

SPIRE\_CP\_SCAL4\_PID (RED) Control Loop PID Tuning  
 File: H\_COP\_SPI\_SC4R.xls  
 Author: L.Lucas-hp



## Procedure Summary

### Objectives

The purpose of this procedure is to confirm the SCAL4 Red control loop PID parameters.  
 Based on procedure:  
 SPIRE\_CP\_SCAL4\_PID (v4)  
 Generated: 27/03/2009

### Summary of Constraints

Functional tests have been successfully performed.

### Spacecraft Configuration

**Start of Procedure**

Mode = SPECSTBY or REDY

**End of Procedure**

Mode = SPECSTBY or REDY

### Reference File(s)

**Input Command Sequences**

**Output Command Sequences**

HCSSC4R  
 HCSSC4RY

### Referenced Displays

**ANDs**      **GRDs**      **SLDs**  
 ZAZ90999  
 SA\_1\_559  
 SA\_4\_559

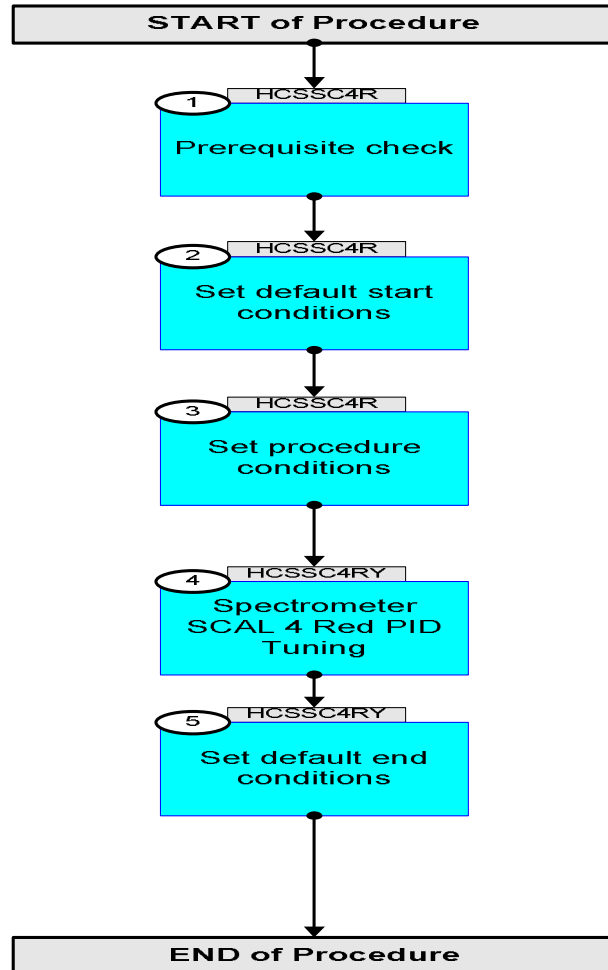
### Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
04/03/09		1	Created	L.Lucas-hp	
05/03/09	2.1	2	Changed Run VM command to take TPF values	L.Lucas-hp	
24/03/09	2.2	2.01	Validation : Title Update	L.Lucas-hp	
07/04/09		3	Updated in line with updates received from SPIRE	L.Lucas-hp	
21/04/09	2.3	3.01	Validation : Text Update	L.Lucas-hp	
04/05/09		4	Made TPF SOC Plannable Removed ETs	L.Lucas-hp	
05/05/09	2.4	4.01	Validation : Text update, s/c/ start and end config	L.Lucas-hp	

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### Procedure Flowchart Overview




