink load. Event messages and display window updates confirming the start and completion of the uplink load generation. display window updates confirming the load is available for further uplink processing.

Success Criteria:

Analysis of the DAS, event history report and contents of the ATC load report to confirm that the FOS is performing the generation of the ATC uplink load as expected for compatible uplink to the AM-1 spacecraft.

Test No.: SCH 2040B

Test Title: Update Ground Schedule & Generate Integrated Report

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the window display of the flight operations ground script and the hard copy print-out of the ground script report. This test demonstrates that an authorized user is provided the tools necessary for the display of the ground script window at the user's workstation. The window display at the user's workstation accurately reflects actual information contained in the ground script.

In addition, this test demonstrates that an authorized user is able to generate a ground script report that provides a hard copy of the information contained in the flight operational ground script.

Input:

A valid ground script and/or a valid DAS in which a ground script can be generated from. ECL directives and menu options to display the ground script window at the user's workstation. ECL directives and menu options to generate a print-out of the ground script report.

Output:

Ground script window display updates to reflect the current ground script selected. Print-out of ground script report.

Success Criteria:

Analysis of the associated DAS, ATC in comparison to the ground script report and window display to confirm that the ground script information is accurately being reported to the authorized user. The ground script information for a given operational period is an identical trace of the same operational period in the associated DAS and ATC.

Test No.: SCH 2050B

Test Title: Generate ATC Uplink Load for Late Changes

Test Support: None

Test Dependencies: PAS, CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to process late change activities received for incorporation into the mission schedule. This test demonstrates that the CMS is capable of receiving a late change activity list from PAS and initiating the necessary action to generate activity expansion of the late change DAS, constraint check the late change activities, generate the late change ATC load and ground schedule. Testing also verifies that the CMS properly manages to replacement of the existing ATC load and ground schedule information with the newly generated Late Change products.

Input:

User directives at the PAS user workstation to invoke the transfer of the Late Change DAS to the CMS for processing. User directives and menu options to print the ATC load report, Ground Schedule and Integrated Load Report.

Output:

User notification confirming the processing of the late change DAS, including ATC load generation and ground schedule updates. User notification confirming the deletion of the subsequent DAS, associated ATC load and ground schedule.

Success Criteria:

Review of the Event History Report, Load Catalog Report, DAS and ATC load reports to verify the CMS is capable of managing the expansion of a late change DAS.

Test No.: SCH 2060B

Test Title: Add ATC Stored Command Verification to Ground Schedule

Test Support: None

Test Dependencies: CMS, PAS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support updates to the TD ground script to account for stored command verification when late changes have been incorporated into the ATC load.

For each stored command that is scheduled to execute outside of a spacecraft contact period, this test demonstrates that the EOC provides a comment in the ground script which specifies the command and time tag with the same time as the stored command.

For each stored command that is scheduled to execute during the spacecraft contact period and has a telemetry execution verifier associated with it in the data base, this test demonstrates that the EOC provides the capability to generate a ground directive to initiate telemetry verification of the execution of the stored command.

For each stored command that is scheduled to execute during a spacecraft contact period and does not have a telemetry execution verifier associated with it in the data base, this test demonstrates that the EOC provides a comment in the ground script which specifies the command and time tag with the same time as the stored command.

Input:

Valid late change activities available for incorporation into the DAS/ATC. ECL directives and menu options to initiate the generation of an updated DAS, ATC load and associated ground script report. ECL directives and menu options to print a hard copy of the ground script report.

Output:

Updated DAS, ATC load and ground script for late change activities introduced during this test.

Success Criteria:

Analysis of DAS print-out, ATC load report and ground script report to confirm that stored command verification comments and ground directives are incorporated into the ground script in accordance with level 3 and level 4 requirements.

Test No.: SCH 2070B

Test Title: Build ATC Patch Load for Late Changes

Test Support: None

Test Dependencies: CMS, DMS, PAS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the generation of an ATC patch load in the event that late change activities are received for an operational period after the associated ATC has been uplinked to the spacecraft. This test demonstrates that the FOS provides the tools necessary for an authorized user to generate an ATC patch load for late changes that have been incorporated into the planning and scheduling DAS. For ATC patch load generation, the FOS is capable of generating and appending to the load all necessary load control commands and allows the user to generate an ATC load report for the patch load.

Input:

Valid DAS for patch load activities. ECL directives and menu options to invoke the expansion of the activities into an ATC patch load.

Output:

Valid ATC patch load available for further uplink processing. Event messages and display window updates confirming the expansion of the DAS. Event messages and display window updates to confirm the successful completion of the load generation process.

Success Criteria:

Analysis of the DAS contents report, ATC load report and event history report to confirm that the load was generated in accordance with the activities contained in the DAS over the same operational period.

Test No.: SCH 2080B

Test Title: Generate ATC Patch Uplink Load & Schedule ATC Patch Uplink

Test Support: None

Test Dependencies: CMS, DMS, PAS, Scheduler Tool, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the generation of an ATC patch uplink load and the scheduling of the load into the timeline for uplink to the spacecraft. This test demonstrates that an authorized user is provided with the tools necessary to generate the patch uplink load in an EDOS/CCSDS compatible format for uplink to the spacecraft.

Upon successful generation of the uplink load, this test demonstrates that an authorized user is capable of invoking the Load Scheduler Tool and is able to schedule the uplink time for the load. The Load Scheduler Tool uses the uplink window that the user desires the load to be uplinked to select three valid communications contacts to uplink the load. During the selection of the valid communication contacts, the following criteria is used: user specified uplink window, valid load uplink time, communication contacts available, uplink constraints, load existence and load size. Once three valid communication contacts are found, the Load Scheduler Tool provides for notification to the user through their timeline display and via a status message at the user's workstation.

Input:

Valid ATC load available for uplink processing. ECL directives and menu options to invoke the tools necessary for generation of the patch uplink load in an EDOS/CCSDS format. ECL directives and menu options to invoke the Load Scheduler Tool and schedule the patch uplink.

Output:

Valid patch uplink load. Timeline updates displaying the scheduled uplink of the patch load. Event messages and display window updates confirming the start and successful completion of the uplink load generation. Event messages and display window updates confirming the scheduling of the patch load for uplink.

Success Criteria:

Review of the timeline to verify that the ATC patch load is scheduled for uplink during the expected time period. Analysis of the event history report, load report and scheduling report to verify that the uplink load was generated and scheduled in accordance with EDOS/CCSDS format requirements as well as PAS Load Scheduler requirements.

Test No.: SCH 2090B

Test Title: Addition of ATC Patch Load Uplink to Ground Schedule & Generation of Integrated Report

Test Support : None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the incorporation of the corresponding command directives and ground directives into the ground script for the uplink of an ATC patch. This test demonstrates that for an ATC patch uplink load generated by an authorized user, the FOS provides the tools necessary to ensure that the corresponding command and ground directives are merged into the associated ground script for proper uplink of the ATC patch load during the scheduled uplink window.

In addition, this test demonstrates that the authorized user is provided with the necessary tools that allow for the generation of a ground script report. The capability to generate a ground script report during this test allows for examination of the report to ensure that the necessary directives have been incorporated into the ground script for uplink of the ATC patch.

Input:

A valid ATC patch load available for uplink load generation and uplink scheduling. ECL directives and menu options to invoke the generation of the uplink load, scheduling of the load uplink and ground script generation. ECL directives and menu options as needed to ensure the necessary uplink directives are incorporated into the ground script. ECL directives and menu options to generate a ground script report.

Output:

Valid ground script and ground script report available for execution. Event messages and display window updates confirming the incorporation of the patch load directives into the ground script. Event messages and display window updates confirming the generation of the ground script report.

Success Criteria:

Analysis of the generated ground script report against the uplink time scheduled in the timeline to confirm that the necessary command and ground directives have been incorporated into the ground script to ensure a successful uplink during the scheduled uplink period.

