

SPIRE-CP-FUNC-SCAL2-PID (RED) Control Loop Tuning  
 File: H\_COP\_SPI\_SC2R.xls  
 Author: L.Lucas-hp



## Procedure Summary

### Objectives

The purpose of this procedure is to confirm the SCAL2 Red control loop PID parameters.  
 Based on procedure:  
 SPIRE\_CP\_SCAL2\_PID (4)  
 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**

HCSSC2R  
 HCSSC2RY

### Referenced Displays

<b>ANDs</b>	<b>GRDs</b>	<b>SLDs</b>
ZAZ90999		
SA_1_559		
SA_4_559		

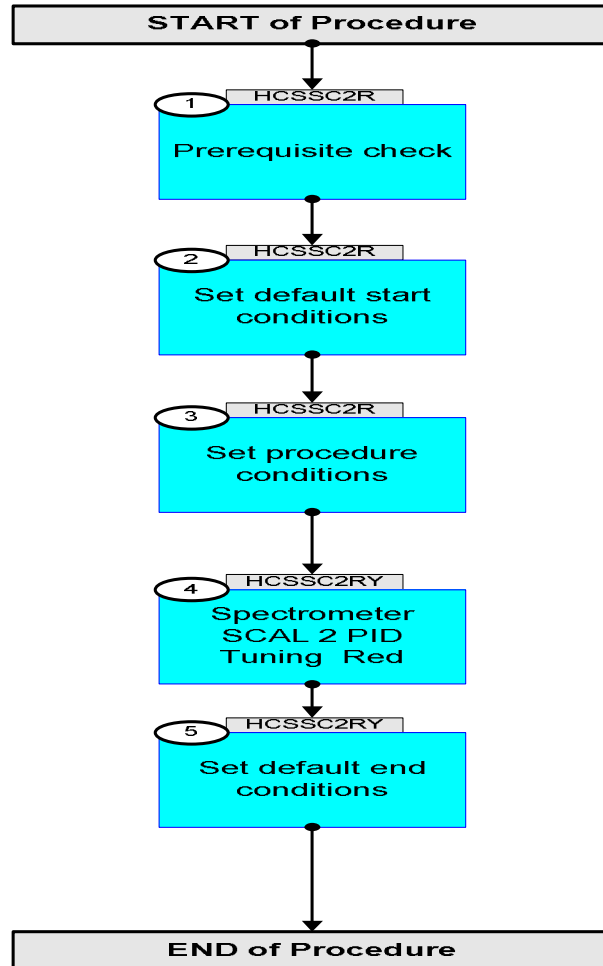
### Configuration Control Information

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 accept TPF values	L.Lucas-hp	
24/03/09	2.2	2.01	Validation : Title Updates	L.Lucas-hp	
07/04/09		3	Updated in line with updates received from SPIRE	L.Lucas-hp	
21/04/09		3.01	Validation : Text Update	L.Lucas-hp	
21/04/09	2.3	3.02	Validation : Text Update	L.Lucas-hp	
04/05/09		4	Remove ETs	L.Lucas-hp	
05/05/09	2.4	4.01	Validation : Text updates, 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 :HCSSC2R ( SCAL 2 PID Tune Red )  TimeTag Type: N 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> = 0xnnnn nnnn			
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 8A130001 <hex>	TC	
		Verify Telemetry hex value 8A13 BBFULLTYPE SM2LN500		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  8A130001 <hex>	TC	
		Verify Telemetry  BBFULLTYPE SM2LN500	35,347 (dec) 8A13 (hex)	AND=ZAZ90999	
End of Sequence					
	HCSSC2RY	TC Seq. Name :HCSSC2RY ( SCAL 2 PID TuneY )  TimeTag Type: Y Sub Schedule ID:  <input type="checkbox"/>			
4		Spectrometer SCAL 2 PID Tuning Red		Next Step: 5	
		<b>Only</b> 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.																																																												
		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																																																												
	ET=+ UT=+00.00.03	RUN_VM1 RUN_VM1 Command Parameter(s) : <table border="0" style="width: 100%;"> <tr><td style="padding-left: 40px;">TABLEID_RUNVM1</td><td style="padding-left: 40px;">SPV4N500</td><td style="padding-left: 40px;">50 &lt;hex&gt;</td></tr> <tr><td style="padding-left: 40px;">INDEX_RUNVM1</td><td style="padding-left: 40px;">SPV5N500</td><td style="padding-left: 40px;">0 &lt;hex&gt;</td></tr> <tr><td style="padding-left: 40px;">N_RUNVM1</td><td style="padding-left: 40px;">SPV6N500</td><td style="padding-left: 40px;">15 &lt;dec&gt;</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">1</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">2</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">3</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">4</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">5</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">6</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">7</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">8</td></tr> <tr><td colspan="3"> </td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">9</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">10</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">11</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">12</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">13</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">14</td></tr> <tr><td style="padding-left: 40px;">DATA_RUNVM1</td><td style="padding-left: 40px;">SPV7N500</td><td style="padding-left: 40px;">15</td></tr> </table> TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 370 Det. descr. : EXECUTE COMMAND LIST HELD IN A TABLE BY S/W DRIVEN VM1	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	SCV02500	TC	
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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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
	ET=+ UT=+00.00.01	SET_BBID  SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID SP01N500  TC Control Flags :  GBM IL DSE ----  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SC001500  80000000 <hex>	TC	
		Note: Now wait for the Instrument Team to monitor the progress of the SCAL2TEMP stabilisation.			
		Check with the Instrument Team before executing the next block of TCs.			
	ET=+ UT=+00.05.01	SET_BBID  SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID SP01N500  TC Control Flags :  GBM IL DSE --Y --  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SC001500  8A140001 <hex>	TC	
	ET=+ UT=+00.00.02	HALT_VM1  HALT_VM1  TC Control Flags :  GBM IL DSE ----  Subsch. ID : 370 Det. descr. : HALT VM1	SCV03500	TC	
	ET=+ UT=+00.00.04	SEND_DRCU_COMMAND  SEND_DRCU_COMMAND  Command Parameter(s) : DRCUCOMMAND SPD4N505 OVERRIDE SPD9N505  TC Control Flags :  GBM IL DSE ----  Subsch. ID : 370 Det. descr. : SEND A SINGLE COMMAND TO THE DRCU	SCD06505  a0ca0000 <hex> 0 <hex> (Def)	TC	
	ET=+ UT=+00.00.01	SET_BBID  SET_BBID  Command Parameter(s) : BUILDING_BLOCK_ID SP01N500  TC Control Flags :  GBM IL DSE ----  Subsch. ID : 370 Det. descr. : SET BUILDING BLOCK IDENTIFIER	SC001500  80000000 <hex>	TC	
		Check that SCAL2 has been switched OFF:			
		Verify Telemetry is +/- 0.1 mV SCAL2V SMS0V520	= 0.0 V	AND=SA_4_559	
		Verify Telemetry, +/- 0.01 mA SCAL2CURR SMS0A520	= 0.0 mA	AND=SA_4_559	
		Verify Telemetry VM1STAT SMV1N500	0xFFFF	AND=SA_1_559	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
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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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
	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	
End of Sequence					
<b>End of Procedure</b>					