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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
<b>Beginning of Procedure</b>					
		TC Seq. Name :HCSSC4R ( SCAL4 PID Tune Red )  TimeTag Type: Y Sub Schedule ID:  <input type="checkbox"/>			
1		Prerequisite check		Next Step: 2	
1.1		HSC/ICC input			
		Verify that the HSC has supplied a valid OBSID value:  <b>OBS_ID</b> = 0xnxxx nxxx			
2		Set default start conditions		Next Step: 3	
		Note that a <b>TM(5,1)</b> packet [New_Step_Report] is generated after each of the following SET_OBS_STEP telecommands			
	ET+= UT+=00.00.00	<b>SET_OBS_STEP</b>  <b>SET_OBS_STEP</b>  Command Parameter(s) : <b>OBSERVATION_STEP</b> <b>SP03N500</b> <b>0 &lt;hex&gt;</b>  Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	<b>SC003500</b>	<b>TC</b>	
	ET+= UT+=00.00.01	<b>SET_BBID</b>  <b>SET_BBID</b>  Command Parameter(s) : <b>BUILDING_BLOCK_ID</b> <b>SP01N500</b> <b>80010001 &lt;hex&gt;</b>  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	<b>SC001500</b>	<b>TC</b>	
		Verify Telemetry  <b>BBFULLTYPE</b> <b>SM2LN500</b> <b>= ClearObs</b>		<b>AND=ZAZ90999</b>	
	ET+= UT+=00.00.00	<b>SET_OBS_STEP</b>  <b>SET_OBS_STEP</b>  Command Parameter(s) : <b>OBSERVATION_STEP</b> <b>SP03N500</b> <b>1 &lt;hex&gt;</b>  Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	<b>SC003500</b>	<b>TC</b>	
	ET+= UT+=00.00.01	<b>SET_OBSID</b>  <b>SET_OBSID</b>  Command Parameter(s) : <b>OBSERVATION_ID</b> <b>SP00N500</b> <b>00000000 &lt;hex&gt;</b>  Subsch. ID : 370 Det. descr. : SET OBSERVATION IDENTIFIER	<b>SC000500</b>	<b>TC</b>	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
		Verify Telemetry OBSID SM10N500	= 00000000 <hex>	AND=ZAZ90999	
	ET=+ UT=+00.00.00	SET_OBS_STEP SET_OBS_STEP Command Parameter(s) : OBSERVATION_STEP SP03N500 Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SC003500 0 <hex>	TC	
	ET=+ UT=+00.00.01	SET_BBID SET_BBID Command Parameter(s) : BUILDING_BLOCK_ID SP01N500 Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SC001500 80000000 <hex>	TC	
		Verify Telemetry BBFULLTYPE SM2LN500	= Null	AND=ZAZ90999	
	ET=+ UT=+00.00.00	SET_OBS_STEP SET_OBS_STEP Command Parameter(s) : OBSERVATION_STEP SP03N500 Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SC003500 0 <hex>	TC	
	ET=+ UT=+00.00.01	SET_BBID SET_BBID Command Parameter(s) : BUILDING_BLOCK_ID SP01N500 Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SC001500 80020001 <hex>	TC	
		Verify Telemetry BBFULLTYPE SM2LN500	= StartObs	AND=ZAZ90999	
3		Set procedure conditions		Next Step: 4	
	ET=+ UT=+00.00.00	RESET_DRCU_COUNTERS RESET_DRCU_COUNTERS Subsch. ID : 370 Det. descr. : RESET DRCU COUNTERS	SCD00505	TC	
		Verify that the TRESET parameter has the same value as the THSK parameter TRESET SM01T500	same as THSK	AND=SA_1_559	
		THSK SM00T500	any	AND=SA_1_559	
		Note that a TM(5,1) packet [New_Step_Report] is generated after each of the following SET_OBS_STEP telecommands			
	ET=+ UT=+00.00.00	SET_OBS_STEP SET_OBS_STEP Command Parameter(s) : OBSERVATION_STEP SP03N500 Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SC003500 1 <hex>	TC	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
	ET=+ UT=+00.00.01	SET_OBSID  Command Parameter(s) : OBSERVATION_ID SP00N500  Subsch. ID : 370 Det. descr. : SET OBSERVATION IDENTIFIER	SET_OBSID  SC000500  OBS_ID	TC	
		Verify Telemetry  OBSID SM10N500	OBS_ID	AND=ZAZ90999	
	ET=+ UT=+00.00.00	SET_OBS_STEP  Command Parameter(s) : OBSERVATION_STEP SP03N500  Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SET_OBS_STEP  SC003500  0 <hex>	TC	
	ET=+ UT=+00.00.01	SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID SP01N500  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SET_BBID  SC001500  80000000 <hex>	TC	
		Verify Telemetry  BBFULLTYPE SM2LN500	= Null	AND=ZAZ90999	
	ET=+ UT=+00.00.00	SET_OBS_STEP  Command Parameter(s) : OBSERVATION_STEP SP03N500  Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SET_OBS_STEP  SC003500  0 <hex>	TC	
	ET=+ UT=+00.00.01	SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID SP01N500  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SET_BBID  SC001500  8A110001 <hex>	TC	
		Verify Telemetry  BBFULLTYPE SM2LN500	8A11 (hex)	AND=ZAZ90999	
End of Sequence					
TC Seq. Name : HCSSC4RY ( SCAL4 PID Tune RedY )					
TimeTag Type: Y					
Sub Schedule ID:					
□					
4		Spectrometer SCAL 4 Red PID Tuning		Next Step: 5	
Only send the next RUN_VM1 TC if advised by the Instrument Team					

