GLAST LAT System Engineering

LAT Test Planning Meeting

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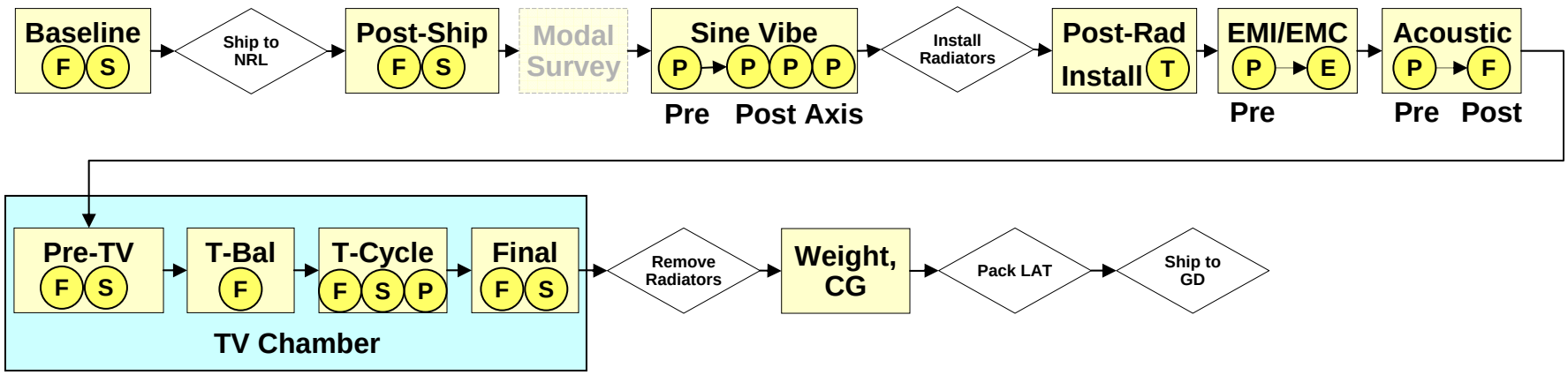
Agenda

- LAT Level Test Sequence
- Baseline LAT Level Test Sequence
- Test Groupings
- LAT Environmental Test Sequences
- Redundancy Configurations