Test No.: SCH 2100B

Test Title: "What-If" Planning & Scheduling

Test Support: none

Test Dependencies: PAS, CMS, DMS

Test Description:

This test is designed to verify the FOS capability to provide an authorized user 'what-if' scheduling capabilities. This test demonstrates that an authorized user is able to access the mission schedule, Timeline Tool and Scheduling Tools and perform a 'what-if' scheduling scenario for subsystem and instrument activities. The 'what-if' scheduling scenario provides the user with the necessary window displays of the mission schedule, timeline etc. based on the 'what-if' activity and resource input. The 'what-if' scheduling scenario can be saved or deleted without having an impact on the actual, operational mission schedule or timeline. The user is also provided with the capability to merge the 'what-if' schedule into the current operational mission schedule/timeline.

Input:

User directive and menu selections to invoke scheduling and timeline 'what-if' capability. User directive and menu selections to schedule instrument and subsystem activities in a 'what-if' scenario. User directives and menu selections to save the 'what-if' schedule and timeline. User directives and menu selections to confirm that the 'what-if' schedule products can be deleted. User directives and menu selections to confirm the 'what-if' schedule products can be merged into the actual mission schedule.

Output:

'What-if" timeline and mission schedule updates at the user's workstation reflecting the instrument and subsystem activities being scheduled.

Success Criteria:

Review of 'what-if' timeline and mission schedule to confirm 'what-if' inputs are accurately represented. Verification that the 'what-if' activities created can be saved, deleted and merged into the actual mission schedule at the users option.

Test No.: SCH 2110B

Test Title: Generate FDF Table Loads

Test Support : None

Test Dependencies: PAS, CMS, DMS, FOS User Interface,

Test Description:

This test is designed to verify the FOS capability to support the generation of Flight Dynamics Facility (FDF) table loads for uplink to the spacecraft. This test demonstrates that an authorized user is provided with the tools necessary to combine data received from the FDF with a default table definition in the PDB to successfully build the table load. Upon building the table load, this test verifies that the tools exist to generate the uplink load, manage the existence of the load in the EOC and schedule the uplink of the load to the AM-1 spacecraft.

Input:

Valid FDF data and default table definitions available to the user for generation of the table load. ECL directives and menu options to invoke the table builder tool, select the FDF data and table definition and initiate the build process. ECL directives and menu options to save the table load as part of the load catalog. ECL directives and menu options to generate the table uplink load and schedule the load for uplink.

Output:

Valid FDF table load available for uplink. Event messages and display window updates confirming that the table builder tool has been invoked, the completion of the build and generation of the FDF table load. FDF table load report.

Success Criteria:

Analysis of the FDF table load report and event report in comparison to the FDF/EOC Interface Control Document to confirm that the FOS provides for the correct build and generation of the FDF table load.

Test No.: SCH 2120B

Test Title: Generate Load Reports

Test Support: None

Test Dependencies: CMS, DMS, FOS User Interface

Test Description:

This test is designed to verify that the FOS supports the generation of required load reports whenever a load is generated for uplink to the spacecraft. This test demonstrates that the FOS provides the tools necessary for the user to obtain a load report for the generation of the following types of loads: ATC, RTS, flight software, table and microprocessor. For the generation of each of these types of loads, the user is able to obtain a load report that contains at a minimum the following information: load name, load type, uplink window, uplink time and date, size of the load, start and ending memory locations, # of commands, # of critical commands. and a list of all RTS commands contained in the load.

Once the load reports have been generated, this test verifies the capability to successfully transfer the reports to the ASTER ICC. The user is able to invoke the tools necessary to enable the FOS-ASTER ICC interface and transfer the load reports to ASTER for their review/use. Testing demonstrates that the load reports are transferred to the ASTER ICC in a corrupt-free, ASTER readable format.

In addition to generating the load report, this test demonstrates that the FOS provides the user the capability to generate Catalog Reports and Map Reports for each uplink load referenced above. As necessary and as required, these reports are also transferred to the ASTER ICC for their review/use.

Input:

Valid load content available for the generation of the following types of loads: ATC, RTS, Table Flight Software and Microprocessor. ECL directives and menu options to invoke the tools necessary to initiate the generation of each type of load. ECL directives and menu options as necessary to initiate the generation of the load, catalog and map reports for each of the uplink loads generated. ECL directives and menu selections to generate a hard copy of each of the reports.

Output:

Valid ATC load, RTS load , flight software load, table load and microprocessor load and associated reports (load, catalog and map). Event messages and display window updates confirming the status of the load generation and the generation of the reports.

Success Criteria:

Analysis of the various reports along with the event history report to ensure that the FOS is preparing the contents of the reports to provide the user with a correct and accurate account of the loads that have been generated for uplink to spacecraft.

Test No.: SYS 2000B

Test Title: String Reconfiguration & Termination

Test Support: None

Test Dependencies: IST connectivity/string connection and support

Test Description:

This test is designed to verify the ability to reconfigure the FOS resource allocation in support of EOS spacecraft telemetry and command processing activity at the EOC. This includes the termination of active logical strings, and changing components in support of established logical strings.

The test begins with the sign-on of several user stations and the initialization of the EOC. Configuration and event pages are displayed and used to verify the EOC configuration following logical string assignments and reconfiguration activity performed by the user with ground configuration authority. Logical string assignments supporting real-time, simulation and replay strings are performed for each supported mode (i.e. operational, test, and training). Following string assignments, several EOC user stations are configured to support new logical string assignments, others will reconfigure to support existing logical strings, while other users sign-off. Several logical string reconfigurations are attempted by the ground controller, including termination of logical strings, requesting new string configurations, requesting new or different string components, etc. Configuration and event message displays are printed following each configuration iteration to ensure accurate management and display of the EOC configuration during string reconfiguration activity.

Input:

ECL directives for initializing the EOC, configuring/reconfiguring logical strings, connecting to logical strings, displaying configuration/event display windows.

Output:

Configuration status display pages/printouts and event displays/printouts at EOC/IST user stations.

Success Criteria:

Logical string reconfiguration activity is accurately portrayed by configuration status displays and event messages; all connected EOC/IST users have access to logical string and component configuration displays. All EOC/IST users (those users passing authentication) are allowed connection to any existing logical string and associated activity on that string (i.e. access to real-time, replay, simulated data, multiple data streams); requests to connect to non-existent strings denied and event message(s) displayed. Attempts to duplicate any existing logical string are denied. Real-time, simulation and replay logical assignments may be configured for any mode (i.e. operational, training, test).

Test No.: SYS 2010B

Test Title: Network Fault Recovery

Test Support: CSMS failure reporting functionality

Test Dependencies: IST connectivity/string connection and support

Test Description:

This test is designed to verify the ability to recover from failures of network components supporting FOS operations, including the Operational LAN (FDDI), Ethernet and hub failures, EBnet Router failure and EOC router failure.

The test begins with the sign-on of several user stations and the initialization of the EOC. Configuration and event pages are displayed and used to verify the EOC configuration following logical string assignments and reconfiguration activity performed by the user with ground configuration authority. Logical string assignments supporting real-time, simulation and replay strings are performed for each supported mode (i.e. operational, test, and training). Following string assignments, each type of failure listed above is performed sequentially, with test steps included to ensure the recovery from each failure. During recovery operations, alphanumeric display pages showing the FOS configuration components and status are viewed and printed at specified times (i.e. before, during, and after failure recovery) in order to verify the accurate representation of configuration information throughout the recovery period.

Input:

ECL directives for initializing the EOC; manual disassembling/disabling/disconnecting connected network components to simulate network/hub failures.

Output:

Configuration status display pages/printouts and event displays/printouts at EOC/IST user stations.

