



## SPIRE Procedure

SPIRE FM Short Functional Test Procedures  
A.A.Aramburu & Sunil D.Sidher

**Ref:** SPIRE-RAL-PRC-2494  
**Issue:** 2.4  
**Date:** 10<sup>th</sup> September 2007  
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## 1. Introduction

This document describes the Short Functional Test (SFT) procedures to be executed on the SPIRE FM Instrument during FM in the absence of the SPIRE instrument personnel. **All the procedures in this document can be run with the instrument either warm or cold (He I and He II conditions). Both PRIME and REDUNDANT instrument are to be tested within the sequence.**

The appendices at the end include nominal switch on and switch off sequences for the SPIRE instrument and a safe switch off procedure in case of anomaly.

### 1.1 Scope

This procedure has been designed for the checkout of the FM instrument **but can also be used during the AVM campaign as a tool to verify all relevant CCS templates.** The same CCS templates will be used for both the AVM and the FM.

#### Note:

- Where no explicit mention is made, it is assumed that FM and AVM procedures are the same.
- Where deviations from the behaviour of the FM units are expected (AVM), this is clearly identified and separate steps for each scenario are specified, i.e., *Procedure Steps for FM* and *Procedure Steps for AVM*.

### 1.2 Change Record

Doc	#	Changes	Date of Change
Issue	1.0	First version	15/08/2005
Issue	1.1	Updates to make the procedure valid for both warm and cold conditions (He I and He II) SFTs updated and enhanced following completion of SFTs on 22/08/2005 Inclusion of sequences for switching on <i>to</i> and switching off <i>from</i> standby mode	08/09/2005
	1.2	Changed SPIRE switch-on procedure for standby mode to generate nominal housekeeping every 4 seconds.	15/09/2005
	1.3	Changed the expected value of TM5N parameter before execution of test procedure SPIRE-FM-SFT-SFT-FUNC-SCU-01.	23/09/2005
	2.0	First FM version	13/06/2006
	2.1	Several Changes to Issue 2.0	22/08/2006
	2.2	Matched the single procedures version with the document's version. <ul style="list-style-type: none"><li>- Explicit specification of Redundant SFT procedures included</li><li>- General Test Sequence Section included</li><li>- Individual pass/fail criteria included on the beginning of each test.</li></ul> General rearrangement of the document Updated Nominal Switch ON/OFF sequences	02/01/2007



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2.3	<p>Included checkout of LPU (SMEC Launch Latch) Revised the limits for MCUM15V parameter in SPIRE-FM-FUNC-MCU-01-P/R. Same parameter checks in SPIRE-FM-FUNC-SMEC-01-P/R and SPIRE-FM-SMEC-OFF-P/R for warm and cold conditions SPIRE-FM-FUNC-DCU-04-PHOT-P/R revised in order to monitor the respective LIA temperatures</p> <p>Changed the names of all procedures and scripts to include reference to SFT. Globally substituted occurrences of SPIRE-FM- with SPIRE-FM-SFT-</p> <p>Explicit references to primary and secondary partitions when switching on the DPU.</p> <p>Deleted Appendix 3 as it was a duplicate of Appendix 2.</p> <p>Test procedure durations revised.</p>	28 <sup>th</sup> August 2007
2.4	<p>Section 3.3:</p> <ul style="list-style-type: none"> <li>• Procedure references SPIRE-FM-SFT-BSM-01-P/R in section 3.3 corrected to SPIRE-FM-SFT-FUNC-BSM-01-P/R.</li> <li>• Procedure references SPIRE-FM-SFT-SMEC-01-P/R in section 3.3 corrected to SPIRE-FM-SFT-FUNC-SMEC-01-P/R.</li> <li>• Added missing references to SPIRE-FM-SFT-FUNC-DCU-01-P/R</li> <li>• Corrected procedure names SPIRE-FM-SFT-DPU-ON-P-SP and SPIRE-FM-SFT-DPU-ON-R-PP SPIRE-FM-DPU-ON-P and SPIRE-FM-DPU-ON-R respectively</li> </ul> <p>Typo in name of script for procedure SPIRE-FM-SFT-PLIA-OFF-R. Corrected script name is SPIRE-FM-SFT-PLIA-OFF-R.tcl</p> <p>For clarity added the expected Photometer/Spectrometer LIA voltages BEFORE switch-on and AFTER switch off of the LIAs.</p> <p>In SPIRE-FM-SFT-FUNC-SMEC-01-P/R removed the monitoring values of the SMECLVDTPWR DURING the tests.</p> <p>Removed the Appendix for Nominal Switch-On sequence as it is irrelevant for the SFTs.</p> <p>Complete rewrite of the Nominal Switch-Off sequence in the Appendix.</p>	10 <sup>th</sup> September 2007



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### 1.3 Applicable Documents

AD#	Title	Reference	Issue#	Date
AD01	SPIRE Functional Test Specification	SPIRE-RAL-DOC-001652	1.4	22/07/2005
AD02	SPIRE ILT Warm Functional Test Procedure	SPIRE-RAL-PRC-002322	1.2	27/01/2006

### 1.4 Reference Documents

RD#	Title	Reference	Issue#	Date
RD01	SPIRE Warm Functional Test Procedures for the CCS	SPIRE-RAL-PRC-002422	1.4	15/07/2005
RD02	SPIRE 3 <sup>rd</sup> Warm Functional Test Report	HP-2-ASED-TR-0077_1_0	1.0	19/07/2005
RD03	Minutes of meeting TRR/PTR for SPIRE SFT Warm prior to Cryostat EQM Cool Down	HP-2-ASED-MN-1039		22/08/2005
RD04	SPIRE Instrument User Manual	SPIRE-RAL-PRJ-002395	1.1	10/04/2006

### 1.5 Open Issues

There are some known issues with regard the DRCU simulator behaviour which will be present only on the AVM scenario:

1. The DRCU Simulator does not recognize certain SPIRE Get HK commands contained in both the nominal and critical requests. As a result, whenever the OBS is started the HK parameters related to these request go into Out of Limits according to the SPIRE MIB OOL checks (See Procedures: SPIRE-FM-SFT-DPU-ON-P/R and SPIRE-FM-SFT-DRCU-ON-P/R).
2. The generation of frames by the DRCU Simulator in response to a request for subsystem frames done by the DPU is not always reproducible. (Normally the DRCU Sim will produce more frames than it was asked for) This would inherently cause the AVM procedures to fail where the correct number of frames generated is checked as pass/fail criteria. On those cases the frame number should be regarded as an 'indicator' rather than an exact figure to expect.

These are non avoidable design features of the DRCU simulator that cannot be corrected at this stage. Hence were applicable the correspondent procedures make reference to this 'anomalous' behaviour explicitly.

### 1.6 Duration

The estimated duration for executing the entire procedure, PRIME and REDUNDANT sequences, is approximately **4 hours**.

### 1.7 List of Acronyms

<b>AND</b>	Alpha Numeric Display
<b>AVM</b>	Avionics Model



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<b>BSM</b>	Beam Steering Mirror
<b>CCS</b>	Central Checkout System
<b>CDMU</b>	Command and Data Management Unit
<b>DCU</b>	Detector Control Unit
<b>DPU</b>	Digital Processing Unit
<b>DRCU</b>	Detector Readout and Control Unit
<b>EGSE</b>	Electrical Ground Support Equipment
<b>FM</b>	Flight Model
<b>FPU</b>	Focal Plane Unit
<b>I-EGSE</b>	Instrument EGSE
<b>IST</b>	Integrated Systems Test
<b>LCL</b>	Latch Current Limiter
<b>LIA</b>	Lock In Amplifier
<b>LPU</b>	Latch Power Unit (External)
<b>MCU</b>	Mechanism Control Unit
<b>MTL</b>	Mission Time Line
<b>OBT</b>	On Board Time
<b>OOL</b>	Out Of Limit
<b>RMS</b>	Reference Mission Scenario
<b>SMEC</b>	Spectrometer Mechanism
<b>VM</b>	Virtual Machine



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## 2. Test Configuration

The following sections describe the required hardware and I-ESGE configuration for the test. The main differences between the AVM and the FM configurations are with respect to the hardware. On the SPIRE AVM hardware the Warm Units and the FPU are substituted by a DRCU simulator.

### 2.1 FM Test Configuration

This is the required hw/sw configuration prior to the start of the test:

SPIRE WU:

- The SPIRE FM FPU should be interconnected through cryoharnesses to the SPIRE FM DRCU
- The SPIRE FM DRCU should be interconnected with the SPIRE FM DPU, both PRIME and REDUNDANT interfaces.
- The SPIRE FM DRCU PRIME and REDUNDANT power interfaces to the Herschel satellite should be connected.
- The SPIRE FM DPU PRIME and REDUNDANT 1553 interfaces to the Herschel satellite should be connected.
- The SPIRE FM DPU PRIME and REDUNDANT power interfaces to the Herschel satellite should be connected.

HCDMU:

- The Bus IFM selected on the HCDMU should be for SPIRE PRIME Instrument, (i.e., 27 TM slots allocated for SPIRE telemetry). For the PRIME side tests the BUS Configuration should be SPIRE Prime (i.e, RT=21) and for the REDUNDANT side test the BUS Configuration should be SPIRE Redundant (i.e, RT=22)
- The HCDMU and CCS should be interconnected.

CCS & IEGSE:

- The CCS and the IEGSE should be interconnected via the Pipe GW.
- The SPIRE MIB should be imported on the CCS.
- The CCSHandler application software should be running on the IEGSE.
- IEGSE system is up and running.(Database, SCOS , QLA, EGSE Router and Gateway, TM ingestion)

### 2.2 AVM Test Configuration

**Note: There is no redundancy on the AVM configuration**

This is the required hw/sw configuration prior to the start of the test:

SPIRE WU:

- The SPIRE DRCU Simulator PC should be powered ON and the operating system running.
- The SPIRE DRCU Simulator PC should be interconnected with the SPIRE FM DPU following RD04.
- The SPIRE FM DPU PRIME 1553 interface to the Herschel satellite should be connected.
- The SPIRE FM DPU PRIME power interface to the Herschel satellite should be connected.