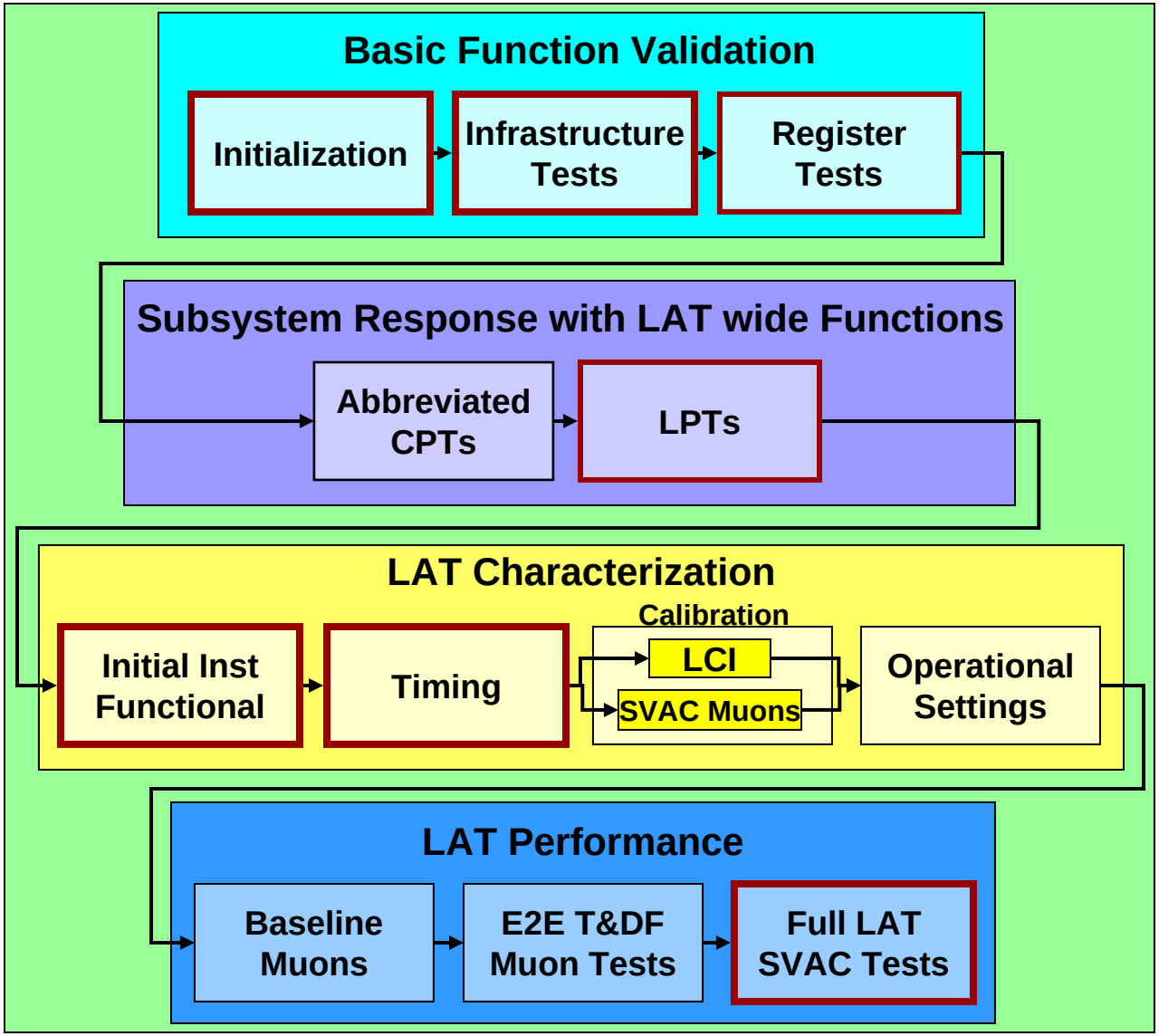
LAT Level Test Sequence



- **P** Partial Functional (includes Limited Performance)
- **F** Full Functional (includes Comprehensive Performance)
- **E** EMI/EMC Emissions/Susceptibility
- **S** SVAC Tests
- **T** TCS LPT

Baseline Level LAT Test Sequence

Full Functional



= Redundancy tests required

Baseline LAT Test - Test Groupings (1/4)

- Basic Function Validation
  - Purpose
    - Initialization
      - Validate FSW conducted LAT initialization sequence
      - Prove FSW interfaces with flight hardware
    - Infrastructure
      - Validate all LAT operational functions such as command, telemetry, Configuration and LCI files, FSW File Management, et. al.
    - Register Tests
      - Utilize FSW utilities to verify function of all LAT registers

Baseline LAT Test - Test Groupings (2/4)

- **Subsystem Response**
  - **Purpose**
    - Abbreviated Comprehensive Performance Test (CPTs)
      - Verify subsystem performance remains in spec in LAT wide environment
      - Demonstrate the complete health of each subsystem
      - Collect trend data
      - Run in all prime and all redundant redundancy configurations
    - Limited Performance Tests (LPTs)
      - Perform quick check of subsystem performance in cross-strapped redundancy configurations

Baseline LAT Test - Test Groupings (3/4)