Success Criteria:

Following FDDI and FDDI hub failures, FDDI ring or hub wraps autonomously with no data loss and FOS software applications continue as normal, and occurs within one minute. During Ethernet failure, the EOC user stations on the Ethernet link lose connection to supported logical strings; the affected user station(s) successfully re-establishes former string connection on another EOC user station. Following an EBnet router failure, FOS receives event messages concerning the failure and reconnection; no FOS configuration is required following recovery. Following EOC router failure and recovery, no FOS reconfiguration is required; IST user stations, following ECL directives to reconnect to established logical strings, are successful in connecting. Upon any network failure, connected EOC/IST user stations receive error messages concerning the failure, and messages following network recovery. Configuration display pages accurately portray the FOS configuration before, during and after network failures.

Test No.: SYS 2020B

Test Title: Real-time Server Failure Recovery

Test Support: CSMS failure reporting functionality

Test Dependencies: Real-time server hardware redundancy

Test Description:

This test is designed to verify the ability to recover from a real-time server failure during real-time operations.

The test begins with the sign-on of several user stations and the initialization of the EOC, including establishment of logical and backup strings, execution of the ground script, and the receipt of real-time telemetry. The real-time server is disconnected/powered down to simulate a failure. Upon detecting telemetry data dropout and other event messages at connected EOC and IST user stations, the ground controller enters directives to transfer control to the backup, specifies the real-time server that is to receive control, and specifies if checkpoint information (telemetry and command path information) is to be applied. As the backup logical string is converted to active, the ground controller requests command authority, resumes the ground script and begins processing real-time telemetry.

Input:

ECL directives for initializing the EOC; manual disassembling/disabling/disconnecting real-time server to simulate server failure.

Output:

Configuration status and event message displays/printouts.

Success Criteria:

Following server failure, EOC/ISTs receive event messages stating real-time data dropout, pause of the ground schedule, and server failure events. Request of ground configuration authority is granted following failure of the server. Directives to transfer control to the backup real-time server, and transfer checkpoint information are successful and occur within one minute of request. Previously running ground script resumes upon ECL directives. EOC/IST users connected to the failed real-time server are re-established to previous logical strings upon re-issue of connection directives. Configuration display pages accurately portray the FOS configuration before, during and after the real-time server failure.

Test No.: SYS 2030B

Test Title: Data Server Failure Recovery

Test Support: CSMS failure reporting functionality

Test Dependencies: Data server hardware redundancy

Test Description:

This test is designed to verify the ability to recover from a data server failure during real-time operations.

The test begins with the sign-on of several user stations and the initialization of the EOC, including establishment of logical and backup strings. Several analysis requests for datasets are generated and submitted. During execution of the datasets, the data server is disconnected/ powered down to simulate a failure. Upon detecting event messages stating communications failure with the data server. Configuration display pages are printed before, during and after failure recovery to ensure accurate portrayal of the FOS equipment configuration.

Input:

ECL directives for initializing the EOC; manual disconnection of the data server to simulate a failure.

Output:

Configuration status and event message displays/printouts; generated datasets.

Success Criteria:

Following server failure, EOC/ISTs receive error messages stating communications failure of the data server. Directives to transfer dataset generation to the backup data server result in the datasets generated without error. EOC/IST users connected to the failed real-time server are re-established to previous logical strings upon re-issue of connection directives; this occurs within one minute. Configuration display pages accurately portray the FOS configuration before, during and after the data server failure.

Test No.: SYS 2040B

Test Title: User Station Failure Recovery

Test Support: CSMS failure reporting functionality

Test Dependencies: None

Test Support Requirements:

Test Description:

This test is designed to verify the ability to recover from a user station failure during real-time operations.

The test begins with the sign-on of several user stations and the initialization of the EOC, including establishment of logical and backup strings, execution of the ground script, and the receipt of real-time telemetry. The EOC user station currently operating as the ground controller/command issuer is disconnected/powered down to simulate a failure. Upon detecting the failure, the ground controller transfers to another EOC user station, requests command authority, applies checkpoint information to the ground script and resumes the script. Steps are also provided to ensure failure recover from an IST user station failure.

Input:

ECL directives for initializing the EOC; manually disconnecting the user station to simulate a failure.

Output:

Configuration status and event message displays/printouts.

Success Criteria:

Request of ground configuration authority, transfer of checkpoint files to the ground script, and resumption of the ground script is successful following the issuance of the directives from another EOC user station. is granted following failure of the user station. Configuration display pages accurately portray the FOS equipment configuration before, during and after the user station failure. IST users experiencing failure conditions may sign-on to another IST user station, and perform functions mirroring their previous activity on the failed user station.

Test No.: SYS 2050B

Test Title: Configuration Monitor

Test Support: CSMS Management Subsystem (MSS)

Test Dependencies: IST connectivity/string connection and support; CSMS functionality

Test Description:

This test is designed to verify the ability to maintain status information on EOC components (software and hardware), and notify EOC/IST users of changes in EOC component global variables while at the same time provide access to MSS-provided status information.

The test begins with the sign-on of several user stations and the initialization of the EOC. Status monitor displays, configuration and event pages are displayed and used to verify the EOC and IST configuration following logical string assignments and reconfiguration activity performed by the user with ground configuration authority. Logical string assignments supporting real-time, simulation and replay strings are performed for each supported mode (i.e. operational, test, and training). As assignments and configuration changes are being made, EOC hardware and software status information is monitored via MSS tools to verify component status information is accurately portrayed.

The second portion of the test deals with the acceptance of FOS component information from the MSS at the EOC, and subsequent display of the information at EOC and IST user stations. Display of MSS provided information includes CPU utilization, equipment downtime, mass storage utilization, communications resource, data accounting, EOC fault solution recommendations, EOC log activities, fault isolation diagnostics, security audit logs, resource utilization reports and EOC hardware/software configuration history information.

Input:

ECL directives for initializing the EOC, configuring/reconfiguring logical strings, connecting to logical strings, displaying configuration monitor/event display windows.

Output:

Configuration monitor displays at EOC/IST user stations. Event displays/printouts at EOC/IST user stations.

Success Criteria:

EOC/IST configuration monitor displays accurately reflect the EOC component status before and after reconfiguration activity; following reconfiguration activity, associated real-time configuration pages update with refreshed information in 3 seconds or less. Component information available via MSS provided displays include CPU utilization, equipment downtime, mass storage utilization, communications resource, data accounting, EOC fault solution recommendations, EOC log activities, fault isolation diagnostics, security audit logs, resource utilization reports and EOC hardware/software configuration history information. The MSS provided information accurately reflects the most current status of FOS components; in cases

where MSS provides statistics based on assimilated files received from the FOS, the generated statistics reflect accurate computations based on associated files received from the FOS.

Test No.: CMD 2000B

Test Title: Command Mode - FOP Configuration

Test Support: EDOS/Spacecraft (or Simulation)

Test Dependencies: CMD, DMS, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the automatic retransmission of commands that were unsuccessfully transmitted to the spacecraft. This test demonstrates that the FOS provides the capability via CCSDS COP-1 protocol to retransmit commands when it is recognized that one or more of the commands were not successfully transmitted. The FOS retransmission capability allows the user to retransmit such that all commands transmitted since the last command known to be received and accepted by the spacecraft shall be retransmitted in the same order as originally transmitted. The user has the capability control the number of automatic retransmission attempts and can disable the automatic retransmission of commands all together.

Input:

Valid commands available for uplink. ECL directives and menu options to transmit the commands unsuccessfully to the spacecraft. ECL directives and menu options to limit the number of automatic retransmissions attempted by the FOS. ECL directives and menu options to enable and disable the retransmision of commands that are not received by the spacecraft.

Output:

Event messages and display updates confirming the automatic retransmission of commands that have failed to be received by the spacecraft. Event messages and display updates confirming the maximum number of retransmissions attempted based on the user override. Event messages and display updates confirming transmission failures with no FOS attempt to retransmit based on the automatic retransmission process being disabled by the user.

Success Criteria:

Analysis of event history report and display snaps to confirm that the FOS is managing the automatic retransmission of commands in accordance with specified requirements.