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment																																																						
		This TC (SCV02500: RUN_VM1), may need to be re-run. In which case the entire procedure will be re-executed with new TPF values as received from the Instrument team. The following info regarding the parameters is for info only																																																									
		TC Parameter SPV7N500 #01: a = Required SCAL temperature (ADC units) TC Parameter SPV7N500 #02: b = SCAL get temperature command TC Parameter SPV7N500 #03: c = SCAL set heater current command TC Parameter SPV7N500 #04: d = Loop period (us) TC Parameter SPV7N500 #05: e = Kp (PID parameter)-float																																																									
		TC Parameter SPV7N500 #06: f = Ki (PID parameter)-float TC Parameter SPV7N500 #07: g = Kd (PID parameter)-float TC Parameter SPV7N500 #08: h = Ki limit - float TC Parameter SPV7N500 #09: i = Low pass filter gain - float TC Parameter SPV7N500 #10: j = Low pass filter coefficient b1 - float																																																									
		TC Parameter SPV7N500 #11: k = Low pass filter coefficient b2 - float TC Parameter SPV7N500 #12: l = Max DAC value - int TC Parameter SPV7N500 #13: m = Pulse Width Modulation (PWM) flag (non-zero if used) TC Parameter SPV7N500 #14: n = TM flag (non-zero if DPU TM packets containing a copy of storage data are to be generated) TC Parameter SPV7N500 #15: o = Initialisation count (if non-zero this additional number of values will be read into the signal registers before starting PID) - try value >2																																																									
		Only send the next RUN_VM1 TC if advised by the Instrument Team																																																									
	ET=+ UT=+00.00.03	<p>RUN_VM1</p> <p style="text-align: center;">RUN_VM1</p> <p>SCV02500</p> <p>TC</p> <p>Command Parameter(s) :</p> <table border="0"> <tr><td>TABLEID_RUNVM1</td><td>SPV4N500</td><td>50 &lt;hex&gt;</td></tr> <tr><td>INDEX_RUNVM1</td><td>SPV5N500</td><td>0 &lt;hex&gt;</td></tr> <tr><td>N_RUNVM1</td><td>SPV6N500</td><td>15 &lt;dec&gt;</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>1</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>2</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>3</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>4</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>5</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>6</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>7</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>8</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>9</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>10</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>11</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>12</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>13</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>14</td></tr> <tr><td>DATA_RUNVM1</td><td>SPV7N500</td><td>15</td></tr> </table> <p>TC Control Flags :</p> <p style="text-align: center;">GBM IL DSE --Y -- ---</p> <p>Subsch. ID : 370 Det. descr. : EXECUTE COMMAND LIST HELD IN A TABLE BY S/W DRIVEN VM1</p>	TABLEID_RUNVM1	SPV4N500	50 <hex>	INDEX_RUNVM1	SPV5N500	0 <hex>	N_RUNVM1	SPV6N500	15 <dec>	DATA_RUNVM1	SPV7N500	1	DATA_RUNVM1	SPV7N500	2	DATA_RUNVM1	SPV7N500	3	DATA_RUNVM1	SPV7N500	4	DATA_RUNVM1	SPV7N500	5	DATA_RUNVM1	SPV7N500	6	DATA_RUNVM1	SPV7N500	7	DATA_RUNVM1	SPV7N500	8	DATA_RUNVM1	SPV7N500	9	DATA_RUNVM1	SPV7N500	10	DATA_RUNVM1	SPV7N500	11	DATA_RUNVM1	SPV7N500	12	DATA_RUNVM1	SPV7N500	13	DATA_RUNVM1	SPV7N500	14	DATA_RUNVM1	SPV7N500	15			
TABLEID_RUNVM1	SPV4N500	50 <hex>																																																									
INDEX_RUNVM1	SPV5N500	0 <hex>																																																									
N_RUNVM1	SPV6N500	15 <dec>																																																									
DATA_RUNVM1	SPV7N500	1																																																									