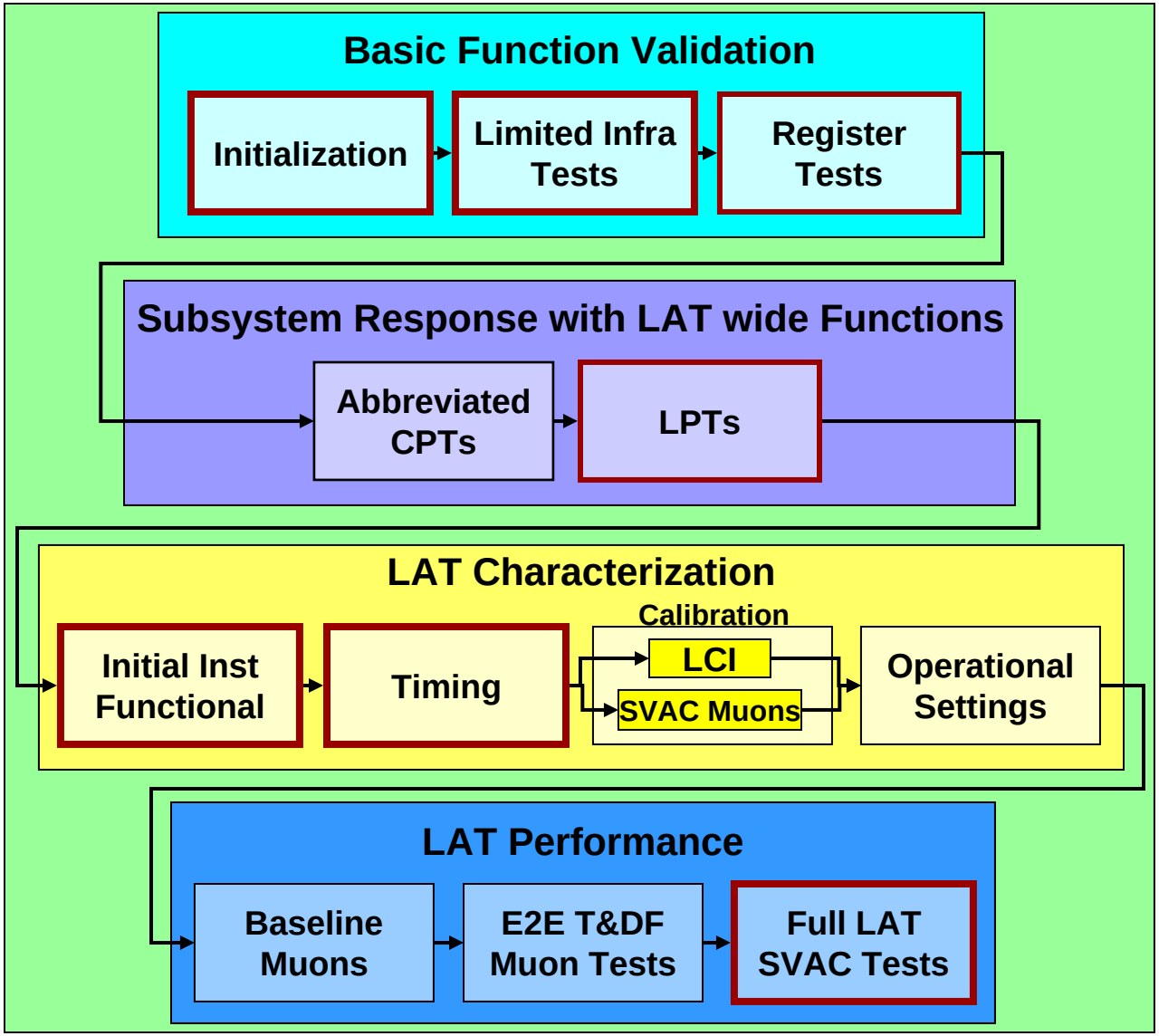
- LAT Characterization
  - Purpose
    - Initial Instrument Functional
      - High-level validation of the LAT as an integrated scientific instrument
    - Timing
      - Measure and adjust LAT wide timing
    - Calibration
      - Calibrate the LAT using LCI and Muons
    - Operational Settings
      - Determine/adjust LAT operational settings as precursor to LAT Level Performance tests

Baseline LAT Test - Test Groupings (4/4)

- LAT Characterization
  - Purpose
    - Baseline Muons
      - Establish Instrument Level baseline performance with Muons
    - E2E Muon Tests
      - Verify T&DF performance using Muons
    - Full LAT SVAC Tests
      - Collect necessary data for analysis to verify LAT meets all requirements in the SRD