Test No.: CMD 2010B

Test Title: Command Modes - Prerequisite State Check Configuration

Test Support: EDOS/Spacecraft (or Simulation)

Test Dependencies: Prerequisite State Check Definitions in PDB, DMS, CMD, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support prerequisite state checking of commands prior to uplink. This test demonstrates that the FOS provides the necessary tools that allow the user to confirm the state of the spacecraft , by checking specific telemetry values in real-time, prior to the commands being transmitted. The user is able to verify up to four discrete spacecraft states prior to command transmission and those commands that require a prerequisite state check are defined in the project data base.

Testing verifies that the FOS suppresses the transmission of commands which fail the associated prerequisite state check. In the event of telemetry values being static, the FOS is capable of recognizing the data as static and returning a failed prerequisite status.

The user is provided with the capability to enable and disable the prerequisite state process and this test confirms that the FOS is able to recognize when an authorized user has enabled or disabled the check and perform or discontinue to perform the check on the associated telemetry points.

Input:

Valid commands and loads available for uplink to the spacecraft. Commands and loads available for uplink shall include commands that require a prerequisite state check prior to transmission. ECL directives and menu options to enable telemetry receipt and initiate the transmission of commands to be uplinked. ECL directives and menu options to randomly enable and disable the Prerequisite State Check mode.

Output:

Event messages and display window updates confirming the receipt of telemetry, command mode and command transmission status. Event messages and display window updates confirming the enable and disable of prerequisite state check.

Success Criteria:

Analysis of commands transmitted and event history report in comparison to AM-1 spacecraft states emulated during this test. This analysis exercise shall confirm that the FOS is capable of recognizing the various spacecraft states via processing of telemetry points as defined in the PDB. For state check fail, verify the FOS suppresses the transmission of the commands. For state check pass, verify the FOS proceeds with the transmission of the commands. For state check disabled, verify that the FOS does not process the state check and proceeds with the transmission of the commands regardless of the spacecraft state.

Test No.: CMD 2020B

Test Title: Command Verification - Telemetry Verification

Test Support: EDOS/Spacecraft (or Simulation)

Test Dependencies: CMD, DMS, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to verify the execution of commands on board the AM-1 spacecraft. This test demonstrates that the FOS provides the user with the tools necessary to verify via telemetry the successful execution of commands by checking the status of discrete telemetry points. The FOS database provides specific information as to which commands are to be telemetry verified and the associated, acceptable telemetry point values.

In addition to command execution, this test demonstrates that the FOS is able to provide via telemetry verification the status of the dispatch of absolute time commands and relative time commands.

Input:

Valid commands and loads available for uplink to the spacecraft. ECL directives and menu options to initiate command uplink and receipt of telemetry. ECL directives to enable telemetry verification.

Output:

Event messages and display window updates confirming the receipt of telemetry, uplink of commands and status of command execution via telemetry verification.

Success Criteria:

Analysis of event history report, snaps of telemetry pages, telemetry verification definitions in the PDB, timeline and load reports to confirm that the FOS is capable of processing telemetry values and accurately reports the status of command execution on board the spacecraft.

Test No.: CMD 2030B

Test Title: ASTER Command Notification

Test Support: ASTER ICC (or Simulation)

Test Dependencies: CMD, DMS, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the ASTER ICC notification of ASTER instrument command uplink status. This test demonstrates that the FOS provides the capability to report to the ASTER ICC the status of ASTER instrument commands that are being uplinked to the spacecraft. The following types of notification are verified during this test: instrument command request has been rejected by the EOC, instrument command transmitted, but not received by spacecraft, received by the spacecraft, but not executed on board, and successful execution.

Input:

Notification messages defined and available for transfer to the ASTER ICC. ECL directives and menu options (if required) to transfer the various types of messages to the ASTER ICC.

Output:

Event messages and display window updates confirming the successful transfer of each message to the ASTER ICC.

Success Criteria:

Analysis of event history report and messages defined in the PDB in comparison to the messages received at the ASTER ICC. Verify that the messages received by ASTER are free of corruption and identical to the messages sent from the FOS.

Test No.: CMD 2040B

Test Title: Command Requests

Test Support: None

Test Dependencies: CMD, DMS, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support command requests from authorized users. This test demonstrates that the FOS provides the tools necessary for an authorized user to create and submit a command request to the EOC Flight Operations Controller for acceptance or rejection. The command request submitted to the Operations controller contains a command procedure to execute and specific instructions for the operations team to follow. The FOS provides the capability to notify the operations controller of a pending command request, allows the controller to display the contents of a command request and transfer to the user a status as to the acceptance or rejection of the requests.

For an accepted command requests, this test demonstrates that the FOS provides the tools necessary to allow the Command Activity Controller (CAC) to merge the procedure into the current ground script, syntax check and validate the procedure and execute the procedure at the specified date and time. The originator of the command request is able to monitor the status of each procedure merged into the ground script via display of the Command Control Window.

Input:

ECL directives and menu options at the authorized user workstation to create a command request and submit it to the EOC Operations Controller for approval. ECL directives and menu options at the Operations Controller workstation to review any pending command requests received, accept and reject requests. ECL directives and menu options at the operations controller window to merge accepted requests into the current ground script. ECL directives at the authorized user workstation to view the execution of accepted procedures via the Command Control Window.

Output:

Event messages and display window updates confirming the creation and transfer of the command requests for approval. Event message and display updates confirming accepted requests, rejected requests and reason for rejection. Update of ground script to reflect those requests that have been approved and merged for execution.

Success Criteria:

Analysis of event history, ground script and window snaps to confirm that the FOS is properly managing the creation, submission, rejection, acceptance and execution of authorized user command requests.

Test No.: CMD 2050B

Test Title: Load Processing - Load Criticality

Test Support : None

Test Dependencies: CMD, DMS, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the uplink of critical commands to the spacecraft. This test demonstrates that the FOS provides the capability to control the uplink of critical commands by requiring a second positive response from the user prior to the transmission of the command. For stored command loads that contain a critical command, the FOS prompts the user to enter a single authorization of "allow" or "cancel" prior to the uplink of the load. The FOS is able to recognize those commands that are considered as critical based on command definitions that reside in the PDB.

Input:

Valid critical command definitions resident in the PDB. Valid stored command loads that contain critical commands available for uplink. ECL directives and menu options at the CAC workstation to initiate the uplink of the stored command loads. ECL directives and menu options to "allow" and "cancel" the transmission of the load uplink.

Output:

Event messages and display window updates confirming the load contains critical commands. Event messages and display window updates prompting the CAC for an "allow" or "cancel" prior to load uplink.

Success Criteria:

Analysis of command definitions in the PDB, event history report and load content reports to confirm that the FOS is managing the detection of critical commands as expected based on the definitions that reside in the database.

Test No.: CMD 2060B

Test Title: Load Processing - Load Verification

Test Support : EDOS/Spacecraft (or Simulation)

Test Dependencies: CMD, DMS, TLM, FOS User Interface

Test Description:

This test is designed to verify the FOS capability to support the verification to the user that a load has been successfully received and stored on board the spacecraft. This test demonstrates that the FOS is able to report to the user the successful uplink of a load based on telemetry point values received from the spacecraft. Specific telemetry points defined in the Project Data Base, take on values that correspond to a successful receipt of a load being uplink to the spacecraft.

Input:

Valid stored command loads available for uplink. Valid telemetry point definitions resident in the PDB that correspond to receipt verification status. ECL directives and menu options to initiate the uplink of the stored command loads. ECL directives and menu options to initiate the receipt of telemetry.

Output:

Event messages confirming the status of the stored command load uplink based on telemetry values being received at the EOC.

Success Criteria:

Analysis of event history, telemetry verification parameters defined in the PDB, telemetry window snaps and command uplink window snaps to confirm that the FOS is successfully managing the reporting of load uplink verification.