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### HCDMU:

- The Bus IFM selected on the HCDMU should be for SPIRE PRIME Instrument, (i.e., 27 TM slots allocated for SPIRE telemetry). For the AVM tests the BUS Configuration should be SPIRE Prime (i.e, RT=21).
- The HCDMU and CCS should be interconnected.

### CCS & IEGSE:

- The CCS and the IEGSE should be interconnected via the Pipe GW.
- The SPIRE MIB should be imported on the CCS.
- The CCSHandler application software should be running on the IEGSE.
- IEGSE system is up and running.(Database, SCOS , QLA, EGSE Router and Gateway, TM ingestion)

## 3. SHORT FUNCTIONAL TEST PROCEDURES OVERVIEW

### 3.1 General instructions for executing test procedures

- Section 3.4 of this document specifies the sequence to be executed. Each of the steps in the sequence has a detailed specification later on sections 4.1 and 4.2. The operator should refer to the later in order to execute detailed steps and the full procedure.
- The procedure tables in section 4.1 and 4.2 include blank boxes where the actual values of parameters can be noted. Based on the comparison with the expected values the success or failure of a step should be recorded in the final column of the table.
- The last row in a procedure table should be used to record the overall Pass/Fail result of each test.

### 3.2 General Pass/Fail criterion

A test procedure can be declared as failed if there are two consecutive execution failures. If the repetition of the procedure is successful then it should be repeated once again as a 'health' check .**In case of overall failure see Appendix 1 in section 5** of the document which addresses the safe switch OFF of the instrument under different scenarios.



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### 3.3 Test Sequence

This section specifies the sequence to be executed with estimated times for each execution. **During AVM, although no redundancy is present, the redundant procedures can still be tested.**

Step #	Procedure Name	Purpose	Duration
1.	SPIRE-FM-SFT-DPU-ON-P	DPU PRIME Power up and OBS start	5 min
2.	SPIRE-FM-SFT-DRCU-ON-P	DRCU PRIME Power up	4 min
3.	SPIRE-FM-SFT-FUNC-SCU-01-P	SCU Nominal Science Packet Generation Check PRIME	3 min
4.	SPIRE-FM-SFT-FUNC-SCU-03-P	SCU DC Thermometry check PRIME	8 min
5.	SPIRE-FM-SFT-FUNC-SCU-06-P	SCU AC Thermometry check PRIME	2 min
6.	SPIRE-FM-SFT-FUNC-SCU-07-P	Sorption Cooler Heaters Check PRIME	5 min
7.	SPIRE-FM-SFT-FUNC-SCU-04-P	Photometer Calibrator Check PRIME	3 min
8.	SPIRE-FM-SFT-FUNC-SCU-05-P	Spectrometer Calibrator Check PRIME	5 min
9.	SPIRE-FM-SFT-FUNC-MCU-01-P	MCU Boot Check PRIME	5 min
10.	SPIRE-FM-SFT-FUNC-MCU-02-P	MCU Nominal Science Packet Generation Check PRIME	5 min
11.	SPIRE-FM-SFT-FUNC-BSM-01-P	BSM Chop/Jiggle Sensors check PRIME	3 min
12.	SPIRE-FM-SFT-BSM-OFF-P	BSM switch OFF PRIME	3 min
13.	SPIRE-FM-SFT-FUNC-SMEC-01-P	SMEC Encoder and LVDT check PRIME	3 min
14.	SPIRE-FM-SFT-SMEC-OFF-P	SMEC switch OFF	3 min
15.	SPIRE-FM-FUNC-DCU-01-P	DCU Science Packet Generation Check PRIME	5 min
16.	SPIRE-FM-SFT-FUNC-DCU-04-PHOT-P	Photometer LIAs Check PRIME	5 min
17.	SPIRE-FM-SFT-PLIA-OFF	Photometer LIAs Switch OFF PRIME	2 min
18.	SPIRE-FM-SFT-FUNC-DCU-04-SPEC-P	Spectrometer LIAs Check PRIME	5 min
19.	SPIRE-FM-SFT-SLIA-OFF	Spectrometer LIAs Switch OFF PRIME	2 min
20.	SPIRE-FM-SFT-FUNC-MCU-OFF-P	MCU switch OFF PRIME	2 min
21.	SPIRE-FM-SFT-FUNC-SCU-OFF-P	SCU Switch OFF PRIME	2 min
22.	SPIRE-FM-SFT-DRCU-OFF-P	DRCU Power OFF PRIME	5 min
23.	SPIRE-FM-SFT-DPU-OFF-P	DPU Power OFF PRIME	5 min
24.	SPIRE-FM-SFT-LPU-01-P	Checkout of LPU PRIME	5 min
25.	<b>Change to SPIRE Redundant MIB on the CCS (If required)</b>		5 min?
26.	<b>Configure 1553 Spacecraft bus from SPIRE DPU PRIME to SPIRE DPU REDUNDANT.</b>		5 min?
27.	SPIRE-FM-SFT-DPU-ON-R	DPU REDUNDANT Power up and OBS start	5 min
28.	SPIRE-FM-SFT-DRCU-ON-R	DRCU REDUNDANT Power up	4 min
29.	SPIRE-FM-SFT-FUNC-SCU-01-R	SCU Nominal Science Packet Generation Check REDUNDANT	3 min
30.	SPIRE-FM-SFT-FUNC-SCU-03-R	SCU DC Thermometry Check REDUNDANT	8 min





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31.	SPIRE-FM-SFT-FUNC-SCU-06-R	SCU AC Thermometry Check REDUNDANT	2 min
32.	SPIRE-FM-SFT-FUNC-SCU-07-R	Sorption Cooler Heaters Check REDUNDANT	5 min
33.	SPIRE-FM-SFT-FUNC-SCU-04-R	Photometer Calibrator Check REDUNDANT	3 min
34.	SPIRE-FM-SFT-FUNC-SCU-05-R	Spectrometer Calibrator Check REDUNDANT	5 min
35.	SPIRE-FM-SFT-FUNC-MCU-01-R	MCU Boot Check REDUNDANT	5 min
36.	SPIRE-FM-SFT-FUNC-MCU-02-R	MCU Nominal Science Packet Generation Check REDUNDANT	5 min
37.	SPIRE-FM-SFT-FUNC-BSM-01-R	BSM Chop/Jiggle Sensors check REDUNDANT	3 min
38.	SPIRE-FM-SFT-BSM-OFF-R	BSM Switch OFF REDUNDANT	3 min
39.	SPIRE-FM-SFT-FUNC-SMEC-01-R	SMEC Encoder and LVDT check REDUNDANT	3 min
40.	SPIRE-FM-SFT-SMEC-OFF-R	SMEC Switch OFF	3 min
41.	SPIRE-FM-FUNC-DCU-01-R	DCU Science Packet Generation Check REDUNDANT	5 min
42.	SPIRE-FM-SFT-FUNC-DCU-04-PHOT-R	Photometer LIAs Check REDUNDANT	5 min
43.	SPIRE-FM-SFT-PLIA-OFF-R	Photometer LIAs Switch OFF REDUNDANT	2 min
44.	SPIRE-FM-SFT-FUNC-DCU-04-SPEC-R	Spectrometer LIAs Check REDUNDANT	5 min
45.	SPIRE-FM-SFT-SLIA-OFF-R	Spectrometer LIAs Switch OFF REDUNDANT	2 min
46.	SPIRE-FM-SFT-FUNC-MCU-OFF-R	MCU Switch OFF REDUNDANT	2 min
47.	SPIRE-FM-SFT-FUNC-SCU-OFF-R	SCU Switch OFF REDUNDANT	2 min
48.	SPIRE-FM-SFT-DRCU-OFF-R	DRCU Power OFF REDUNDANT	5 min
49.	SPIRE-FM-SFT-DPU-OFF-R	DPU Power OFF REDUNDANT	5 min
50.	SPIRE-FM-SFT-LPU-01-R	Checkout of LPU REDUNDANT	5 min
<b>Total:</b>			<b>~3-4 Hours</b>



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## 4. DETAILED SHORT FUNCTIONAL TEST PROCEDURES

### 4.1 PRIME Instrument

#### 4.1.1 Procedure SPIRE-FM-SFT-DPU-ON-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	To switch on the SPIRE DPU PRIME and start generating housekeeping
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are switched off
<b>Final configuration</b>	SPIRE DPU PRIME is ON and SPIRE HK is being produced , SPIRE DRCU PRIME is OFF
<b>Preconditions</b>	<ul style="list-style-type: none"><li>• SPIRE FM DPU is electrically integrated with the Herschel Satellite</li><li>• SPIRE MIB PRIME is imported in the CCS database.</li><li>• CCS is up and running</li><li>• FUNCTIONAL TEST PARAMETERS display is selected on the CCS</li></ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail Criteria</b>	Nominal and critical HK reports start being generated at their nominal rates of 1Hz and 0.5Hz respectively.