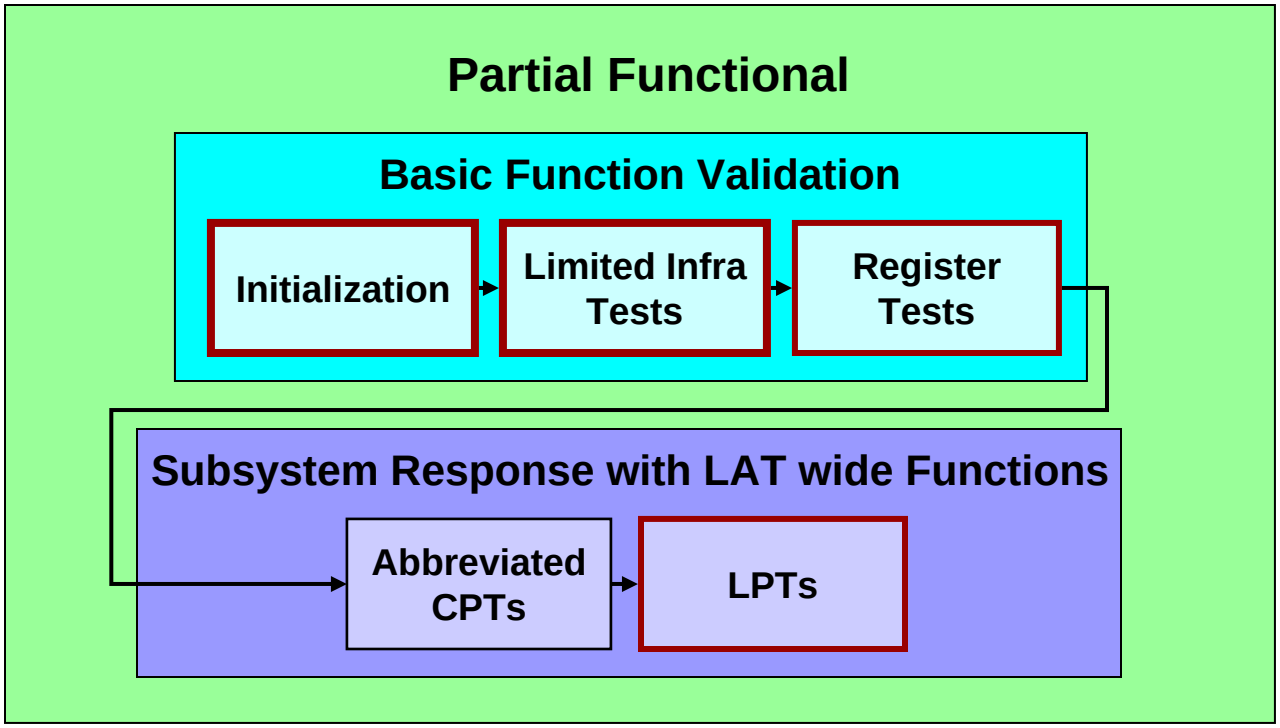
Post Ship Test Sequence

Full Functional



= Redundancy tests required

Sine Vibe LAT Level Test Sequence



- Partial Functional repeated 4 times, one pre Sine Vibe and once after each axis

