

MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153
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Date: 05-Nov-2013
Page: 1 of 11

MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

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MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153

Date: 05-Nov-2013

Issue: 1.1

Page: 2 of 11

CHANGE RECORD

DATE	CHANGE DETAILS	ISSUE
14 October 2013	Document created	1.0
05 November 2013	RF Calibration included within scripts following GRM repair and testing	1.1

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MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153

Date: 05-Nov-2013

Issue: 1.1

Page: 3 of 11

TABLE OF CONTENTS

1.	Introduction	4
1.1	Applicable Documents	4
2.	WGA Scans test Module	5
2.1	Sequence outline.....	5
2.2	Resources.....	6
2.3	Ptolemy Models.....	7
2.3.1	Flight Model (FM).....	7
2.3.2	Qualification Model (QM).....	7
2.3.3	Chemistry Set Simulator (CSS).....	7
2.3.4	Ground Reference Model (GRM).....	7
3.	Operation of Module S – WGA Scans test.....	8
3.1	Load Ptolemy Memory	8
3.2	Execution of Module S – WGA Scans test.....	9
4.	Script Module S – WGA Scans test.....	11

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MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153

Date: 05-Nov-2013

Issue: 1.1

Page: 4 of 11

1. Introduction

This document describes the command sequence and operation of Ptolemy Module S – WGA Scans test. The module is designed as a standalone module to operate all of the mass spectrometer scan functions.

1.1 Applicable Documents

Ref	Title	Document Number	Issue	Date
AD1	Ptolemy Telecommand and Telemetry Definitions	RO-LPT-RAL-TN-3403	5.1	26 Feb 02
AD2	Ptolemy Operations plan	RO-LPT-OU-PL-3101	4.0	25 Nov 10
AD3	Ptolemy Flight Operations Plan for the First Science Sequence	RO-LPT-OU-PL-3147	1.1	20 Sep 13
AD4	Ptolemy Initialisation Description	RO-LPT-OU-PL-3112	1.0	13 Jul 04

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MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153

Date: 05-Nov-2013

Issue: 1.1

Page: 5 of 11

2. WGA Scans test Module

Module S operates the mass spectrometer, using all of the WGA scan functions that have been used during the Rosetta Cruise phase and those that will be used during the FSS. Module S is not in the current plan for use on the Ptolemy FM; it is being used to test the mass spectrometer sequences on the QM and for timing tests on the GRM.

2.1 Sequence outline

1. Monitor manifold pressure and voltage supply currents for 3 seconds.
2. Switch on the mass spectrometer. Perform an RF calibration
3. Operate each of the mass spectrometer scans with a 10 second gap between each scan. Collecting Aux data tIon defines the start of the MS acquire, tAD590 defines the end of the MS acquire. Mass spectra scans are in the following order: WGA2, WGA6, WGA7, WGA3 and WGA4.
4. Monitor currents on voltage supply rails.

The detailed Ptolemy sequence is listed in section 4.

MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153

Date: 05-Nov-2013

Issue: 1.1

Page: 6 of 11

2.2 Resources

Start State – All Ptolemy subsystems off

End State – All Ptolemy subsystems off

Subsystems operated:

Mass spec. RF calibration, WGA2, WGA3, WGA4, WGA6, WGA7

Data Volume:

Aux Science packets 3
Spectrum packets 380
Number of spectra 50

Resources:

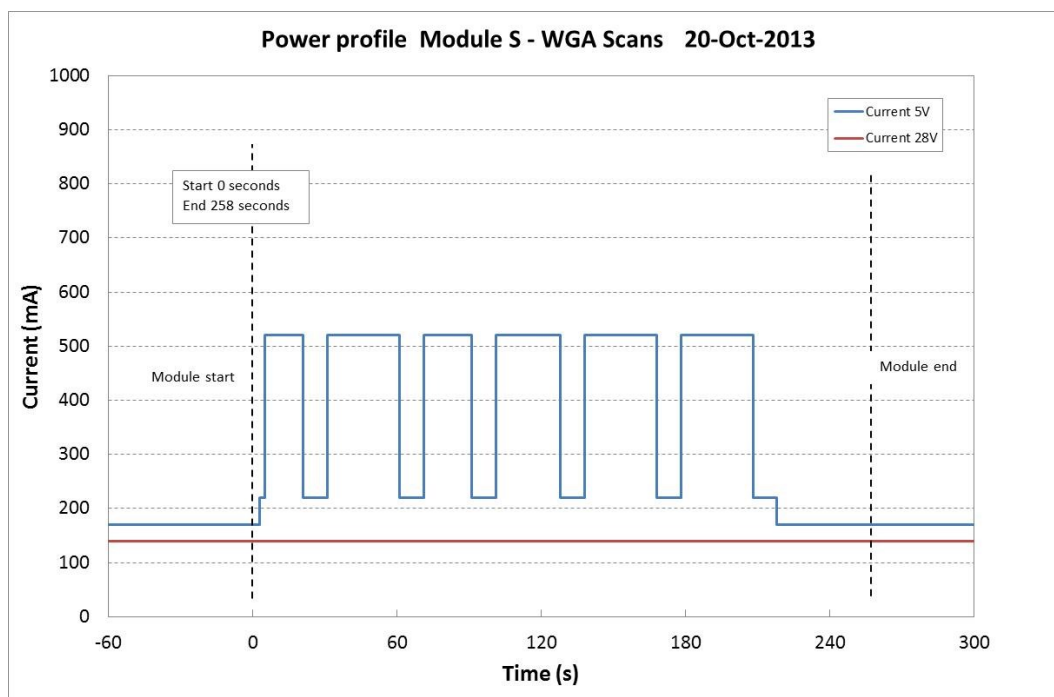
Helium used none
Hydrogen used none
Oxygen used none
Reference gas none
Nano-tip use 10 s (~200ms /spectrum)

Power profile	5.2V Supply Rail		28V supply rail	
	Current (mA)	Power (W)	Current (mA)	Power (W)
Nominal:				
Average	390	2.03	140	3.92
Maximum	520	1.81	140	3.92

Duration 258 s

Total energy 1534 J

Calculated power profile



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MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153

Date: 05-Nov-2013

Issue: 1.1

Page: 7 of 11

2.3 Ptolemy Models

A summary of the use of Module R- RF tune with the various Ptolemy models is given below.

Model	Use	Power Profile (c.f. FM)	Timing (c.f. FM)	Sensors
FM	Limited	-	-	-
QM	Vacuum	Same	Same	Same
CSS	Any time	Different	Same	Same
GRM	Any time	Different	Same	Same

2.3.1 Flight Model (FM)

Module S – WGA Scans test uses the mass spectrometer nano-tips and its use should be limited.

2.3.2 Qualification Model (QM)

Module S – WGA Scans use the mass spectrometer high voltage supplies. It should only be used when the QM is under vacuum.

2.3.3 Chemistry Set Simulator (CSS)

Module S – WGA Scans can be used at any time on the CSS.

2.3.4 Ground Reference Model (GRM)

Module S – WGA Scans can be used at any time on the GRM. There are no high voltage supplies on the GRM.

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MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153

Date: 05-Nov-2013

Issue: 1.1

Page: 8 of 11

3. Operation of Module S – WGA Scans test

3.1 Load Ptolemy Memory

In order to operate Module S – WGA Scans, the commands have to be loaded onto Ptolemy EEPROM using the Ptolemy Load Memory TC (AD1). The TCs to upload the module only need to be transmitted once for each Ptolemy instrument, unless a check memory TC indicates that the Ptolemy EEPROM has become corrupted.

Total number of Load memory TCs 4
Number of words 68
Sequence control CBD0 to CBD3
Memory address page 5 offset BD00 to BD84

Load memory Module S- WGA Scans test TC1 of 4

```
1F3C CBD0 0039 1006 0200 9701 0005 BD00
0016 28CE 28D4 28D6 3000 0128 CE28 D428
D630 0001 28CE 28D4 28D6 3000 0145 0330
0002 8230 000A 28C8 1202 0500 0A01 A09F
```

Load memory Module S- WGA Scans test TC2 of 4

```
1F3C CBD1 0039 1006 0200 9701 0005 BD2C
0016 28CE 3000 0A28 C812 0605 000A 0128
CE30 000A 28C8 1207 0500 0A01 28CE 3000
0A28 C812 0305 000A 0128 CE30 000A BF8B
```

Load memory Module S- WGA Scans test TC3 of 4

```
1F3C CBD2 0039 1006 0200 9701 0005 BD58
0016 28C8 1204 0500 0A01 28CE 3000 0A44
3000 0A28 CE28 D428 D630 000A 28CE 28D4
28D6 3000 0A28 CE28 D428 D630 000A 7DF9
```