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### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Pass/Fail
1	Select DPU AND OBS PARAMETERS display is on the CCS	—	—	—	
2	<b>Power ON the SPIRE DPU PRIME unit using the dedicated spacecraft LCL line and configure 1553 Spacecraft bus for SPIRE DPU PRIME (RT = 21)</b>	—	—	—	
3	Wait for the boot software to produce at least 2 event packets (5,1)				
4	Execute TCL script SPIRE-FM-SFT-DPU-START-P-SP.tcl	—	—	—	
5	Check that Nominal and Critical HK packets are arriving at the CCS: <b>SPIRE Nominal HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID : 0x502</li> </ul> <b>SPIRE Critical HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID: 0x500</li> </ul>				
6	Check that THSK parameter is refreshing every second	THSK	Refreshing @ 1 Hz	—	
7	Check that TM2N parameter is incrementing by 1 every second	TM2N	Incrementing by 1 @ 1Hz	—	
8	Check that TM1N parameter is incrementing by 1 every 2 second	TM1N	Incrementing by 1 @ 0.5Hz		
<b>Test Result (Pass/Fail):</b>					

### Procedure Steps for AVM:



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Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Pass/Fail
1	Select DPU AND OBS PARAMETERS display is on the CCS	—	—	—	
2	<b>Power ON the SPIRE DPU PRIME unit using the dedicated spacecraft LCL line and configure 1553 Spacecraft bus for SPIRE DPU PRIME (RT = 21)</b>	—	—	—	
3	Wait for the boot software to produce at least 2 event packets (5,1)				
4	Execute TCL script SPIRE-FM-SFT-DPU-START-P-SP.tcl	—	—	—	
5	Check that Nominal and Critical HK packets are arriving at the CCS: <b>SPIRE Nominal HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID : 0x502</li> </ul> <b>SPIRE Critical HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID: 0x500</li> </ul>				
6	<b>When the HK requests start being generated several HK parameters will go Out of Limits (Hard). This is a design feature of the DRCU Simulator and cannot be avoided.</b>	PLIAP5V PLIAP9V PLIAM9V SLIAP5V SLIAP9V SLIAM9V LIAPiTEMP LIASiTEMP BIASTEMP DAQTEMP	-/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL		
7	Check that THSK parameter is refreshing every second	THSK	Refreshing @ 1 Hz	—	
8	Check that TM2N parameter is incrementing by 1 every second	TM2N	Incrementing by 1 @ 1Hz	—	
9	Check that TM1N parameter is incrementing by 1 every 2 second	TM1N	Incrementing by 1 @ 0.5Hz		
10	<b>On CCS check the consistency of the SPIRE on board time to the HCDMU time and the CCS. *</b>	—	—		
11	On IEGSE check the consistency between SCOS time and THSK and QLA time.	THSK	Incrementing once per second		

**Test Result (Pass/Fail):**



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### 4.1.2 Procedure SPIRE-FM-SFT-DRCU-ON-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	To switch on the SPIRE DRCU PRIME and start generating housekeeping
<b>Initial configuration</b>	SPIRE DPU PRIME is ON and DRCU PRIME is switched OFF
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>• SPIRE FM DRCU is electrically integrated with the Herschel Satellite</li> <li>• SPIRE DRCU is switched OFF</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• FUNCTIONAL TEST PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	4 minutes
<b>Pass/Fail Criteria</b>	DRCU voltages show expected 'ON' values

#### Procedure steps for FM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-DRCU-START-P-STEP1.tcl	—	—	—	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	
4	<b>Power ON the SPIRE DRCU PRIME unit using the dedicated spacecraft LCL line.</b>	—	—	—	
5	Execute TCL script SPIRE-FM-SFT-DRCU-START-P-STEP2.tcl	—	—	—	
6	Check that THSK parameter is again refreshing every second	THSK	Refreshing @ 1Hz		
7	Check that TM2N parameter is again incrementing every second	TM2N	Incrementing by 1 @ 1Hz	—	
8	Check that the SCU/DCU voltages show nominal values	SCUP5V SCUP9V SCUM9V BIASP5V BIASP9V BIASM9V	~ 5.2 ± 0.5V ~ 9.0 ± 0.2V ~ -9.0 ± 0.2V ~ 5.1 ± 0.5V ~ 9.0 ± 0.2V ~ -9.0 ± 0.2V	—	

**Test Result (Pass/Fail):**



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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-DRCU-START-P-STEP1.tcl	—	—	—	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	
4	Start DRCU simulator application software.*	—	—	—	
5	Execute TCL script SPIRE-FM-SFT-DRCU-START-P-STEP2.tcl	—	—		
6	Check that THSK parameter is again refreshing every second	THSK	Refreshing @ 1Hz	—	
7	Check that TM2N parameter is again incrementing every second	TM2N	Incrementing by 1 @ 1Hz	—	

### Test Result (Pass/Fail):

*\* It is assumed that the DRCU simulator PC is already ON. Double click on the Transmit.exe icon on the desktop of the PC to start the application software.*



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### 4.1.3 Procedure SPIRE-FM-SFT-FUNC-SCU-01-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SCU science packet generation check
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced
<b>Final configuration</b>	Unchanged
<b>Constraints</b>	<ul style="list-style-type: none"><li>• SPIRE DRCU PRIME is switched ON</li><li>• SPIRE MIB PRIME is imported in the CCS database.</li><li>• CCS is up and running</li><li>• SFT PARAMETERS display is selected on the CCS</li></ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail Criteria</b>	Specified SCU HK parameters show expected increment.

#### Procedure Steps:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-01-P.tcl	SCUFRAMECNT TM5N	0/31 0x3FFF/1		

**Test Result (Pass/Fail):**



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### 4.1.4 Procedure SPIRE-FM-SFT-FUNC-SCU-03-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SCU DC thermometry check
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and DC thermometry is ON
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	8 minutes
<b>Pass/Fail Criteria</b>	DC Thermometry channels show temperature readings according to the actual instrument temperature* *: At warm temperatures all channels should show short circuit RAW readings of -32768

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-03-P.tcl	—	—	—	—
2	<b>Wait for the parameter BBFULLTYPE to get set to SCU DC Therm</b>				
3	A few seconds later record the value of parameter SCUTEMPSTAT	SCUTEMPSTAT	0/FFFF/FFFF		
4	If the instrument is at He II temperatures check the values of SCU DC thermometry channels.	PUMPHRTEMP PUMPHSTEMP EVAPHSTEMP SHUNTTEMP EMCFILTEMP SL0TEMP PLOTEMP OPTTEMP BAFTEMP BSMIFTEMP SCAL2TEMP SCAL4TEMP SCALTEMP SMECIFTEMP SMECTEMP	(All Values TBC) -/~4.6K -/~3.0K -/~3.0K -/~1.7K -/~4.6K -/~1.7K -/~1.7K -/~4.6K -/~4.6K -/~4.5K -/~4.6K -/~4.6K -/~4.6K -/~4.6K -/~4.6K		





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Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
		BSMTEMP	-/~4.5K		
5	If the instrument is at He I temperatures check the values of SCU DC thermometry channels.	PUMPHRTEMP PUMPHSTEMP EVAPHSTEMP SHUNTTEMP EMCFILTEMP SLOTEMP PLOTEMP OPTTEMP BAFTEMP BSMIFTEMP SCAL2TEMP SCAL4TEMP SCALTEMP SMECIFTEMP SMECTEMP BSMTEMP	(All Values TBC) ~4.2K ~4.4K ~4.3K ~4.2K ~4.8K ~4.2K ~4.2K ~4.8K ~4.8K ~4.7K ~4.8K ~4.8K ~4.8K ~4.8K ~4.7K ~4.7K ~4.8K		
6	If the instrument is warm:  <b>Configure the SFT PARAMETERS display to show the RAW values of SCU DC thermometry channels.</b>  Record the RAW values of SCU DC thermometry channels. Nominal values should show a short circuit status (or RAW -32768).  <b>Non Nominal (Open Circuit Criterion): RAW reading in the range [0, -100]</b>	PUMPHRTEMP PUMPHSTEMP EVAPHSTEMP SHUNTTEMP EMCFILTEMP SLOTEMP PLOTEMP OPTTEMP BAFTEMP BSMIFTEMP SCAL2TEMP SCAL4TEMP SCALTEMP SMECIFTEMP SMECTEMP BSMTEMP	— — — — — — — — — — — — — — — —		

**Test Result (Pass/Fail):**



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### 4.1.5 Procedure SPIRE-FM-SFT-FUNC-SCU-06-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SCU AC thermometry check
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and DC thermometry is ON
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Constraints</b>	<ul style="list-style-type: none"><li>• SPIRE DRCU PRIME is switched ON</li><li>• SPIRE MIB PRIME is imported in the CCS database.</li><li>• CCS is up and running</li><li>• SFT PARAMETERS display is selected on the CCS</li></ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail Criteria</b>	AC Thermometry channel shows temperature readings according to the actual instrument temperature

#### Procedure Steps:



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Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-06-P.tcl	—	—	—	—
2	<b>Wait for the parameter BBFULLTYPE to get set to SCU AC Therm</b>				
3	A few seconds later record the value of parameter SUBKSTAT	SUBKSTAT	0/1/1		
4	If the instrument is at He II temperatures check the value of SCU AC thermometry channel.	SUBKTEMP	~1.7K		
5	If the instrument is at He I temperatures check the value of SCU AC thermometry channel.	SUBKTEMP	~4K		
6	<p>If the instrument is warm:</p> <p><b>Configure the SFT PARAMETERS display to show the RAW value of SCU AC thermometry channel.</b></p> <p>Only record the RAW value of SCU AC thermometry channel if it indicates an open circuit.</p> <p><b>Open Circuit Criterion:</b> RAW reading in the range [0, -100]</p>	SUBKTEMP	—		

**Test Result (Pass/Fail):**



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### 4.1.6 Procedure SPIRE-FM-SFT-FUNC-SCU-07-P

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	Sorption Cooler Heater Check
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and DC thermometry is ON
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail Criteria</b>	Sorption cooler heat switches and pump heater show expected voltages