Test No.: TLM 2000B

Test Title: Derived Parameter Processing

Test Support: ETS or data simulator with data scripting capabilities

Test Dependencies: Aggregate set of derived parameter files in the telemetry portion of the operational database - at least one parameter definition supporting each allowable arithmetic operator; previously defined alphanumeric pages containing derived parameters; Scripted telemetry for all formats at all EDOS provided data rates; scripted bad quality data

Test Description:

This test is designed to verify the ability to provide real-time pseudotelemetry processing capabilities using predefined operational database definitions, and to provide display of parameter results.

Following sign-on, alphanumeric telemetry pages which include derived parameter and associated derived parameter value displays are invoked at the user station. The telemetry data driver is initiated, broadcasting housekeeping telemetry onto the FOS LAN in the form of EDUs. As telemetry packets are received and derived parameters decommutated, the displayed alphanumeric displays are printed at specified times. Derived parameter values residing on alphanumeric displays are analyzed post-test to ensure decommutated values match computations for scripted raw values (or computations based on EU values) for specified mnemonics. As the data continues decommutation, calculation intervals, as well as turning derived calculations on/off are performed by the ground controller. Scripted bad quality data is transmitted to verify flagging of parameter results. The above steps are repeated for diagnostic/health & safety telemetry formats, for each EDOS provided data rate.

Input:

ECL directives to enable/disable derived parameter processing, change calculation interval, display derived parameter alphanumeric display pages. UNIX directives to control data driver.

Output:

Derived parameter alphanumeric displays; event message displays

Success Criteria:

Each derived parameter decommutated according to the data base defined polynomial or linear interpolation. Derived parameter alphanumeric display fields display value (i.e. numeric or text), data base defined units (i.e. amps, volts, degrees, etc.), and associated flag fields. Derived parameters with values out of range limits are reported as out of limits on FUI display pages, match the data base defined limit definition (i.e. out of limits red high, red low, yellow high, yellow low), and display associated limits flag in the flag field. Any derived parameter whose inputs are flagged as static result in the output flagged as static and the output not calculated. Any derived parameter with an input flagged with a conversion error results in the parameter not

calculated and a conversion error flag set. Any derived parameter input marked with a questionable quality flag results in the computation being performed, but a questionable quality flag displayed in its associated flag field. Once derived parameter calculation interval is set, individual and/or derived parameter sets are calculated/recalculated based on the new interval rate. Any interval rate of less than one second results in an error message.

Test No.: TLM 2010B

Test Title: User Adjustment of Limits & Limit Set Definitions

Test Support: ETS or data simulator with data scripting capabilities

Test Dependencies: Operational database including parameter definitions with associated limits and multiple limit set definitions. Scripted housekeeping, health & safety, diagnostic telemetry packets. Alphanumeric display pages containing parameters associated with this test.

Test Description:

This test is designed to verify the ability to adjust limits definitions and limit set definitions for selected parameters in real-time by EOC/IST users.

Following sign-on, alphanumeric telemetry pages are displayed at the EOC. Scripted housekeeping telemetry packets containing raw values causing parameter limit violations are transmitted onto the FOS LAN. As the packets are decommutated, limit definitions and limit sets are changed, causing associated parameters to go in and out of limits, depending on the newly specified definitions. As data is decommutated alphanumeric and event pages are printed and analyzed off-line to ensure accurate limits processing based on user specified limits and limit set definitions. The above steps are repeated for health & safety a and diagnostic telemetry.

Input:

ECL directives to configure the EOC for telemetry processing, to display/print alphanumeric display pages, and to change limit definitions.

Output:

Alphanumeric page displays and event displays/printouts.

Success Criteria:

All limits violation flags as seen on alphanumeric telemetry displays match raw or EU limit definitions as defined in the AM-1 PDB or when specified, matching user specifications. All limits in the "warning range" (i.e. yellow limits low, yellow limits high) result in a yellow limits flag. All limits in the "alarm range" (i.e. red limits low, red limits high) result in a red limits flag. Limit violation messages are displayed for each occurrence of a limit violation by any of the decommutated parameters valid for the decommutated telemetry stream/format. Adjustments to limit definition or limit sets does not affect global telemetry processing; changes affect only the local telemetry processing capabilities (i.e. local to that user station only).

Test No.: TLM 2020B

Test Title: User Adjustment of EU conversion Algorithms & Coefficients

Test Support: ETS or data simulator with data scripting capabilities

Test Dependencies: Operational database with associated EU definitions based on polynomials and linear interpolations up to 16 point pairs. Scripted housekeeping, diagnostic and health & safety telemetry packets. Alphanumeric display pages containing parameters associated with this test.

Test Description:

This test is designed to verify the ability to select a predefined EU conversion algorithm, or adjust the predefined EU conversion algorithm coefficient values for selected parameters in real-time by EOC/IST users.

Following sign-on, alphanumeric telemetry pages are displayed at the EOC. Scripted housekeeping telemetry packets containing raw values are transmitted onto the FOS LAN. As the packets are decommutated, EU conversion algorithms and EU coefficient values are changed via ECL directives for selected parameters. As data is decommutated, alphanumeric and event pages are printed and analyzed off-line to ensure accurate EU computations based on user specified EU algorithms or coefficients. The above steps are repeated for health & safety and diagnostic telemetry.

Input:

ECL directives to configure the EOC for telemetry processing, to display/print alphanumeric display pages and to change parameter EU information

Output:

Alphanumeric page displays and event displays/printouts.

Success Criteria:

Via off-line analysis, it is determined that the decommutated/EU parameter values displayed on alphanumeric display pages correlate to EU values using the applied EU algorithm or algorithm coefficient. Changes made to EU algorithms and EU coefficients are reflected in event messages. Adjustments to EU conversion information does not affect global telemetry processing; changes affect only the local telemetry processing capabilities (i.e. local to that user station only).

Test No.: TLM 2030B

Test Title: Multiple Source Telemetry Display

Test Support: ETS or data driver with data scripting capabilities

Test Dependencies: Real-time, playback and simulation telemetry processing capabilities

Test Description:

This test is designed to verify the ability to connect and display multiple telemetry processing activities at the EOC and IST user stations.

Following sign-on and initialization of real-time, simulation and replay strings, real-time housekeeping telemetry is enabled at the EDOS/ETS for receipt by the real-time string; real-time health & safety telemetry is enabled at the data generator for receipt by the simulation string; A telemetry replay is then requested for processing by the replay string. Several EOC/IST users, using a combination of ECL directives and menu options, display a combination of alphanumeric display pages, schematics, tables and graphs in support of each previously defined string. As multiple sources of telemetry are received, processed and displayed at the EOC/IST user stations, snaps of displays are taken at specified time intervals and compared to the real-time telemetry (or replay) source.

Input:

ECL directives to sign on and initialize strings, to select and print displays.

Output:

Telemetry archive file dumps, alphanumeric and event displays.

Success Criteria:

EOC and IST users, upon connection to an existing logical string, may display that string's telemetry processing information via display pages, graphs, tables, or schematics. Any combination of existing telemetry sources can be supported by any EOC/IST user. The display of multiple string telemetry processing information does not affect display of other string's telemetry processing information.

Test No.: TLM 2040B

Test Title: Ground Telemetry Receipt, Storage & Retrieval

Test Support: EDOS/EBnet; ETS supporting DSN, GN, WOTS, operational or emulated interfaces.

Test Dependencies: DSN, GN, WOTS interface functionality

Test Description:

This test is designed to verify the ability to receive and store ground telemetry information as it is received from external interfaces. Ground receipt and archive of ground telemetry includes TSS summary reports and rate buffered delivery records from EDOS and monitor blocks from the DSN, GN, and WOTS. A secondary objective of the test is to verify the capability of providing report information derived from archived ground telemetry.

]The test begins with initialization of the EOC and real-time string configuration. TSS summary reports and rate buffered delivery records are transmitted from EDOS for automatic archiving by the FOS DMS archive. Subsequent to this activity, DSN support is configured, followed by the transmission of monitor blocks from the DSN. This is followed by the initiation of GN and WOTS support and transmission of monitor blocks during both of those support sessions. Report requests and printouts based on archived summary reports and monitor block information are generated and analyzed off-line to archived data to ensure accurate analysis representation of archived ground telemetry.

