

MODULUS – Ptolemy

Ptolemy Mode Description: Module U – WGA and CDMS timing test

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Date: 6-Nov-2013

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1. Introduction

This document describes the command sequence and operation of Ptolemy Module U – WGA and CDMS timing test. The module is designed as a standalone module to acquire 150 mass spectra of WGA6 and 150 spectra of WGA7.

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	1.2	06 Nov 13
AD4	Ptolemy Initialisation Description	RO-LPT-OU-PL-3112	1.0	13 Jul 04

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2. WGA and CDMS timing test Module

Module U operates the mass spectrometer to acquire 150 mass spectra of WGA6 ($m/z = 35$ to 50) and 150 mass spectra of WGA7 ($m/z = 20$ to 150). The RF is not tuned; tuning will be achieved by either executing a Module R, the Cruise Phase mode or by CDMS writing the RF word to the Ptolemy backup RAM. Module U 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. Measure temperature of AD590, and the currents and voltages on the 5V and 28V rails
2. Switch on the mass spectrometer and perform an RF calibration.
3. Acquire 150 mass spectra of WGA 6, followed by 150 mass spectra of WGA 7. Switch off the mass spectrometer.
4. Measure temperature of AD590, and the currents and voltages on the 5V and 28V rails.

The detailed Ptolemy sequence is listed in section 4.

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2.2 Resources

Start State – All Ptolemy subsystems off
End State – All Ptolemy subsystems off

Subsystems operated:

Mass spec. WGA6, WGA7

Data Volume:

Aux Science packets 1
Spectrum packets 1200
Number of spectra 300

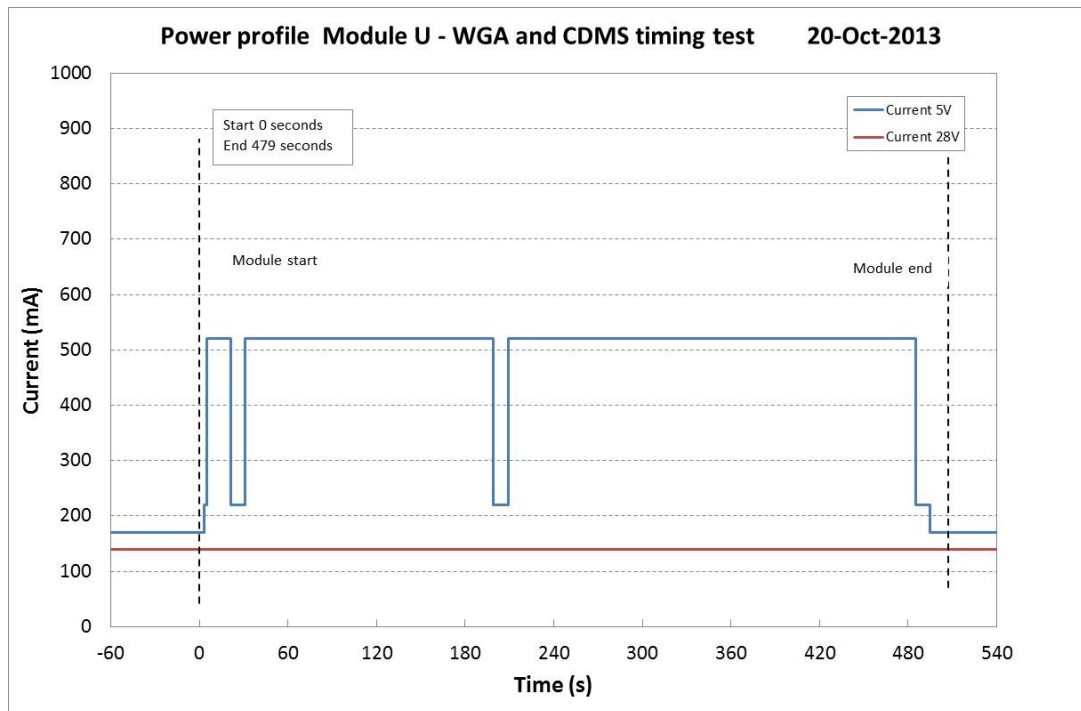
Resources:

Helium used none
Hydrogen used none
Oxygen used none
Reference gas none
Nano-tip use none

Power profile	5.2V Supply Rail		28V supply rail	
	Current (mA)	Power (W)	Current (mA)	Power (W)
Nominal:				
Average	490	2.55	140	3.92
Maximum	520	1.81	140	3.92

Duration 508 s
Total energy 3286 J

Calculated power profile



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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	Any time	-	-	-
QM	Vacuum	Same	Same	Same
CSS	Any time	Different	Same	Same
GRM	Any time	Different	Same	Same

2.3.1 Flight Model (FM)

ModuleU uses the mass spectrometer, but does not use the nano-tips. It can be used at any time on the FM, subject to power limitations.