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-07-P.tcl	—	—	—	—
2	<b>Wait for the parameter BBFULLTYPE to get set to Cooler_Htr_Chk</b>	BBFULLTYPE	Cooler_Htr_Chk		
3	Record the value of parameter SPHSV – the Sorption Pump Heat Switch Voltage. <i>This voltage stays on for ~20 seconds. Wait for the voltage to go to zero to continue.</i>	SPHSV - mV	0/~323/0		
4	Record the value of parameter EVHSV – the Evaporator Heat Switch Voltage. <i>This voltage stays on for ~20 seconds. Wait for the voltage to go to zero to continue.</i>	EVHSV - mV	0/~323/0		
5	Record the value of parameter SPHTRV – the Sorption Pump Heater Voltage. <i>This voltage stays on for ~20 seconds. Wait for the voltage to go to zero to continue.</i>	SPHTRV - V	0/~8.8/0		

**Test Result (Pass/Fail):**



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### 4.1.7 Procedure SPIRE-FM-SFT-FUNC-SCU-04-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	Photometer Calibration Check (PRIME)
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Final configuration</b>	Unchanged
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail Criteria</b>	PCAL voltage and current agree with expected values

#### Procedure Steps:

Step	Description	Parameter Name - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-04-P.tcl  <b>The expected values during the test should be monitored when parameter BBFULLTYPE in the SFT PARAMETERS display is set to PCAL_Check This usually happens about 30 seconds from the start of test execution.</b>	PCALCURR - mA PCALV – V  BBFULLTYPE	0.0/0.1/0.0 0.0/0.026/0.0  PCAL_Check		
<b>Test Result (Pass/Fail):</b>					



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### 4.1.8 Procedure SPIRE-FM-SFT-FUNC-SCU-05-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> 2007
<b>Purpose</b>	Spectrometer Calibration Check (PRIME)
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Final configuration</b>	Unchanged
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	SCAL2 and SCAL4 voltage and currents agree with expected values

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-05-P.tcl	—	—	—	
2	<b>Wait for the parameter BBFULLTYPE to get set to SCAL4_Check</b>	BBFULLTYPE	SCAL4_Check		
3	A few seconds later record the value of parameters SCAL4CURR and SCAL4V <i>These parameters are set back to 0 after ~20 seconds</i>	SCAL4CURR – mA SCAL4V – V	0.0/0.10/0.0 0.0/0.05/0.0		
4	<b>Wait for the parameter BBFULLTYPE to get set to SCAL2_Check</b>	BBFULLTYPE	SCAL2_Check		
5	A few seconds later record the values of parameters SCAL2CURR and SCAL2V <i>These parameters are set back to 0 after ~20 seconds</i>	SCAL2CURR – mA SCAL2V – V	0.0/0.10/0.0 0.0/0.05/0.0		

**Test Result (Pass/Fail):**



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### 4.1.9 Procedure SPIRE-FM-SFT-FUNC-MCU-01-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	MCU (PRIME) Boot Check
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	MCU voltages and board temperatures show expected 'ON' values

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-MCU-01-P.tcl	—	—	—	—
2	Check that the MCU is booted up successfully	MCUBITSTAT	0/1/1		
3	Check MCU HK parameter values and ensure that the values are refreshing	MCUP5V MCUP14V MCUM14V MCUP15V MCUM15V  MCUMACTEMP MCUSMECTEMP MCUBSMTEMP	~ 5.0 ± 0.2V ~ 14.0 ± 0.5V ~ -14.0 ± 0.5V ~ 15.0 ± 0.5V ~ -15.0 ± 0.7V  ~300K ~300K ~300K		
<b>Test Result (Pass/Fail):</b>					

**Procedure Steps for FM:**



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### Procedure Steps for AVM:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-MCU-01-P.tcl	—	—	—	—
2	Check that the MCU is booted up successfully	MCUBITSTAT	0/1/1		

**Test Result (Pass/Fail):**





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### 4.1.10 Procedure: SPIRE-FM-SFT-FUNC-MCU-02-P

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	MCU Nominal Frame Generation Check
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted.
<b>Final configuration</b>	Unchanged.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Specified MCU HK parameters show expected increment

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-MCU-02-P.tcl	MCUFRAMECNT	<b>FM</b> : 0/297 <b>AVM</b> : 0/300	—	—

**Test Result (Pass/Fail):**



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### 4.1.11 Procedure SPIRE-FM-SFT-FUNC-BSM-01-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	BSM (PRIME) Chop/Jiggle Sensor Check.
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. BSM Chop/Jiggle sensors are ON.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MCU PRIME is booted.</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail criteria</b>	HK Parameters CHOPSENSPWR and JIGGSENSPWR show expected ON values.

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-BSM-01-P.tcl	—	—	—	—
2	Check that the Chop and Jiggle sensors have switched on	CHOPSENSPWR JIGGSENSPWR	0/1/1 0/1/1		

**Test Result (Pass/Fail):**



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### 4.1.12 Procedure SPIRE-FM-SFT-BSM-OFF-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	BSM (PRIME) Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. BSM Chop/Jiggle sensors are ON.
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. BSM Chop/Jiggle sensors are OFF.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MCU PRIME is booted.</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail criteria</b>	HK Parameters CHOPSENSPWR and JIGGSENSPWR show expected OFF values.

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute SPIRE-FM-SFT-BSM-OFF-P.tcl	—	—	—	—
2	Check that the power to the BSM sensors is switched off	CHOPSENSPWR JIGGSENSPWR	1/-/0 1/-/0		

**Test Result (Pass/Fail):**



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### 4.1.13 Procedure SPIRE-FM-SFT-FUNC-SMEC-01-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SMEC (PRIME) Encoder/LVDT Sensor Check.
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. SMEC Encoder and LVDT are ON.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>SPIRE DRCU PRIME is switched ON</li> <li>SPIRE MCU PRIME is booted.</li> <li>SPIRE MIB PRIME is imported in the CCS database.</li> <li>CCS is up and running</li> <li>SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail criteria</b>	HK Parameters SMECENC PWR and SMECLVDT PWR show expected ON values.

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SMEC-01-P.tcl	—	—	—	—
2	Check that power to the SMEC LED and LVDT sensor is on	SMECENC PWR  SMECLVDT PWR	0/-/1  0/-/1		

**Test Result (Pass/Fail):**



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### 4.1.14 Procedure SPIRE-FM-SFT-SMEC-OFF-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SMEC (PRIME) Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. SMEC Encoder and LVDT are ON.
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. SMEC Encoder and LVDT are OFF.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MCU PRIME is booted.</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail criteria</b>	HK Parameters SMECENC PWR and SMECLVDTPWR show expected OFF values.

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute SPIRE-FM-SFT-SMEC-OFF-P.tcl	—	—	—	—
2	Check that the power to the SMEC sensors is switched off	SMECENC PWR	1/-/0		
		SMECLVDTPWR	1/-/0		
<b>Test Result (Pass/Fail):</b>					



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### 4.1.15 Procedure SPIRE-FM-SFT-FUNC-DCU-01-P

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	DCU science packet generation check for all Photometer and Spectrometer packet types (PF, PSW, PMW, PLW, SF, SSW and SLW)
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted.
<b>Final configuration</b>	Unchanged
<b>Constraints</b>	<ul style="list-style-type: none"> <li>SPIRE DRCU PRIME is switched ON</li> <li>SPIRE MIB PRIME is imported in the CCS database.</li> <li>CCS is up and running</li> <li>SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Specified DCU HK parameter shows expected increment

#### Procedure Steps:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-01-P.tcl	DCUFRAMECNT	0/700		

**Test Result (Pass/Fail):**



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### 4.1.16 Procedure SPIRE-FM-SFT-FUNC-DCU-04-PHOT-P

<b>Version</b>	2.4
<b>Date</b>	10 <sup>th</sup> Sept 2007
<b>Purpose</b>	Photometer LIAs PRIME Check
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. Photometer LIAs are ON
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• Photometer LIAs are OFF</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• DCU PARAMETERS &amp; SFT PARAMETERS displays are selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Specified Photometer LIA HK parameters show expected ON values

#### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-04-PHOT-P.tcl	PLIABITSTAT	0/1/1		
2	Check Photometer LIA HK parameter values and ensure that the values are refreshing	PLIAP5V PLIAP9V PLIAM9V	0.0/-/ 5.2 ± 0.2V 0.0/-/ 11.5 ± 0.5V 0.0/-/-11.5 ± 0.5V		
3	<b>On the DCU PARAMETERS display check that the LIA temperatures are slowly warming up.</b> At switch-on it is possible that some of the LIA temperatures will be in soft or even hard limits. No action is required.	LIAP1TEMP to LIAP9TEMP	~ 290-300 K		
4	<b>Wait for ~3 minutes before continuing with the SFTs</b>	—	—	—	—

<b>Test Result (Pass/Fail):</b>
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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-04-PHOT-P.tcl	PLIABITSTAT	0/1/1		
2	<p><b>Note:</b> When the command to switch ON Photometer LIAs is sent to the DRCU simulator ALL photometer LIA related HK parameters will go Out of Limits (Hard Limits). This is an inherent feature of the DRCU simulator which cannot be avoided.</p>	PLIAP5V PLIAP9V PLIAM9V LIAP9TEMP LIAP8TEMP LIAP7TEMP LIAP6TEMP LIAP5TEMP LIAP4TEMP LIAP3TEMP LIAP2TEMP LIAP1TEMP	OOL OOL OOL OOL OOL OOL OOL OOL OOL OOL OOL OOL		
<b>Test Result (Pass/Fail):</b>					





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### 4.1.17 Procedure SPIRE-FM-SFT-PLIA-OFF-P

<b>Version</b>	2.4
<b>Date</b>	10 <sup>th</sup> Sept 2007
<b>Purpose</b>	Photometer LIAs PRIME Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. Photometer LIAs are ON
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. Photometer LIAs are OFF
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• Photometer LIAs are ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail criteria</b>	Specified Photometer LIA HK parameters show expected OFF values

#### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-PLIA-OFF-P.tcl	PLIABITSTAT	1/-/0		
2	Check Photometer LIA HK parameter values	PLIAP5V PLIAP9V PLIAM9V	5.2 ± 0.2V/-/0.0 11.5 ± 0.5V/-/0.0 -11.5 ± 0.5V/-/0.0		
<b>Test Result (Pass/Fail):</b>					



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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-PLIA-OFF-P.tcl	PLIABITSTAT	1/-/0		

**Test Result (Pass/Fail):**



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### 4.1.18 Procedure SPIRE-FM-SFT-FUNC-DCU-04-SPEC-P

<b>Version</b>	2.4
<b>Date</b>	10 <sup>th</sup> Sept 2007
<b>Purpose</b>	Spectrometer LIAs PRIME Check
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. Spectrometer LIAs are ON
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• Spectrometer LIAs are OFF</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS &amp; DCU PARAMETERS displays are selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Specified Spectrometer LIA HK parameters show expected ON values

#### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-04-SPEC-P.tcl	SLIABITSTAT	0/1/1		
2	Check Spectrometer LIA HK parameter values and ensure that the values are refreshing	SLIAP5V SLIAP9V SLIAM9V	0.0/-/ 5.2 ± 0.2V 0.0/-/ 11.5 ± 0.5V 0.0/-/-11.5 ± 0.5V		
3	<b>On the DCU PARAMETERS display check that the LIA temperatures are slowly warming up.</b> At switch-on it is possible that some of the LIA temperatures will be in soft or even hard limits. No action is required.	LIAS1TEMP to LIAS3TEMP	~ 290-300 K		
4	<b>Wait for ~3 minutes before continuing with the SFTs</b>	—	—	—	—

**Test Result (Pass/Fail):**



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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-04-SPEC-P.tcl	SLIABITSTAT	0/1/1		
2	<b>Note:</b> When the command to switch ON Spectrometer LIAs is sent to the DRCU simulator ALL photometer LIA related HK parameters will go Out of Limits (Hard Limits). This is an inherent feature of the DRCU simulator which cannot be avoided.	SLIAP5V SLIAP9V SLIAM9V LIAS3TEMP LIAS2TEMP LIAS1TEMP	OOL OOL OOL OOL OOL OOL		

**Test Result (Pass/Fail):**



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### 4.1.19 Procedure SPIRE-FM-SFT-SLIA-OFF-P

<b>Version</b>	2.4
<b>Date</b>	10 <sup>th</sup> Sept 2007
<b>Purpose</b>	Spectrometer LIAs PRIME Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. Spectrometer LIAs are ON
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted. Spectrometer LIAs are OFF
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• Spectrometer LIAs are ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail criteria</b>	Specified Spectrometer LIA HK parameters show expected OFF values

#### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-SLIA-OFF-P.tcl	SLIABITSTAT	1/-/0		
2	Check Photometer LIA HK parameter values	SLIAP5V SLIAP9V SLIAM9V	5.2 ± 0.2V/-/0.0 11.5 ± 0.5V/-/0.0 -11.5 ± 0.5V/-/0.0		

**Test Result (Pass/Fail):**



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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-SLIA-OFF-P.tcl	SLIABITSTAT	1/-/0		

**Test Result (Pass/Fail):**



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### 4.1.20 Procedure SPIRE-FM-SFT-FUNC-MCU-OFF-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	MCU PRIME Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU PRIME is OFF.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MCU PRIME is ON.</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail criteria</b>	Specified MCU HK Parameter shows expected value.

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute SPIRE-FM-SFT-FUNC-MCU-OFF-P.tcl	—	—	—	—
2	Check that the MCU is switched off	MCUBITSTAT	1/-/0		

**Test Result (Pass/Fail):**



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### 4.1.21 Procedure SPIRE-FM-SFT-FUNC-SCU-OFF-P

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SCU PRIME Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON.
<b>Final configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is OFF
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail criteria</b>	Specified SCU HK Parameters show expected value.

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-OFF-P.tcl	—	—	—	—
2	A few seconds later record the value of parameter SCUTEMPSTAT	SCUTEMPSTAT	FFFF/-/0		
3	A few seconds later record the value of parameter SUBKSTAT	SUBKSTAT	1/-/0		

**Test Result (Pass/Fail):**





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### 4.1.22 Procedure SPIRE-FM-SFT-DRCU-OFF-P

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	DRCU PRIME Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON.
<b>Final configuration</b>	SPIRE DPU PRIME is ON, SPIRE DRCU PRIME is OFF and SPIRE HK is not being produced .
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE-FM-SFT-FUNC-SCU-OFF has been executed.</li> <li>• SPIRE DRCU PRIME is switched ON</li> <li>• SPIRE MIB PRIME is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	THSK and TM2N stop refreshing/incrementing

#### Procedure Steps for FM:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-DRCU-OFF.tcl	—	—	—	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	
4	<b>Power OFF the SPIRE DRCU PRIME unit.</b>	—	—	—	

**Test Result (Pass/Fail):**



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### Procedure Steps for AVM:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-DRCU-OFF-P.tcl	—	—	—	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	
4	<b>CCS staff:</b> <b>Stop DRCU Simulator application software</b>	—	—	—	

**Test Result (Pass/Fail):**



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### 4.1.23 Procedure SPIRE-FM-SFT-DPU-OFF-P

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	DPU PRIME Switch OFF
<b>Initial configuration</b>	SPIRE DPU PRIME is ON but not generating HK.
<b>Final configuration</b>	SPIRE DPU PRIME is OFF.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>SPIRE-FM-SFT-DRCU-OFF has been executed.</li> <li>SPIRE DPU PRIME is switched ON</li> <li>SPIRE MIB PRIME is imported in the CCS database.</li> <li>CCS is up and running</li> <li>SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Power to SPIRE DPU PRIME is OFF

**Procedure Steps:**

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Power OFF the SPIRE DPU PRIME unit.	—	—	—	

<b>Test Result (Pass/Fail):</b>
---------------------------------



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### 4.1.24 Procedure SPIRE-FM-SFT-LPU-01-P

<b>Version</b>	1.0
<b>Date</b>	Tuesday, 28 August 2007
<b>Purpose</b>	DPU PRIME Switch OFF
<b>Initial configuration</b>	Prime and redundant DPU and DRCU are off
<b>Final configuration</b>	Prime and redundant DPU and DRCU are off
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• Cryostat is vertical to within <math>\pm 45^\circ</math></li> <li>• Prime and redundant DPU and DRCU are off</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	The specified current is drawn when the LPU is enabled and is switched off when the LPU is disabled

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Power on Prime LPU LCL (LCL #25)	LCL status	OFF/ /ON		State of LCL #25 switches to ON
2	Send HL command #5 (LPU Enable Prime)	LCL #25 current	0mA/ /130-180mA		Current between 130-180mA
4	Send HL command #6 (LPU Disable Prime)	LCL #25 current	130-180mA/ /0mA		Current off
5	Un-power Prime LPU LCL (LCL # 25)	LCL status	ON/ / OFF		State of LCL #25 switches to OFF

**Test Result (Pass/Fail):**



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## 4.2 REDUNDANT Instrument

### 4.2.1 Procedure SPIRE-FM-SFT-DPU-ON-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	To switch on the SPIRE DPU REDUNDANT and start generating housekeeping
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are switched off
<b>Final configuration</b>	SPIRE DPU REDUNDANT is ON and SPIRE HK is being produced , SPIRE DRCU REDUNDANT is OFF
<b>Preconditions</b>	<ul style="list-style-type: none"><li>• SPIRE FM DPU is electrically integrated with the Herschel Satellite</li><li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li><li>• CCS is up and running</li><li>• FUNCTIONAL TEST PARAMETERS display is selected on the CCS</li></ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail Criteria</b>	Nominal and critical HK reports start being generated at their nominal rates of 1Hz and 0.5Hz respectively.



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### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Pass/Fail
1	Select DPU AND OBS PARAMETERS display is on the CCS	—	—	—	
2	<b>Power ON the SPIRE DPU REDUNDANT unit using the dedicated spacecraft LCL line and configure 1553 Spacecraft bus for SPIRE DPU REDUNDANT (RT = 22)</b>	—	—	—	
3	Wait for the boot software to produce at least 2 event packets (5,1)				
4	Execute TCL script SPIRE-FM-SFT-DPU-START-R-PP.tcl	—	—	—	
5	Check that Nominal and Critical HK packets are arriving at the CCS: <b>SPIRE Nominal HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID : 0x502</li> </ul> <b>SPIRE Critical HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID: 0x500</li> </ul>				
6	Check that THSK parameter is refreshing every second	THSK	Refreshing @ 1 Hz	—	
7	Check that TM2N parameter is incrementing by 1 every second	TM2N	Incrementing by 1 @ 1Hz	—	
8	Check that TM1N parameter is incrementing by 1 every 2 second	TM1N	Incrementing by 1 @ 0.5Hz		
<b>Test Result (Pass/Fail):</b>					

### Procedure Steps for AVM:



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Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Pass/Fail
1	Select DPU AND OBS PARAMETERS display is on the CCS	—	—	—	
2	<b>Power ON the SPIRE DPU REDUNDANT unit using the dedicated spacecraft LCL line and configure 1553 Spacecraft bus for SPIRE DPU REDUNDANT (RT = 22)</b>	—	—	—	
3	Wait for the boot software to produce at least 2 event packets (5,1)				
4	Execute TCL script SPIRE-FM-SFT-DPU-START-R-PP.tcl	—	—	—	
5	Check that Nominal and Critical HK packets are arriving at the CCS: <b>SPIRE Nominal HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID : 0x502</li> </ul> <b>SPIRE Critical HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID: 0x500</li> </ul>				
6	<b>When the HK requests start being generated several HK parameters will go Out of Limits (Hard). This is a design feature of the DRCU Simulator and cannot be avoided.</b>	PLIAP5V PLIAP9V PLIAM9V SLIAP5V SLIAP9V SLIAM9V LIAPiTEMP LIASiTEMP BIASTEMP DAQTEMP	-/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL -/ OOL		
7	Check that THSK parameter is refreshing every second	THSK	Refreshing @ 1 Hz	—	
8	Check that TM2N parameter is incrementing by 1 every second	TM2N	Incrementing by 1 @ 1Hz	—	
9	Check that TM1N parameter is incrementing by 1 every 2 second	TM1N	Incrementing by 1 @ 0.5Hz		
10	<b>On CCS check the consistency of the SPIRE on board time to the HCDMU time and the CCS. *</b>	—	—		
11	On IEGSE check the consistency between SCOS time and THSK and QLA time.	THSK	Incrementing once per second		
<b>Test Result (Pass/Fail):</b>					