DATA_RUNVM1	SPV7N500	2																																																									
DATA_RUNVM1	SPV7N500	3																																																									
DATA_RUNVM1	SPV7N500	4																																																									
DATA_RUNVM1	SPV7N500	5																																																									
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	ET=+ UT=+00.00.01	SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID  TC Control Flags :  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SET_BBID  SP01N500  GBM IL DSE ----	SC001500  80000000 <hex>	TC	
		Note: Now wait for the Instrument Team to monitor the progress of the SCAL4TEMP stabilisation. A default wait time of 5 minutes is set in the procedure.				
		Check with the Instrument Team before executing the next block of TCs.				
	ET=+ UT=+00.05.01	SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID  TC Control Flags :  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SET_BBID  SP01N500  GBM IL DSE --Y --	SC001500  8A120001 <hex>	TC	
	ET=+ UT=+00.00.02	HALT_VM1  TC Control Flags :  Subsch. ID : 370 Det. descr. : HALT VM1	HALT_VM1  GBM IL DSE ----	SCV03500	TC	
	ET=+ UT=+00.00.04	SEND_DRCU_COMMAND  Command Parameter(s) : DRCUCOMMAND OVERRIDE  TC Control Flags :  Subsch. ID : 370 Det. descr. : SEND A SINGLE COMMAND TO THE DRCU	SEND_DRCU_COMMAND  SPD4N505 SPD9N505  GBM IL DSE ---	SCD06505  a0cc0000 <hex> 0 <hex> (Def)	TC	
	ET=+ UT=+00.00.01	SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID  TC Control Flags :  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SET_BBID  SP01N500  GBM IL DSE ----	SC001500  80000000 <hex>	TC	
		SPACON Check that SCAL4 has been switched OFF:				
		Verify SCAL4 is off. Check TM is 0mA +/-0.01mA SCAL4CURR	SMS1A520	= -0.0012 mA	AND=SA_4_559	
		Verify Telemetry is 0V +/-0.01mV SCAL4V	SMS1V520	= -0.0007 V	AND=SA_4_559	
		Verify Telemetry is set to 0xFFFF VM1STAT	SMV1N500		AND=SA_1_559	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
		Note: It may be necessary to repeat the test with different parameters for the RUN_VM1 TC			
5		Set default end conditions		Next Step: END	
		Note that a <b>TM(5,1)</b> packet [New_Step_Report] is generated after each of the following SET_OBS_STEP telecommands			
	ET=+ UT=+00.00.00	SET_OBS_STEP  Command Parameter(s) : OBSERVATION_STEP SP03N500  Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SET_OBS_STEP  SC003500  0 <hex>	TC	
	ET=+ UT=+00.00.01	SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID SP01N500  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SET_BBID  SC001500  80000000 <hex>	TC	
		Verify Telemetry  BBFULLTYPE SM2LN500	= Null	AND=ZAZ90999	
	ET=+ UT=+00.00.00	SET_OBS_STEP  Command Parameter(s) : OBSERVATION_STEP SP03N500  Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SET_OBS_STEP  SC003500  0 <hex>	TC	
	ET=+ UT=+00.00.01	SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID SP01N500  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SET_BBID  SC001500  80030001 <hex>	TC	
		Verify Telemetry  BBFULLTYPE SM2LN500	= EndObs	AND=ZAZ90999	
	ET=+ UT=+00.00.00	SET_OBS_STEP  Command Parameter(s) : OBSERVATION_STEP SP03N500  Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SET_OBS_STEP  SC003500  1 <hex>	TC	
	ET=+ UT=+00.00.01	SET_OBSID  Command Parameter(s) : OBSERVATION_ID SP00N500  Subsch. ID : 370 Det. descr. : SET OBSERVATION IDENTIFIER	SET_OBSID  SC000500  00000000 <hex>	TC	
		Verify Telemetry  OBSID SM10N500	= 00000000 <hex>	AND=ZAZ90999	



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	ET=+ UT=+00.00.00	SET_OBS_STEP  Command Parameter(s) : <b>OBSERVATION_STEP</b> <b>SP03N500</b>  Subsch. ID : 370 Det. descr. : SET OBSERVATION STEP	SET_OBS_STEP  SC003500  0 <hex>	TC	
	ET=+ UT=+00.00.01	SET_BBID  Command Parameter(s) : <b>BUILDING_BLOCK_ID</b> <b>SP01N500</b>  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SET_BBID  SC001500  80000000 <hex>	TC	
		Verify Telemetry  <b>BBFULLTYPE</b> <b>SM2LN500</b>	= Null	AND=ZAZ90999	
End of Sequence					
<b>End of Procedure</b>					