Input:

ECL directives to initialize the EOC and request TDRSS support sessions. ECL/mouse/keyboard selection of report options.

Output:

Ground telemetry reports; ground telemetry archive files.

Success Criteria:

The reception of incoming TSS reports, monitor blocks, etc. are marked by event messages, displayed at all connected user stations. Each TSS summary report, rate buffered delivery record, and monitor block is archived in the DMS archive automatically, and the aggregate sets of each are available for reporting purposes following ingest.

Test No.: TLM 2050B

Test Title: Adjustment of Telemetry Replay

Test Support: None

Test Dependencies: Previously Archived housekeeping, health & safety, and diagnostic telemetry

Test Description:

This test verifies the ability to adjust limit definitions, limit sets, EU conversion coefficients, EU conversion algorithms, replay rate, and replay time period via menu options provided by the Replay Controller Tool and other user interface supplied menu options.

The test begins with the initialization of the replay logical string, and initialization of several EOC user stations in support of the replay string. The Replay Controller tool is invoked, and pre-defined replay alphanumeric telemetry pages, telemetry plots, telemetry strip charts and telemetry schematics are displayed at various user stations. Replay information (i.e. spacecraft ID, start/stop time, data type, replay time, EU conversion information, limits information, and replay rate) is entered via selected Replay Controller menu options. The replay of housekeeping telemetry is initiated and display pages, plots, graphs and schematics are displayed and printed. They are analyzed and compared post-test against telemetry archive file dumps (and against each other) to ensure accurate parameter value (raw or EU), flag display (i.e. static, limits, delta limits, quality). Steps are provided to pause and resume the replay at varied rates. The above steps are repeated for the replay of SSR, health & safety and diagnostic telemetry packets.

Input:

ECL directives to configure the EOC string configuration, to display/print replay pages, plots, strip charts, schematics, Mouse/keyboard selection of Replay Controller tool options.

Output:

Telemetry replay pages, plots, strip charts, schematics.

Expected Results:

Via off-line analysis, parameter values (raw or EU) and parameter status information (i.e. applicable parameter flags, UTC, spacecraft time, current orbit number, data source, current major/minor cycle counts, current telemetry format, current telemetry rate, spacecraft ID) from replay pages, plots, strip charts and/or schematics matches values in the replay data stream. All replay displays provide a visual indication of the start time, stop time, and position of current time during the replay and following reinitiation of the replay according to the new replay rate. Each user, once assigned to the replay logical string, may view the initiated replay by displaying replay pages, plots, strip charts, and/or schematics.

All limit violation flags as seen on alphanumeric telemetry displays match raw or EU limit definitions as defined in the AM-1 PDB and when changed, match changes entered by the user. All limits in the "warning range" (i.e. yellow limits low, yellow limits high) result in a yellow

limits flag. All limits in the "alarm range" (i.e. red limits low, red limits high) result in a red limits flag. Limit violation messages are displayed for each occurrence of a limit violation by any of the decommutated parameters valid for the decommutated telemetry stream/format. Adjustments to limit definitions, limit set definitions, EU conversion algorithms, EU coefficients, and replay rate does not affect global telemetry processing; changes affect only the local telemetry processing capabilities (i.e. local to that user station only). Via off-line analysis, it is determined that the decommutated/EU parameter values displayed on replay displays correlate to EU values using the applied EU algorithm or algorithm coefficient. Changes made to EU algorithms and EU coefficients are reflected in replay event messages.

Test No.: TLM 2060B

Test Title: Telemetry Replay - Derived Parameter Processing

Test Support: None

Test Dependencies: Aggregate set of derived parameter files in the telemetry portion of the operational database. Scripted telemetry and SSR data - supplied at all EDOS provided data rates; scripted bad quality data. Previously archived telemetry data.

Test Description:

This test is designed to verify the ability to provide real-time pseudotelemetry processing capabilities during telemetry playback, using predefined derived parameter database definitions, and to provide display of parameter results.

Following sign-on, alphanumeric telemetry replay pages which include derived parameter and associated derived parameter value displays are invoked at the EOC/IST user stations. The telemetry replay is initiated via the Replay Controller Tool. As telemetry packets are received and derived parameters decommutated, replay displays are printed at specified times. Derived parameter values residing on the replay displays are analyzed post-test to ensure decommutated values match computations for scripted raw values (or computations based on EU values) for specified parameters. As replay data continues decommutation, calculation intervals, as well as turning derived calculations on/off are performed by the ground controller. Scripted bad quality data is replayed to verify bad quality flagging of parameter results. The above steps are repeated for the replay of health & safety, diagnostic, and SSR data packets.

Input:

ECL directives to enable/disable derived parameter processing, change calculation interval, display derived parameter alphanumeric replay display pages. UNIX directives to control data driver.

Output:

Derived parameter alphanumeric replay displays; event message displays

Success Criteria:

Each derived parameter decommutated according to the data base defined polynomial or linear interpolation during the replay period. Derived parameter alphanumeric display fields display value (i.e. numeric or text), data base defined units (i.e. amps, volts, degrees, etc.), and associated flag fields. Derived parameters with values out of range limits are reported as out of limits on FUI display pages, match the data base defined limit definition (i.e. out of limits red high, red low, yellow high, yellow low), and display associated limits flag in the flag field. Any derived parameter whose inputs are flagged as static result in the output flagged as static and the output not calculated. Any derived parameter with an input flagged with a conversion error results in the parameter not calculated and a conversion error flag set. Any derived parameter input marked

with a questionable quality flag results in the computation being performed, but a questionable quality flag displayed in its associated flag field. Once derived parameter calculation interval is set, individual and/or derived parameter sets are calculated/recalculated based on the new interval rate. Any interval rate of less than one second results in an error message. During replay pause, no derived parameter fields are updated until the replay is resumed.

Test No.: TLM 2070B

Test Title: Telemetry Merge

Test Support: ETS or SSR data generator

Test Dependencies: Archive directory and archive file access via user interface.

Test Description:

This test is designed to verify the ability to create a seamless archive by automatically merging real-time and SSR telemetry.

Following initialization of the EOC and real-time string configuration, several iterations of SSR playback and subsequent merging are initiated, including SSR playback containing good quality packets, SSR data containing bad quality packets, SSR data from the previous back orbit, and SSR data from the 2nd previous back orbit. Following the completion of each SSR dump, telemetry archive files containing the merged data are printed and analyzed off-line to ensure seamless archiving.

Input:

ECL directives to sign on and initialize strings and to enable archiving. Keyboard/mouse selection of archive menu options. to display alphanumeric and event message displays.

Output:

Telemetry archive file dumps, event messages.

Success Criteria:

Following SSR packet receipt completion, the SSR packets are archived in sequential order, to housekeeping telemetry packets already residing in the archive. The following conditions occur for the merging of SSR data: 1) duplicate data in the SSR downlink are rejected by the archiving process with archiving process continuing without error, 2) duplicate data in the SSR downlink takes the place of questionable quality packets, with the archiving process continuing without error 3) all non-duplicate SSR packets of questionable quality are included in the telemetry archive, with the archiving process continuing without error.

Test No.: ANA 2000B

Test Title: Special Processing Algorithms

Test Support: None

Test Dependencies: User Defined Algorithm Definition - User interface functionality. Previously archived telemetry - housekeeping, diagnostic, health & safety, SSR packets.

Test Description:

This test is designed to verify the capability for users to define algorithms and apply defined algorithms to user-specified analysis requests.

Following the generation and registration of a user-supplied algorithm, The Analysis Request and Time Selector windows are displayed, and an historical request of housekeeping data is generated, with selected options including request name, start/stop time interval, parameter names, sampling rates and applied algorithm name. The request is saved and submitted for dataset generation. Following the completion of the dataset and the printing of its contents, each report is analyzed off-line to ensure report content complies with the registered algorithm.