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### 4.2.2 Procedure SPIRE-FM-SFT-DRCU-ON-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	To switch on the SPIRE DRCU REDUNDANT and start generating housekeeping
<b>Initial configuration</b>	SPIRE DPU REDUNDANT is ON and DRCU REDUNDANT is switched OFF
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>• SPIRE FM DRCU is electrically integrated with the Herschel Satellite</li> <li>• SPIRE DRCU is switched OFF</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• FUNCTIONAL TEST PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	4 minutes
<b>Pass/Fail Criteria</b>	DRCU voltages show expected 'ON' values

#### Procedure steps for FM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-DRCU-START-R-STEP1.tcl	---	---	---	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	---	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	---	
4	<b>Power ON the SPIRE DRCU REDUNDANT unit using the dedicated spacecraft LCL line.</b>	---	---	---	
5	Execute TCL script SPIRE-FM-SFT-DRCU-START-R-STEP2.tcl	---	---	---	
6	Check that THSK parameter is again refreshing every second	THSK	Refreshing @ 1Hz		
7	Check that TM2N parameter is again incrementing every second	TM2N	Incrementing by 1 @ 1Hz	---	
8	Check that the SCU/DCU voltages show nominal values	SCUP5V SCUP9V SCUM9V BIASP5V BIASP9V BIASM9V	~ 5.2 ± 0.5V ~ 9.0 ± 0.2V ~ -9.0 ± 0.2V ~ 5.1 ± 0.5V ~ 9.0 ± 0.2V ~ -9.0 ± 0.2V	---	

**Test Result (Pass/Fail):**





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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-DRCU-START-R-STEP1.tcl	—	—	—	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	
4	Start DRCU simulator application software.*	—	—	—	
5	Execute TCL script SPIRE-FM-SFT-DRCU-START-R-STEP2.tcl	—	—		
6	Check that THSK parameter is again refreshing every second	THSK	Refreshing @ 1Hz	—	
7	Check that TM2N parameter is again incrementing every second	TM2N	Incrementing by 1 @ 1Hz	—	

### Test Result (Pass/Fail):

*\* It is assumed that the DRCU simulator PC is already ON. Double click on the Transmit.exe icon on the desktop of the PC to start the application software.*



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### 4.2.3 Procedure SPIRE-FM-SFT-FUNC-SCU-01-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SCU science packet generation check
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced
<b>Final configuration</b>	Unchanged
<b>Constraints</b>	<ul style="list-style-type: none"><li>• SPIRE DRCU REDUNDANT is switched ON</li><li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li><li>• CCS is up and running</li><li>• SFT PARAMETERS display is selected on the CCS</li></ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail Criteria</b>	Specified SCU HK parameters show expected increment.

#### Procedure Steps:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-01-R.tcl	SCUFRAMECNT TM5N	0/31 0x3FFF/1		

**Test Result (Pass/Fail):**



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### 4.2.4 Procedure SPIRE-FM-SFT-FUNC-SCU-03-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SCU DC thermometry check
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and DC thermometry is ON
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	8 minutes
<b>Pass/Fail Criteria</b>	DC Thermometry channels show temperature readings according to the actual instrument temperature* *: At warm temperatures all channels should show short circuit RAW readings of -32768

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-03-R.tcl	—	—	—	—
2	<b>Wait for the parameter BBFULLTYPE to get set to SCU_DC_Therm</b>				
3	A few seconds later record the value of parameter SCUTEMPSTAT	SCUTEMPSTAT	0/FFFF/FFFF		
4	If the instrument is at He II temperatures check the values of SCU DC thermometry channels.	PUMPHTRTEMP PUMPHSTEMP EVAPHSTEMP SHUNTTEMP EMCFILTEMP SL0TEMP PL0TEMP OPTTEMP BAFTEMP BSMIFTEMP SCAL2TEMP SCAL4TEMP SCALTEMP	(All Values TBC) -/~4.6K -/~3.0K -/~3.0K -/~1.7K -/~4.6K -/~1.7K -/~1.7K -/~4.6K -/~4.6K -/~4.5K -/~4.6K -/~4.6K -/~4.6K		



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Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
		SMECIFTEMP SMECTEMP BSMTEMP	-/~4.6K -/~4.6K -/~4.5K		
5	If the instrument is at He I temperatures check the values of SCU DC thermometry channels.	PUMPHTRTEMP PUMPHSTEMP EVAPHSTEMP SHUNTTEMP EMCFILTEMP SL0TEMP PL0TEMP OPTTEMP BAFTEMP BSMIFTEMP SCAL2TEMP SCAL4TEMP SCALTEMP SMECIFTEMP SMECTEMP BSMTEMP	(All Values TBC) ~4.2K ~4.4K ~4.3K ~4.2K ~4.8K ~4.2K ~4.2K ~4.8K ~4.8K ~4.7K ~4.8K ~4.8K ~4.8K ~4.7K ~4.7K ~4.8K		
6	<p>If the instrument is warm:</p> <p><b>Configure the SFT PARAMETERS display to show the RAW values of SCU DC thermometry channels.</b></p> <p>Record the RAW values of SCU DC thermometry channels. Nominal values should show a short circuit status (or RAW -32768).</p> <p><b>Non Nominal (Open Circuit Criterion): RAW reading in the range [0, -100]</b></p>	PUMPHTRTEMP PUMPHSTEMP EVAPHSTEMP SHUNTTEMP EMCFILTEMP SL0TEMP PL0TEMP OPTTEMP BAFTEMP BSMIFTEMP SCAL2TEMP SCAL4TEMP SCALTEMP SMECIFTEMP SMECTEMP BSMTEMP	— — — — — — — — — — — — — — — —		
<b>Test Result (Pass/Fail):</b>					



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### 4.2.5 Procedure SPIRE-FM-SFT-FUNC-SCU-06-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SCU AC thermometry check
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and DC thermometry is ON
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Constraints</b>	<ul style="list-style-type: none"><li>• SPIRE DRCU REDUNDANT is switched ON</li><li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li><li>• CCS is up and running</li><li>• SFT PARAMETERS display is selected on the CCS</li></ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail Criteria</b>	AC Thermometry channel shows temperature readings according to the actual instrument temperature

#### Procedure Steps:



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Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-06-R.tcl	—	—	—	—
2	<b>Wait for the parameter BBFULLTYPE to get set to SCU_AC_Therm</b>				
3	A few seconds later record the value of parameter SUBKSTAT	SUBKSTAT	0/1/1		
4	If the instrument is at He II temperatures check the value of SCU AC thermometry channel.	SUBKTEMP	~1.7K		
5	If the instrument is at He I temperatures check the value of SCU AC thermometry channel.	SUBKTEMP	~4K		
6	<p>If the instrument is warm:</p> <p><b>Configure the SFT PARAMETERS display to show the RAW value of SCU AC thermometry channel.</b></p> <p>Only record the RAW value of SCU AC thermometry channel if it indicates an open circuit.</p> <p><b>Open Circuit Criterion: RAW reading in the range [0, -100]</b></p>	SUBKTEMP	—		

**Test Result (Pass/Fail):**



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### 4.2.6 Procedure SPIRE-FM-SFT-FUNC-SCU-07-R

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	Sorption Cooler Heater Check
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and DC thermometry is ON
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail Criteria</b>	Sorption cooler heat switches and pump heater show expected voltages

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-07-R.tcl	—	—	—	—
2	<b>Wait for the parameter BBFULLTYPE to get set to Cooler_Htr_Chk</b>	BBFULLTYPE	Cooler_Htr_Chk		
3	Record the value of parameter SPHSV – the Sorption Pump Heat Switch Voltage. <i>This voltage stays on for ~20 seconds. Wait for the voltage to go to zero to continue.</i>	SPHSV - mV	0/~323/0		
4	Record the value of parameter EVHSV – the Evaporator Heat Switch Voltage. <i>This voltage stays on for ~20 seconds. Wait for the voltage to go to zero to continue.</i>	EVHSV - mV	0/~323/0		
5	Record the value of parameter SPHTRV – the Sorption Pump Heater Voltage. <i>This voltage stays on for ~20 seconds. Wait for the voltage to go to zero to continue.</i>	SPHTRV - V	0/~8.8/0		
<b>Test Result (Pass/Fail):</b>					



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### 4.2.7 Procedure SPIRE-FM-SFT-FUNC-SCU-04-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	Photometer Calibration Check (REDUNDANT)
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Final configuration</b>	Unchanged
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail Criteria</b>	PCAL voltage and current agree with expected values

#### Procedure Steps:

Step	Description	Parameter Name - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-04-R.tcl  <b>The expected values during the test should be monitored when parameter BBFULLTYPE in the SFT PARAMETERS display is set to PCAL_Check This usually happens about 30 seconds from the start of test execution.</b>	PCALCURR - mA PCALV – V  BBFULLTYPE	0.0/0.1/0.0 0.0/0.026/0.0  PCAL_Check		
<b>Test Result (Pass/Fail):</b>					





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### 4.2.8 Procedure SPIRE-FM-SFT-FUNC-SCU-05-R