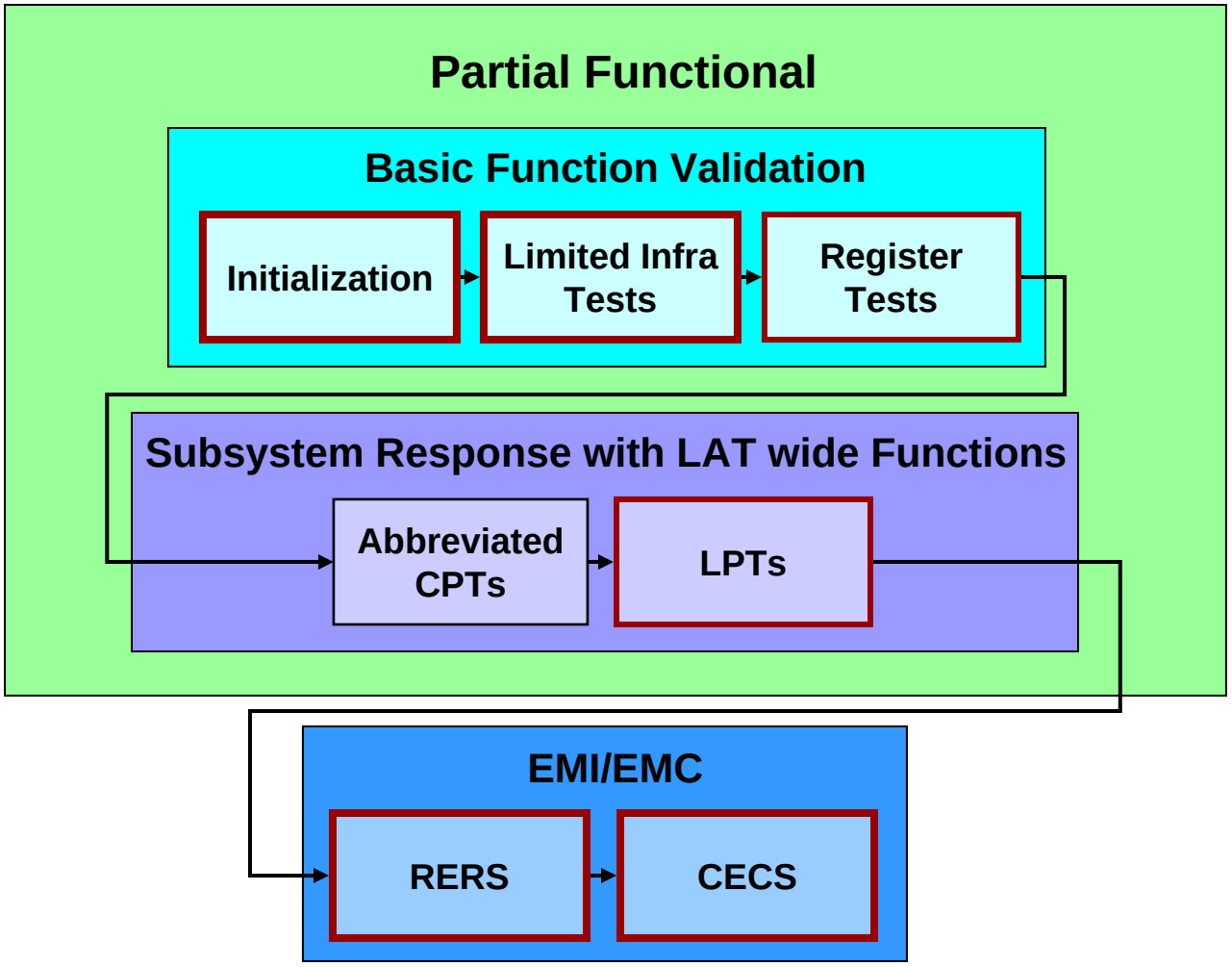
= Redundancy tests required

Post Radiator Installation

- TCS LPT
  - Contents TBD

= Redundancy tests required

EMI/EMC LAT Level Test Sequence



= Redundancy tests required

LAT Level Test Function/Interface Validation (1/3)

Basic Functions	Instrument Response		
Infrastructure	Science Support Functions	Characterization	Science Data Functions
SC Discrete Commands	*ACD Functions*	*Trigger Timing*	*Event Handling*
SC Discrete Telemetry	Threshold Adjust	TKR 3-in-a-Row	Event Monitoring
Command	High Threshold Adjust	VETO	Event Filtering
1553 Command	Zero Suppression	CNO	Event Building
Command Processing	Pulse Height Measurement	Cal Lo	Event Data Delivery
Command Execution	Low Gain Mode	Cal High	Event Source Location
Command Validation	Event Data Readout	T-Ack	Event Energy Measurement
Cmd Status Reporting	*CAL Functions*	Periodic Triggers	Filter Identified Transients
Subsystem Commanding	Energy Measurement	Solicited Triggers	*GRB Handling*
Register Commanding	Low Threshold Adjust	*Calibration*	GRB Monitoring
Telemetry	High Threshold Adjust	ACD Calibration	GRB Filtering
Housekeeping Telemetry	Zero Suppression	CAL Calibration	GRB Building
Dwell Telemetry	Low Energy Trigger	Tracker Calibration	GRB Delivery
Diagnostic Telemetry	High Energy Trigger	*Operational Settings*	GRB Source Location
Alert Telemetry	Position Resolution	ACD Ops Settings	
Subsystem Telemetry	Angular Resoltion	CAL Ops Settings	
Register Readback	Event Data Readout	Tracker Ops Settings	

LAT Level Test Function/Interface Validation (2/3)

Basic Functions	Instrument Response		
Infrastructure	Science Support Functions	Characterization	Science Data Functions
File Management	*Tracker Functions*		
File Dump	Trigger Threshold Adjust		
Directory Dump	TOT Adjust		
File System Status Dump	Right/Left Readout		
File Loads	Event Data Readout		
Memory Dumps	*T&DF Functions*		
FSW Initialization	Data Integrity		
Initialization	Trigger Monitoring		
Reinitialization	Trigger Time Adjust		
SIU/EPU Boot	Trigger Acknowledgement		
SIU/EPU Reset/Reboot	T-Ack Blocking		
SIU Secondary Boot	Trigger Live Time Measure		
SEU/Memory Protection	Trigger Event Data		
Watchdog	Event Data Readout		
LAT Safety	Event Data Overwrite Protect		
Safe Mode	Event Filter Reconfiguration		
Load Shed	External Trigger		
SAA Transit	GRB Notification		
	Unfiltered Event Data Readout		

LAT Level Test Function/Interface Validation (3/3)