Input:

Keyboard/mouse selection of analysis tools, selection of telemetry history options and for display/ printout of reports. C programming input; registration of algorithms.

Output:

Algorithm registration menus; user-specified report displays/printouts; algorithm definitions.

Success Criteria:

Registration of algorithms is not successful until the algorithm name, algorithm object file name, output parameter name, and input parameters are defined. Via off-line analysis, report displays and printouts contain accurate parameter computations as computed from the selected algorithm. Any request for data where input parameters do not exist in the requested start/stop time result in an error message and the dataset not created - for cases where the request is contained by one associated database, and where the request is contained by more than one associated database.

Test No.: ANA 2010B

Test Title: Report Browser/Editor

Test Support: None

Test Dependencies: Previously defined reports - at least one report from each report category, from each FOS subsystem

Test Description:

This test is designed to verify the Report Browser/Editor Tool, which allows a user to request generation of reports from predefined templates, browse and edit existing reports, or invoke the Report Template Builder.

The test begins with the Report Browser Tool invoked at the EOC and IST user station locations. Using the tool, a list of all available reports is browsed, followed by the request for display and editing of existing reports. Following editing of the reports, each is saved, and reinvoked. Menu options are selected for the display of all available report templates, and reports are generated using the Tool. Examples of reports generated include command directory, activity constraint, long term science plan, instrument specific BAPs, ASTER schedule, Preliminary Resource Schedule, predicted TDRSS ephemeris, Attitude predictions, ATC memory map, critical command loads, downlink order, and parameter-out-of-limits.

Input:

ECL directives to initiate and control Report Browser/Editor tool and tool menus.

Output:

Report Browser/Editor menu display, report printouts/displays.

Success Criteria:

Any FOS report can be generated, accessed, printed, saved, and edited using the Report Browser/Editor tool. Generation and editing activities allowed by authorized users only. All reports available to EOC and IST users.

Test No.: ANA 2020B

Test Title: Dataset Generation Based on Triggers

Test Support: None

Test Dependencies: Archived operational data base containing valid start/stop times for dataset requests; archived housekeeping, diagnostic, health & safety and SSR telemetry packets; previously defined trigger events

Test Description:

This test is designed to verify the ability to generate various datasets (i.e. statistical, non-statistical) based on previously defined events. The test begins with the initiation of specified events as triggers (i.e. a telemetry parameter violating a red high limit definition) via the selection of options residing on the trigger generation menu. Following the simulation of each triggered event, the dataset generated as a result is compared against datasets generated in previous tests to ensure data integrity of each generated dataset when generating the dataset via the trigger function. Examples of datasets generated via a triggered event include statistical datasets based on derived parameters and user specified statistics based on derived parameters.

Input:

Mouse/keyboard selection of trigger options and dataset directory browsing. ECL and/or mouse/keyboard input to browse dataset content and for generating reports.

Output:

Analysis status windows, reports based on generated datasets, trigger menu displays, event page displays.

Success Criteria:

Following the simulation of each triggered event, the associated dataset definition is automatically generated. The dataset definition matches that specified by the user during the trigger definition process. All derived parameter datasets specified via the trigger analysis function are treated in the same manner as those not generated from the trigger function (e.g. stored in the same directory, reports may be generated from any triggered dataset, etc.). Via off-line analysis, derived parameter dataset computations are accurate.

Test No.: ANA 2030B

Test Title: Spacecraft State Reporting

Test Support: ETS or data driver capable of receiving commands and setting specific spacecraft states per command definition.

Test Dependencies: Real-time commanding, telemetry processing

Test Description:

This test is designed to verify the ability to monitor the status of stored commands executed on-board the spacecraft during the back-orbit by comparing spacecraft expected states of discrete parameters versus the actual state of the spacecraft. This test also verifies the ability to print and display the spacecraft state report.

The test begins with the entry of an ECL directive to load the current telemetry values into the Spacecraft State Table. Since no telemetry is flowing, the event messages from this should indicate that the load was unsuccessful. The data generator is initiated to broadcast real-time spacecraft/instrument housekeeping telemetry onto the FOS LAN. An ECL directive is issued to load the current telemetry values into the Spacecraft State Table. The event messages from this load should indicate that the load was successful. A command load will then be sent, and the state compare is performed.

The next section of the test takes place after the time specified for stored commands to be invoked. With telemetry flowing, the Spacecraft State Table is compared via directive. The discrepancies between the current state and the expected state are analyzed off-line, and commands are then issued to alter some of the states to expected states. The spacecraft state report is printed to ensure that no discrepancies are reported following the changing of the current states.

Input:

ECL directives to issue commands, initiate the load/compare/reporting of the spacecraft state table. UNIX directives to control data generator and/or simulator.

Output:

Spacecraft state table comparison report. Analysis status windows, event display windows.

Success Criteria:

Spacecraft state model loaded only during times of good quality telemetry flow; during static or questionable quality conditions, loading of the spacecraft state table is prohibited, results in error messages and does not contribute to reporting of spacecraft state statistics. Spacecraft states reported on ground match those of the spacecraft as reported in the telemetry downlink. All miscompares between current and expected states are reported. Following the altering of the expected states to current states, no miscompares are reported in the spacecraft state report.

Test No.: ANA 2040B

Test Title: Spacecraft Clock Correlation based on RDD Calculation Method

Test Support: NCC or NCC Emulator

Test Dependencies: NCC; NCC RCTD messages

Test Description:

This test verifies the ability to calculate the spacecraft clock drift error based on the Return Data Delay (RDD) method for calibrating the drift value.

The test begins with the initialization of Return Channel Time Delay (RCTD) messages from the NCC, and the broadcast of spacecraft telemetry onto the FOS LAN. The event, RDD clock display pages, and clock graph/table displays are invoked at EOC user stations. RDD calculation of the spacecraft clock rate is enabled by the ground controller via ECL directive. Event messages stating current clock drift values, and real-time tables/graphs portraying the clock drift error rate are viewed and printed. The printouts are analyzed off-line against collective UTC, spacecraft clock, spacecraft telemetry and RCTD messages to ensure accurate calculation of the clock error based on the RDD algorithm and accurate portrayal of the clock drift rate by spacecraft clock graphs/tables.

Input:

ECL directives to configure the EOC configuration, to enable/disable clock error calculation, and to display/print event pages and spacecraft clock graphs/tables.

Output:

Event display page, spacecraft clock graphs/tables. spacecraft telemetry, RCTD messages.

Expected Results:

Spacecraft clock error calculation based on the RDD algorithm method may be enabled/disabled via user input. Via off-line analysis, the displayed clock error and error rate for a given time period as displayed on spacecraft clock graphs/tables is accurate based on the RDD algorithm method; corresponding clock drift rate as displayed on spacecraft clock graph(s) matches event messages stating drift error and also matches the difference of drift counts from successive samples in time.

Test No.: ANA 2050B

Test Title: Spacecraft Clock Correlation based on USCCS Calculation Method

Test Support: NCC Interface

Test Dependencies: NCC; NCC RCTD messages; NCC Interface

Test Description:

This test verifies the ability to calculate the spacecraft clock drift error based on the User Spacecraft Clock Calibration System (USCCS) method for calibrating the drift value.

The test begins with the initialization of Time Transfer Messages (TTMs) from the NCC and the broadcast of spacecraft telemetry onto the FOS LAN. The event, USCCS clock display page, and clock graph/table displays are invoked at EOC user stations. Automatic USCCS calculation of the clock drift rate is enabled by the ground controller via ECL directive. Event messages stating current clock drift values, and real-time tables/graphs portraying the clock drift error rate are viewed and printed. The printouts are analyzed off-line against spacecraft telemetry, TTMs and the RDD algorithm to ensure accurate calculation of the clock error and associated clock drift rate.

Input:

ECL directives to configure the EOC configuration, to enable/disable USCCS clock error calculation, and to display/print event pages and spacecraft clock graphs/tables.