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	Spectrometer Calibration Check (REDUNDANT)
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Final configuration</b>	Unchanged
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	SCAL2 and SCAL4 voltage and currents agree with expected values

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-05-R.tcl	—	—	—	
2	<b>Wait for the parameter BBFULLTYPE to get set to SCAL4_Check</b>	BBFULLTYPE	SCAL4_Check		
3	A few seconds later record the value of parameters SCAL4CURR and SCAL4V <i>These parameters are set back to 0 after ~30 seconds</i>	SCAL4CURR – mA SCAL4V – V	0.0/0.10/0.0 0.0/0.05/0.0		
4	<b>Wait for the parameter BBFULLTYPE to get set to SCAL2_Check</b>	BBFULLTYPE	SCAL2_Check		
5	A few seconds later record the values of parameters SCAL2CURR and SCAL2V <i>These parameters are set back to 0 after ~30 seconds</i>	SCAL2CURR – mA SCAL2V – V	0.0/0.10/0.0 0.0/0.05/0.0		

**Test Result (Pass/Fail):**



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### 4.2.9 Procedure SPIRE-FM-SFT-FUNC-MCU-01-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	MCU (REDUNDANT) Boot Check
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	MCU voltages and board temperatures show expected 'ON' values

#### Procedure Steps for FM:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-MCU-01-R.tcl	—	—	—	—
2	Check that the MCU is booted up successfully	MCUBITSTAT	0/1/1		
3	Check MCU HK parameter values and ensure that the values are refreshing	MCUP5V MCUP14V MCUM14V MCUP15V MCUM15V  MCUMACTEMP MCUSMECTEMP MCUBSMTEMP	~ 5.0 ± 0.2V ~ 14.0 ± 0.5V ~ -14.0 ± 0.5V ~ 15.0 ± 0.5V ~ -15.0 ± 0.7V  ~300K ~300K ~300K		
<b>Test Result (Pass/Fail):</b>					



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### Procedure Steps for AVM:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-MCU-01-R.tcl	—	—	—	—
2	Check that the MCU is booted up successfully	MCUBITSTAT	0/1/1		

**Test Result (Pass/Fail):**



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### 4.2.10 Procedure: SPIRE-FM-SFT-FUNC-MCU-02-R

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	MCU Nominal Frame Generation Check
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted.
<b>Final configuration</b>	Unchanged.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Specified MCU HK parameters show expected increment

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-MCU-02-R.tcl	MCUFRAMECNT	<b>FM</b> : 0/297 <b>AVM</b> : 0/300	—	—

**Test Result (Pass/Fail):**



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### 4.2.11 Procedure SPIRE-FM-SFT-FUNC-BSM-01-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	BSM (REDUNDANT) Chop/Jiggle Sensor Check.
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. BSM Chop/Jiggle sensors are ON.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MCU REDUNDANT is booted.</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail criteria</b>	HK Parameters CHOPSENSPWR and JIGGSENSPWR show expected ON values.

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-BSM-01-R.tcl	—	—	—	—
2	Check that the Chop and Jiggle sensors have switched on	CHOPSENSPWR JIGGSENSPWR	0/1/1 0/1/1		

**Test Result (Pass/Fail):**



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### 4.2.12 Procedure SPIRE-FM-SFT-BSM-OFF-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	BSM (REDUNDANT) Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. BSM Chop/Jiggle sensors are ON.
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. BSM Chop/Jiggle sensors are OFF.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MCU REDUNDANT is booted.</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail criteria</b>	HK Parameters CHOPSENSPWR and JIGGSENSPWR show expected OFF values.

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute SPIRE-FM-SFT-BSM-OFF-R.tcl	—	—	—	—
2	Check that the power to the BSM sensors is switched off	CHOPSENSPWR JIGGSENSPWR	1/-/0 1/-/0		

**Test Result (Pass/Fail):**



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### 4.2.13 Procedure SPIRE-FM-SFT-FUNC-SMEC-01-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SMEC (REDUNDANT) Encoder/LVDT Sensor Check.
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. SMEC Encoder and LVDT are ON.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MCU REDUNDANT is booted.</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail criteria</b>	HK Parameters SMECENC PWR and SMECLVDT PWR show expected ON values.

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SMEC-01-R.tcl	—	—	—	—
2	Check that power to the SMEC LED and LVDT sensor is on	SMECENC PWR	0/-/1		
		SMECLVDT PWR	0/-/1		

**Test Result (Pass/Fail):**



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### 4.2.14 Procedure SPIRE-FM-SFT-SMEC-OFF-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SMEC (REDUNDANT) Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. SMEC Encoder and LVDT are ON.
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. SMEC Encoder and LVDT are OFF.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MCU REDUNDANT is booted.</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	3 minutes
<b>Pass/Fail criteria</b>	HK Parameters SMECENC PWR and SMECLVDTPWR show expected OFF values.

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute SPIRE-FM-SFT-SMEC-OFF-R.tcl	—	—	—	—
2	Check that the power to the SMEC sensors is switched off	SMECENC PWR  SMECLVDTPWR	1/-/0  1/-/0		
<b>Test Result (Pass/Fail):</b>					





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### 4.2.15 Procedure SPIRE-FM-SFT-FUNC-DCU-01-R

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	DCU science packet generation check for all Photometer and Spectrometer packet types (PF, PSW, PMW, PLW, SF, SSW and SLW)
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted.
<b>Final configuration</b>	Unchanged
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Specified DCU HK parameter shows expected increment

#### Procedure Steps:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-01-R.tcl	DCUFRAMECNT	0/700		

**Test Result (Pass/Fail):**



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### 4.2.16 Procedure SPIRE-FM-SFT-FUNC-DCU-04-PHOT-R

<b>Version</b>	2.4
<b>Date</b>	10 <sup>th</sup> Sept 2007
<b>Purpose</b>	Photometer LIAs REDUNDANT Check
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. Photometer LIAs are ON
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• Photometer LIAs are OFF</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS &amp; DCU PARAMETERS displays are selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Specified Photometer LIA HK parameters show expected ON values

#### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-04-PHOT-R.tcl	PLIABITSTAT	0/1/1		
2	Check Photometer LIA HK parameter values and ensure that the values are refreshing	PLIAP5V PLIAP9V PLIAM9V	0.0/-/ 5.2 ± 0.2V 0.0/-/ 11.5 ± 0.5V 0.0/-/-11.5 ± 0.5V		
3	<b>On the DCU PARAMETERS display check that the LIA temperatures are slowly warming up.</b> At switch-on it is possible that some of the LIA temperatures will be in soft or even hard limits. No action is required.	LIAP1TEMP to LIAP9TEMP	~ 290-300 K		
4	<b>Wait for ~3 minutes before continuing with the SFTs</b>	—	—	—	—

<b>Test Result (Pass/Fail):</b>
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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-04-PHOT-R.tcl	PLIABITSTAT	0/1/1		
2	<p><b>Note:</b> When the command to switch ON Photometer LIAs is sent to the DRCU simulator ALL photometer LIA related HK parameters will go Out of Limits (Hard Limits). This is an inherent feature of the DRCU simulator which cannot be avoided.</p>	PLIAP5V PLIAP9V PLIAM9V LIAP9TEMP LIAP8TEMP LIAP7TEMP LIAP6TEMP LIAP5TEMP LIAP4TEMP LIAP3TEMP LIAP2TEMP LIAP1TEMP	OOL OOL OOL OOL OOL OOL OOL OOL OOL OOL OOL OOL		
<b>Test Result (Pass/Fail):</b>					



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### 4.2.17 Procedure SPIRE-FM-SFT-PLIA-OFF-R

<b>Version</b>	2.4
<b>Date</b>	10 <sup>th</sup> Sept 2007
<b>Purpose</b>	Photometer LIAs REDUNDANT Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. Photometer LIAs are ON
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. Photometer LIAs are OFF
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• Photometer LIAs are ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail criteria</b>	Specified Photometer LIA HK parameters show expected OFF values

#### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-PLIA-OFF-R.tcl	PLIABITSTAT	1/-/0		
2	Check Photometer LIA HK parameter values	PLIAP5V PLIAP9V PLIAM9V	5.2 ± 0.2V/-/0.0 11.5 ± 0.5V/-/0.0 -11.5 ± 0.5V/-/0.0		
<b>Test Result (Pass/Fail):</b>					



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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-PLIA-OFF-R.tcl	PLIABITSTAT	1/-/0		

**Test Result (Pass/Fail):**



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### 4.2.18 Procedure SPIRE-FM-SFT-FUNC-DCU-04-SPEC-R

<b>Version</b>	2.4
<b>Date</b>	10 <sup>th</sup> Sept 2007
<b>Purpose</b>	Spectrometer LIAs REDUNDANT Check
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. Spectrometer LIAs are ON
<b>Constraints</b>	<ul style="list-style-type: none"> <li>SPIRE DRCU REDUNDANT is switched ON</li> <li>Spectrometer LIAs are OFF</li> <li>SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>CCS is up and running</li> <li>SFT PARAMETERS &amp; DCU PARAMETERS displays are selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Specified Spectrometer LIA HK parameters show expected ON values

#### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-04-SPEC-R.tcl	SLIABITSTAT	0/1/1		
2	Check Spectrometer LIA HK parameter values and ensure that the values are refreshing	SLIAP5V SLIAP9V SLIAM9V	0.0/-/ 5.2 ± 0.2V 0.0/-/ 11.5 ± 0.5V 0.0/-/-11.5 ± 0.5V		
3	<p><b>On the DCU PARAMETERS display check that the LIA temperatures are slowly warming up.</b></p> <p>At switch-on it is possible that some of the LIA temperatures will be in soft or even hard limits. No action is required.</p>	LIAS1TEMP to LIAS3TEMP	~ 290-300 K		
4	<b>Wait for ~3 minutes before continuing with the SFTs</b>	—	—	—	—