2.3.2 Qualification Model (QM)

Module U uses 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 U Scans can be used at any time on the CSS.

2.3.4 Ground Reference Model (GRM)

Module U can be used at any time on the GRM. There are no high voltage supplies on the GRM.

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3. Operation of Module U – WGA and CDMS timing test

3.1 Load Ptolemy Memory

In order to operate Module U – WGA and CDMS timing test, 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 3
Number of words 47
Sequence control CBE0 to CBE2
Memory address page 5 offset BE00 to BE5C

Load memory Module U – WGA and CDMS timing test TC1 of 3

1F3C CBE0 0039 1006 0200 9701 0005 BE00
0016 28CE 28D4 28D6 3000 0128 CE28 D428
D630 0001 28CE 28D4 28D6 3000 0145 0330
0002 8230 000A 28C8 1206 0500 9601 56C2

Load memory Module U – WGA and CDMS timing test TC1 of 3

1F3C CBE1 0039 1006 0200 9701 0005 BE2C
0016 28CE 3000 0A28 C812 0705 0096 0128
CE30 000A 4430 000A 28CE 28D4 28D6 3000
0128 CE28 D428 D630 0001 28CE 28D4 D08F

Load memory Module U – WGA and CDMS timing test TC1 of 3

1F3C CBE2 0013 1006 0200 9701 0005 BE58
0003 28D6 3000 01FF A3CC

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3.2 Execution of Module U – WGA and CDMS timing test

The sequence to execute Module U – WGA and CDMS timing 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 U
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 U – WGA and CDMS timing test
7. Once the WGA and CDMS timing test module has been completed then transmit TC to set Ptolemy into Safe mode

TC: Check Memory Module U

**1F3C F111 000D 1006 0900 9701 0005 BE00
002F 4B43**

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	BE00	002F	7E32

TC: Parameter update – define Module U start address

**1F3C F131 000D 10C3 0100 200E 0002 0005
BE00 19E1**

Updates parameter 0x200E with two words to define the start address as EEPROM page 5 0xBE00

TC: Start Module U – WGA and CDMS timing test

1F3C F151 0007 10C1 0C00 0002 EA69

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

Check memory	1F3C F111 000D 1006 0900 9701 0005 BE00 002F 4B43
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 F131 000D 10C3 0100 200E 0002 0005 BE00 19E1
Start Module U	1F3C F151 0007 10C1 0C00 0002 EA69
Select Safe mode	1F3C F004 0005 10C1 FF00 C48F

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4. Script Module U – WGA and CDMS timing test

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

26 Commands

Time (s)	Command	Comments
3	Loop, , Begin, 3, , Aux Data, AD590, , , , Aux Data, i5V, , , , Aux Data, i28V, , , , Time Delay, , , , 1, Loop, , End, , ,	Measure temperature of AD590, and the currents and voltages on the 5V and 28V rails.
31	Set MS, IT 3, On, , , Time Delay, , , , 2, Calibrations, RF Cal., , , , Time Delay, , , , 10,	Switch on the mass spectrometer and perform an RF calibration.
495	Aux Data, tION, , , , MS Acquire, IT 5, , 6, 150, 1 Aux Data, AD590, , , , Time Delay, , , , 10, Aux Data, tION, , , , MS Acquire, IT 5, , 7, 150, 1 Aux Data, AD590, , , , Time Delay, , , , 10, Set MS, , Off, , ,	Acquire 150 mass spectra of WGA 6, followed by 150 mass spectra of WGA 7. Switch off the mass spectrometer.
508	Time Delay, , , , 10, Loop, , Begin, 3, , Aux Data, AD590, , , , Aux Data, i5V, , , , Aux Data, i28V, , , , Time Delay, , , , 1, Loop, , End, , ,	Measure temperature of AD590, and the currents and voltages on the 5V and 28V rails.

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