Output:

Event display page, spacecraft clock graphs/tables. spacecraft telemetry, TTM messages.

Expected Results:

Spacecraft clock error calculation based on the USCCS algorithm method may be enabled/disabled via user input. Via off-line analysis, the displayed clock error and error rate for a given time period as displayed on spacecraft clock graphs/tables is accurate based on the USCCS algorithm method; corresponding clock drift rate as displayed on spacecraft clock graph(s) matches event messages stating drift error and also matches the difference of drift counts from successive samples in time.

Test No.: SEG 2000B

Test Title: Concurrent Operations

Test Support: EDOS, EBnet, FDF, NCC, SD VF, SMC, ASTER, ISTs

Test Dependencies: Full functionality of FOS subsystems - planning & scheduling, command management, real-time commanding, telemetry processing, analysis processing, user interface

Test Description:

This test is designed to verify the ability to simultaneously perform concurrent operations in support of the EOS spacecraft, including external interface functionality in support of ongoing operations. During the test, specific functions within each FOS phase (i.e. planning & scheduling, real-time operations, and analysis) will be exercised, concurrently with external interfaces which support those activities (i.e. EDOS, EBnet, FDF, NCC, SMC, SDVF, and ASTER ICC). Examples of activity taking place concurrently includes 1) EOC and IST scheduling 2) ground script execution, 3) ATC load generation, 4) real-time commanding, 5) telemetry receipt/processing/display, 6) telemetry subset generation and transmission to the FDF, 7) TDRSS schedule reception from the NCC and subsequent use in scheduling, 8) command load transmission to the SDVF, 9) event message display and archiving, 10) SSR playback processing, 11) CODA reception from EDOS, 12) EOC/IST real-time telemetry monitoring, 13) anomaly investigation and routine analysis requests, 14) dedicated replay monitoring at EOC/IST user stations. At different stages throughout the test, steps are provided to log FOS software and hardware activity (i.e. CPU utilization, network bandwidth usage, etc.).

Input:

ECL directives/mouse/keyboard selection of menu items to configure the EOC and initialize both internal and external functions.

Output:

CPU/network/software process utilization logs, event messages, event display pages.

Expected Results:

FOS primary resources (i.e. CPUs, disk storage devices, network communications) do not exceed 50% of capacity during the operational period. Concurrent operations supports 15 operational ISTs, with at least one dedicated instrument IST allowed connection to the floating pool. Operational load does not affect critical real-time functionality (i.e. real-time commanding, telemetry processing and display). Command loop delay during concurrent operations does not exceed 2.5 seconds. Up to 7 operational spacecraft support provided simultaneously.

Test No.: SEG 2010B

Test Title: Spacecraft Activity Log

Test Support: ETS or data driver with activity log dump data capability

Test Dependencies: Spacecraft commanding of activity log data dumping

Test Description:

This test is designed to verify the ability to receive and display the spacecraft activity log events, request the spacecraft activity log via command request, receive the dump at the EOC, and to provide an Activity Log Interpretive Report following dump reception.

The test begins with the configuration of the EOC to support real-time activities, the initialization of several EOC user stations, and sign-on to configured real-time string by IST users. The ETS data driver is initialized to broadcast housekeeping telemetry which includes the trickled event messages pertaining to the Activity Log Queue. The event page displays are viewed at the EOC to verify accurate representation of activity log event messages, including time tag, event ID, event text, and parameter values. The command controller issues commands to dump the activity log. Following receipt of the dump, the spacecraft activity log is browsed via the report browser, and sent to configured ISTs via the Data Mover Tool.

Input:

ECL directives/mouse/keyboard selection of menu items to configure the EOC and ISTs. ECL directives to command the spacecraft activity log dump, view and transmit the spacecraft activity log report.

Output:

Event display pages; spacecraft activity log report

Expected Results:

Real-time activity log event messages displayable via event message display pages; the event messages match database definitions. Dump of activity log is received in its entirety following command directive to dump the log. Activity logs are available via the Report Browser Tool, and transmittable to ISTs via the Data Mover Tool. Via off-line analysis, activity log content including event message IDs, time tags, event message text and associated parameters/values are accurate.

Abbreviations and Acronyms

AGS	ASTER Ground System
AM	Morning (ante meridiem) -- see EOS AM
ANA	Analysis
AOS	Acquisition of Signal
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer (formerly ITIR)
ATC	Absolute Time Command
BAP	Baseline Activity Profile
CAC	Command Activity Controller
CCSDS	Consultative Committee for Space Data Systems
CERES	Clouds and Earth's Radiant Energy System
CI	Configuration item
CLCW	Command Link Control Words
CM	Configuration Management
CMD	Command
CMS	Command Management System
COTS	Commercial Off-The-Shelf
CSCI	Computer software configuration item
CSMS	Communications and System Management Segment
CSS	Communications Subsystem (CSMS)
CTIU	Command and Telemetry Interface Unit
DAR	Data Acquisition Request
DAS	Detailed Activity Schedule
DB	Database
DBA	Database Administrator
DBMS	Database Management System
DDTS	Distributed Defect Tracking System
DFCD	Data Format Control Document
DID	Data item description; data ingest/distribution

DMS	Data Management Subsystem
DSN	Deep Space Network
DSS	Decision Support System
EASE	Expert Advisor State Equation
ECL	ECS Command Language
ECOM	EOS Communications
ECS	EOSDIS Core System
EDF	ECS Development Facility
EDOS	EOS Data and Operations System
EDU	EDOS Data Unit
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
ETS	EOSDIS Test System
EU	Engineering Unit
EVT	Event
FDF	Flight Dynamics Facility
FIFO	First In - First Out
FMG	File Management
FOS	Flight Operations Segment (ECS)
FOT	Flight Operations Team
FUI	FOS User Interface
GCMR	Ground Configuration Message Request
HGA	High Gain Antenna
I&T	Integration and Test
ICC	Instrument Control Center
IP	International Partners
IRD	Interface requirements document
IST	Instrument Support Toolkit
JPL	Jet Propulsion Laboratory
LAN	Local Area Network

LaRC	Langley Research Center
LMC	Lockheed Martin Corporation
LOS	Loss of Signal
LSM	Local System Manager
LTIP	Long Term Instrument Plan
LTSP	Long Term Science Plan
MISR	Multi-Angle Imaging SpectroRadiometer
MO&DSD	Mission Operations and Data Systems Directorate (GSFC Code 500)
MODIS	Moderate Resolution Imaging Spectrometer
MOPITT	Measurements of Pollution in the Troposphere
MSS	Managememt and Subsystem (part of CSMS)
MTPE	Mission to Planet Earth
Nascom	NASA Communications Network
NASDA	National Space Development Agency (Japan)
NCC	Network Control Center
NOAA	National Oceanic and Atmospheric Administration
OASIS	Operations and Science Instrument Support
ODB	Operational Database
ODM	Operational Data Message
PAS	Planning and Scheduling
PDB	Project Data Base
PI	Principal Investigator
PI/TL	Principal Investigator/Team Leader
PROC	Procedure
QA	Quality Assurance
RCM	Real-time Contact Management
RCTD	Return Channel Time Delay
RMA	Reliability, Maintainability, Availability
RTCS	Relative Time Command Sequence
RTS	Relative Time Sequence
SCC	Spacecraft Controls Computer

SCF	Science Computing Facility
SDVF	SMC Service Management Center
SDPS	Science Data Processing System
SN	Space Network
SSIM	Spacecraft Simulator
SSR	Solid State Recorder
TD	Target Day
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TL	Team Leader
TLM	Telemetry
TOO	Target of Opportunity
TTM	Time Transfer Message
TW	Target Week
USCCS	User Spacecraft Clock Calibration System
UPS	User Planning System
UTC	Universal Time Coordinated
UI	User Interface
WAN	Wide Area Network
WOTS	Wallops Orbital Tracking Station