**Test Result (Pass/Fail):**



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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-DCU-04-SPEC-R.tcl	SLIABITSTAT	0/1/1		
2	<b>Note:</b> When the command to switch ON Spectrometer LIAs is sent to the DRCU simulator ALL photometer LIA related HK parameters will go Out of Limits (Hard Limits). This is an inherent feature of the DRCU simulator which cannot be avoided.	SLIAP5V SLIAP9V SLIAM9V LIAS3TEMP LIAS2TEMP LIAS1TEMP	OOL OOL OOL OOL OOL OOL		

**Test Result (Pass/Fail):**



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### 4.2.19 Procedure SPIRE-FM-SFT-SLIA-OFF-R

<b>Version</b>	2.4
<b>Date</b>	10 <sup>th</sup> Sept 2007
<b>Purpose</b>	Spectrometer LIAs REDUNDANT Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. Spectrometer LIAs are ON
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted. Spectrometer LIAs are OFF
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• Spectrometer LIAs are ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail criteria</b>	Specified Spectrometer LIA HK parameters show expected OFF values

#### Procedure Steps for FM:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/Failure
1	Execute TCL script SPIRE-FM-SFT-SLIA-OFF-R.tcl	SLIABITSTAT	1/-/0		
2	Check Photometer LIA HK parameter values	SLIAP5V SLIAP9V SLIAM9V	5.2 ± 0.2V/-/0.0 11.5 ± 0.5V/-/0.0 -11.5 ± 0.5V/-/0.0		
<b>Test Result (Pass/Fail):</b>					





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### Procedure Steps for AVM:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-SLIA-OFF-R.tcl	SLIABITSTAT	1/-/0		

**Test Result (Pass/Fail):**



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### 4.2.20 Procedure SPIRE-FM-SFT-FUNC-MCU-OFF-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	MCU REDUNDANT Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is booted.
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON and MCU REDUNDANT is OFF.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MCU REDUNDANT is ON.</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail criteria</b>	Specified MCU HK Parameter shows expected value.

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute SPIRE-FM-SFT-FUNC-MCU-OFF-R.tcl	—	—	—	—
2	Check that the MCU is switched off	MCUBITSTAT	1/-/0		

**Test Result (Pass/Fail):**



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### 4.2.21 Procedure SPIRE-FM-SFT-FUNC-SCU-OFF-R

<b>Version</b>	2.3
<b>Date</b>	28 <sup>th</sup> August 2007
<b>Purpose</b>	SCU REDUNDANT Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON.
<b>Final configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is OFF
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	2 minutes
<b>Pass/Fail criteria</b>	Specified SCU HK Parameters show expected value.

#### Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-FUNC-SCU-OFF-R.tcl	—	—	—	—
2	A few seconds later record the value of parameter SCUTEMPSTAT	SCUTEMPSTAT	FFFF/-/0		
3	A few seconds later record the value of parameter SUBKSTAT	SUBKSTAT	1/-/0		

**Test Result (Pass/Fail):**



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### 4.2.22 Procedure SPIRE-FM-SFT-DRCU-OFF-R

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	DRCU REDUNDANT Switch OFF
<b>Initial configuration</b>	SPIRE DPU and DRCU REDUNDANT are ON and SPIRE HK is being produced and AC/DC thermometry is ON.
<b>Final configuration</b>	SPIRE DPU REDUNDANT is ON, SPIRE DRCU REDUNDANT is OFF and SPIRE HK is not being produced .
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE-FM-SFT-FUNC-SCU-OFF has been executed.</li> <li>• SPIRE DRCU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	THSK and TM2N stop refreshing/incrementing

#### Procedure Steps for FM:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-DRCU-OFF.tcl	—	—	—	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	
4	<b>Power OFF the SPIRE DRCU REDUNDANT unit.</b>	—	—	—	

**Test Result (Pass/Fail):**



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### Procedure Steps for AVM:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-FM-SFT-DRCU-OFF-R.tcl	—	—	—	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	
4	<b>CCS staff:</b> <b>Stop DRCU Simulator application software</b>	—	—	—	

**Test Result (Pass/Fail):**



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### 4.2.23 Procedure SPIRE-FM-SFT-DPU-OFF-R

<b>Version</b>	2.2
<b>Date</b>	2 <sup>nd</sup> January 2007
<b>Purpose</b>	DPU REDUNDANT Switch OFF
<b>Initial configuration</b>	SPIRE DPU REDUNDANT is ON but not generating HK.
<b>Final configuration</b>	SPIRE DPU REDUNDANT is OFF.
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• SPIRE-FM-SFT-DRCU-OFF has been executed.</li> <li>• SPIRE DPU REDUNDANT is switched ON</li> <li>• SPIRE MIB REDUNDANT is imported in the CCS database.</li> <li>• CCS is up and running</li> <li>• SFT PARAMETERS display is selected on the CCS</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	Power to SPIRE DPU REDUNDANT is OFF

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Power OFF the SPIRE DPU REDUNDANT unit.	—	—	—	

**Test Result (Pass/Fail):**



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### 4.2.24 Procedure SPIRE-FM-SFT-LPU-01-R

<b>Version</b>	1.0
<b>Date</b>	Tuesday, 28 August 2007
<b>Purpose</b>	DPU PRIME Switch OFF
<b>Initial configuration</b>	Prime and redundant DPU and DRCU are off
<b>Final configuration</b>	Prime and redundant DPU and DRCU are off
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• Cryostat is vertical to within <math>\pm 45^\circ</math></li> <li>• Prime and redundant DPU and DRCU are off</li> </ul>
<b>Duration</b>	5 minutes
<b>Pass/Fail criteria</b>	The specified current is drawn when the LPU is enabled and is switched off when the LPU is disabled

#### Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	<b>Power on Redundant LPU LCL (LCL #26)</b>	LCL status	OFF/ /ON		State of LCL #26 switches to ON
3	<b>Send HL command #21 (LPU Enable Redundant)</b>	LCL #26 current	0mA/ /130-180mA		Current between 130-180mA
4	<b>Send HL command #22 (LPU Disable Redundant)</b>	LCL #26 current	130-180mA/ /0mA		Current off
5	<b>Un-power Prime LPU LCL (LCL # 25)</b>	LCL status	ON/ / OFF		State of LCL #26 switches to OFF

**Test Result (Pass/Fail):**



## Spire Procedure

SPIRE FM ShortFunctional Test Procedures  
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### 5. APPENDIX 1: NOMINAL SPIRE SWITCH-OFF SEQUENCE

<b>Version</b>	2.3
<b>Date</b>	10 <sup>th</sup> Sept. 2007
<b>Purpose</b>	To switch OFF the SPIRE instrument if an anomaly should occur
<b>Initial configuration</b>	SPIRE can be in ANY configuration - Prime or Redundant - as specified in the procedure steps
<b>Final configuration</b>	SPIRE is OFF
<b>Preconditions</b>	<ul style="list-style-type: none"><li>• SPIRE FM DPU is electrically integrated with the Herschel Satellite</li><li>• SPIRE MIB PRIME is imported in the CCS database.</li><li>• CCS is up and running</li><li>• FUNCTIONAL TEST PARAMETERS display is selected on the CCS</li></ul>
<b>Duration</b>	~5-8 minutes
<b>Pass/Fail Criteria</b>	SPIRE is OFF. All instrument subsystems are completely powered OFF.

**Note:**

All HK parameters relevant to this procedure can be located on the FUNCTIONAL TEST PARAMETERS CCS display. The exact name of the script to be executed at each step depends on whether the Prime or Redundant instrument is switched on.





## Spire Procedure

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### Procedure Steps:

Step	Description	Parameter - Unit	Value	Actual value before/after
1	<p><b>Check to see if the Photometer LIAs are on</b></p> <p>If PLIABITSTAT=1 then execute SPIRE-FM-SFT-PLIA-OFF-&lt;P/R&gt;.tcl</p>	PLIABITSTAT	<b>0 or 1</b>	
2	<p><b>Check to see if the Spectrometer LIAs are on</b></p> <p>If SLIABITSTAT=1 then execute SPIRE-FM-SFT-SLIA-OFF-&lt;P/R&gt;.tcl</p>	SLIABITSTAT	<b>0 or 1</b>	
3	<p><b>Check to see if the BSM is on</b></p> <p>If CHOPSENSPWR=1 or JIGGSENSPWR=1, then execute SPIRE-FM-SFT-BSM-OFF-&lt;P/R&gt;.tcl</p>	CHOPSENSPWR JIGGSENSPWR	<b>0 or 1</b> <b>0 or 1</b>	
4	<p><b>Check to see if the SMEC is on</b></p> <p>If SMECENCPWR=1 or SMECLVDTPWR=1, then execute SPIRE-FM-SFT-SMEC-OFF-&lt;P/R&gt;.tcl</p>	SMECENCPWR SMECLVDTPWR	<b>0 or 1</b> <b>0 or 1</b>	
5	<p><b>Check to see if the MCU is on</b></p> <p>If MCUBITSTAT=1 then execute SPIRE-FM-SFT-MCU-OFF-&lt;P/R&gt;.tcl</p>	MCUBITSTAT	<b>0 or 1</b>	
6	<p><b>Check to see if the SCU DC/AC thermometry is on</b></p> <p>If SUBKSTAT=1 or SCUTEMPSTAT≠0, then execute SPIRE-FM-SFT-SCU-OFF-&lt;P/R&gt;.tcl</p>	SUBKSTAT SCUTEMPSTAT	<b>0 or 1</b> <b>≠ 0</b>	
7	Execute Procedure SPIRE-FM-SFT-DRCU-OFF-P/R.tcl	TM2N THSK	<b>Should stop updating</b>	
8	Execute Procedure SPIRE-FM-SFT-DPU-OFF-P/R.tcl	n/a	<b>n/a</b>	



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