Load memory Module S- WGA Scans test TC4 of 4

```
1F3C CBD3 000F 1006 0200 9701 0005 BD84
0001 FFFF B045
```


MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153
Issue: 1.1

Date: 05-Nov-2013
Page: 9 of 11

3.2 Execution of Module S – WGA Scans test

The sequence to execute Module S – WGA Scans test in a Standalone mode is as follows:

1. Start with Ptolemy switched on and having transmitted the Ptolemy Initialisation TCs.
2. Check Memory Module S
3. Transmit TC to set Ptolemy into Standby mode
4. Transmit TC to enable the relevant Ptolemy subsystems
5. Transmit TC to define module start address
6. Transmit TC to Module S – WGA Scans test
7. Once the WGA Scans test module has been completed then transmit TC to set Ptolemy into Safe mode

TC: Check Memory Module S

**1F3C F110 000D 1006 0900 9701 0005 BD00
0043 D349**

The results of the Memory check TC are returned as a Check memory report within a Housekeeping packet.

Memory Address		Number of Words	Expected Checksum
Page	Offset		
0005	BD00	0043	7B825

TC: Parameter update – define Module S start address

**1F3C F130 000D 10C3 0100 200E 0002 0005
BD00 E24E**

Updates parameter 0x200E with two words to define the start address as EEPROM page 5 0xBD00

TC: Start Module S – WGA Scans test

1F3C F150 0007 10C1 0C00 0002 014A

MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153

Date: 05-Nov-2013

Issue: 1.1

Page: 10 of 11

The TCs listed below were used to execute Module S on the CSS on 20-Oct-2013 having initialised Ptolemy with Initialisation(3).seq (AD4)

Check memory 1F3C F110 000D 1006 0900 9701 0005 BD00
 0043 D349

Start Standby 1F3C C000 000B 10C1 0000 0009 0000 0000
 CE64

Hazard enable 1F3C C000 000B 10C2 0100 FFFF FBFF 0070
 3239

Update parameter 1F3C F130 000D 10C3 0100 200E 0002 0005
 BD00 E24E

Start Module S 1F3C F150 0007 10C1 0C00 0002 014A

Select Safe mode 1F3C F004 0005 10C1 FF00 C48F

MODULUS – Ptolemy

Ptolemy Mode Description: Module S – WGA Scans test

Document no.: RO-LPT-OU-PL-3153
Issue: 1.1

Date: 05-Nov-2013
Page: 11 of 11

4. Script Module S – WGA Scans test

Script file name: FSS2 Module S – WGA Scans test (20-Oct-2013)

38 Commands

Time (s)	Command	Comments
3	Loop, , Begin, 3, , Aux Data, AD590, , , , Aux Data, i5V, , , , Aux Data, i28V, , , , Time Delay, , , , 1, Loop, , End, , ,	Monitor manifold pressure and voltage supply currents for 3 seconds
31	Set MS, IT 3, On, , , Time Delay, , , , 2, Calibrations, RF Cal., , , , Time Delay, , , , 10,	Switch on the mass spectrometer
218	Aux Data, tION, , , , MS Acquire, IT 5, , 2, 10, 1 Aux Data, AD590, , , , Time Delay, , , , 10, Aux Data, tION, , , , MS Acquire, IT 5, , 6, 10, 1 Aux Data, AD590, , , , Time Delay, , , , 10, Aux Data, tION, , , , MS Acquire, IT 5, , 7, 10, 1 Aux Data, AD590, , , , Time Delay, , , , 10, Aux Data, tION, , , , MS Acquire, IT 5, , 3, 10, 1 Aux Data, AD590, , , , Time Delay, , , , 10, Aux Data, tION, , , , MS Acquire, IT 5, , 4, 10, 1 Aux Data, AD590, , , , Time Delay, , , , 10, Set MS, , Off, , ,	Operate each of the mass spectrometer scans with a 10 second gap between each scan. Collecting Aux data tIon defines the start of the MS acquire, tAD590 defines the end of the MS acquire. Mass spectra scans are in the following order: WGA2, WGA6, WGA7, WGA3 and WGA4.
231	Time Delay, , , , 10, Loop, , Begin, 3, , Aux Data, AD590, , , , Aux Data, i5V, , , , Aux Data, i28V, , , , Time Delay, , , , 10, Loop, , End, , ,	Monitor currents on voltage supply rails

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