Basic Functions	Instrument Response		
Infrastructure	Science Support Functions	Characterization	Science Data Functions
Time Services	*FSW Functions*		
GPS Time Hack from SC	Science Modes		
GPS Message from SC	Mode Transitions		
Time Consistency Check	VETO Rate Monitor		
LAT Clock Correlation	L1 Trigger Rate Monitor		
Configuration Files	CNO Rate Monitor		
Config File Compilation	Event Filter Reprogram		
Config File Upload	Event Filter Changes		
File Execution	Event Filter Bypass		
Execution Verification	GRB Handling		
Delta Configs/Overlays	GBM Message Response		
Calibration Files	GRB Notification		
Cal File Compilation	Mode Transitions		
Cal File Upload	Science Data Delivery		
File Execution	High Rate Science Data		
Data Collection	Low Rate Science Data		
Result Data Compression	GRB Data		
Cal Data Delivery	Diagnostic Science Data		
Backdoor	Deadtime Monitoring		
Power Distribution			
Command & Config			
Telemetry Collection			
SIU/Survival Heater Pwr			
Processor Power			
PDU Supplied Power			
Thermal Control			
Survival Mode			
Operational Temp Control			

LAT Level Redundancy Configurations

Config No.	LAT UNITS ON																		
	SC-P	SC-R	SIU-P Feed	SIU-R Feed	Pri Htr Feed	Red Htr Feed	SIU-P	SIU-R	GASU-P	GASU-R	EPU-P0	EPU-P1	EPU-R	Towers	ACD	+Y HCB	-Y HCB	PDU-P	PDU-R
1	On	-	On	-	On	-	On	-	On	-	On	On	-	On	On	On	On	On	-
2	-	On	-	On	-	On	-	On	-	On	-	On	On	On	On	On	On	-	On
3	-	On	On	-	On	-	On	-	-	On	On	On	-	On	On	On	On	On	-
4	On	-	-	On	On	-	-	On	-	On	On	-	On	On	On	On	On	On	-
5	-	On	-	On	-	On	-	On	On	-	On	-	On	On	On	On	On	-	On
6	On	-	On	-	-	On	On	-	On	-	-	On	On	On	On	On	On	-	On

On	On	= Unit is powered On in the LAT Configuration specified
-	-	= Unit is powered Off in the LAT Configuration specified

LAT Level Test - Interfaces Verified

Device	INTERFACES VERIFIED												
	SIU-P	SIU-R	GASU-P	GASU-R	EPU-P0	EPU-P1	EPU-R	Towers	ACD	+Y HCB	-Y HCB	PDU-P	PDU-R
SC-P	1,6	4	1,6	4	-	-	-	-	1,4,6	1,4,6	1,4,6	1,4	6
SC-R	3	2,5	5	2,3	-	-	-	-	2,3,5	2,3,5	2,3,5	3	2,5
SIU-P Feed	1,3,6	-	-	-	-	-	-	-	-	-	-	-	-
SIU-R Feed	-	2,4,5	-	-	-	-	-	-	-	-	-	-	-
SIU-P	-	-	1,6	3	-	-	-	-	-	1,3,6	1,3,6	1,3	6
SIU-R	-	-	5	2,4	-	-	-	-	-	2,4,5	2,4,5	4	2,5
GASU-P	-	-	-	-	1,5	1,6	5,6	1,5,6	1,5,6	-	-	1	5,6
GASU-R	-	-	-	-	3,4	2,3	2,4	2,3,4	2,3,4	-	-	3,4	2
EPU-P0	-	-	-	-	-	-	-	-	-	-	-	1,3,4	5
EPU-P1	-	-	-	-	-	-	-	-	-	-	-	1,3	2,6
EPU-R	-	-	-	-	-	-	-	-	-	-	-	4	2,5,6
Towers	-	-	-	-	-	-	-	-	-	-	-	1,3,4	2,5,6
ACD	-	-	-	-	-	-	-	-	-	-	-	1,3,4	2,5,6
Htr-P Feed	-	-	-	-	-	-	-	-	-	1,3,4	1,3,4	-	-
Htr-R Feed	-	-	-	-	-	-	-	-	-	2,5,6	2,5,6	-	-
+Y HCB	-	-	-	-	-	-	-	-	-	-	-	1,3,4	2,5,6
-Y HCB	-	-	-	-	-	-	-	-	-	-	-	1,3,4	2,5,6

1	3	= Interface verified by CPT in LAT Configuration(s) specified
-	-	= No direct electrical interface between specified units or redundant table entry

Notes:
1) SC-P indicates all primary SC-LAT electrical signals, excluding power feeds
2) SC-R indicates all redundant SC-LAT electrical signals, excluding power feeds
3) Analog telemetry measured by the SC is not cross-strapped, therefore some telemetry points may not be available in configs 2-5.