

MODULUS – Ptolemy

Ptolemy Mode Description: Module R – RF tune

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Issue: 1.1

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1. Introduction

This document describes the command sequence and operation of Ptolemy Module R – RF tune. The module is designed as a standalone module to tune the mass spectrometer RF electronics.

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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2. RF tune Module

Module R determines the frequency of the RF electronics. Once completed, the RF is set to the tuned frequency and the value is written to the Ptolemy area of the CDMS backup RAM. Ptolemy reads the tuned value from CDMS backup RAM when transitioning from Safe to Standby mode.

2.1 Sequence outline

1. Measure the temperature of the ion trap and AD590. Measure the currents of the 5V and 28V voltage rails.
2. Operate the tapping station to undock Switch on the mass spectrometer. Perform an RF calibration. Wait 10 seconds then switch off the mass spectrometer
3. Measure the temperature of the ion trap and AD590. Measure the currents of the 5V and 28V voltage 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

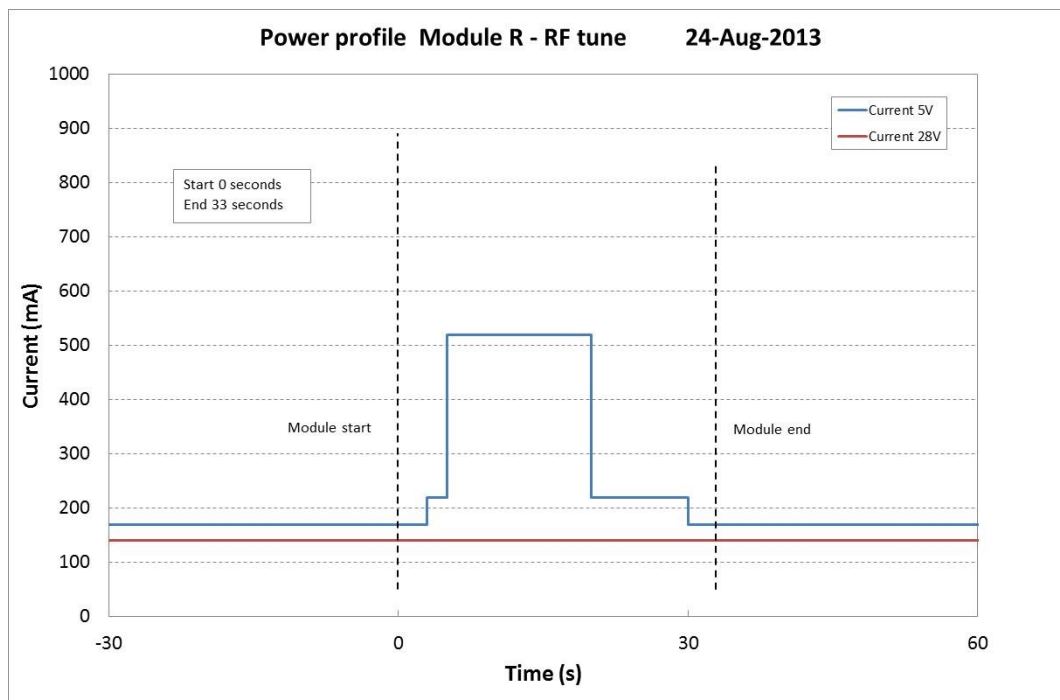
Subsystems operated:
Mass spec. RF calibration

Data Volume:	Resources:
Aux Science packets 1	Helium used none
Spectrum packets 0	Hydrogen used none
Number of spectra 0	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	140	1.81	140	3.92
Maximum	520	1.81	140	3.92

Duration 33 s
Total energy 189 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	Any time	Same	Same	Same
CSS	Any time	Different	Same	Same
GRM	Any time	Different	Same	Same

2.3.1 Flight Model (FM)

Module R- RF tune can be used at any time on the FM (subject to time and power limitations).

2.3.2 Qualification Model (QM)

Module R- RF tune can be used at any time on the QM, both in air and in vacuum.

2.3.3 Chemistry Set Simulator (CSS)

Module R- RF tune can be used at any time on the CSS.

2.3.4 Ground Reference Model (GRM)

Module R- RF tune can be used at any time on the GRM.

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3. Operation of Module R- RF tune

3.1 Load Ptolemy Memory

In order to operate Module R- RF tune, 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 2

Number of words 39

Sequence control CB00 to CB01

Memory address page 5 offset B000 to B04C

Load memory Module R- RF tune TC1 of 2

```
1F3C CB00 0039 1006 0200 9701 0005 B000
0016 28C8 28CE 28D4 28D6 3000 0128 C828
CE28 D428 D630 0001 28C8 28CE 28D4 28D6
3000 0145 0330 0002 8230 000A 4428 9825
```

Load memory Module R- RF tune TC2 of 2

```
1F3C CB01 002F 1006 0200 9701 0005 B02C
0011 C828 CE28 D428 D630 0001 28C8 28CE
28D4 28D6 3000 0128 C828 CE28 D428 D630
0001 FFFF AACC
```

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3.2 Execution of Module R – RF tune

The sequence to execute Module R – RF tune in a Standalone mode is as follows:

1. Start with Ptolemy switched on and having transmitted the Ptolemy Initialisation TCs.
2. Check Memory Module R
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 Begin Module R – RF tune
7. Once the RF tune module has been completed then transmit TC to set Ptolemy into Safe mode

TC: Check Memory Module R

**1F3C F10F 000D 1006 0900 9701 0005 B000
0027 D7B5**

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	B000	0027	0F87

TC: Parameter update – define Module R start address

**1F3C F12F 000D 10C3 0100 200E 0002 0005
B000 854A**

Updates parameter 0x200E with two words to define the start address as EEPROM page 5 0xB000

TC: Start Module R – RF tune

1F3C F14F 0007 10C1 0C00 0002 CAE0

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The TCs listed below were used to execute Module R on the CSS on 30-Aug-2013 having initialised Ptolemy with Initialisation(3).seq (AD4)

Check memory	1F3C F10F 000D 1006 0900 9701 0005 B000 0027 D7B5
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 F12F 000D 10C3 0100 200E 0002 0005 B000 854A
Start Module R	1F3C F14F 0007 10C1 0C00 0002 CAE0
Select Safe mode	1F3C F004 0005 10C1 FF00 C48F

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4. Script Module R – RF tune

Script file name: FSS2 Module R - tune RF (24-Aug-2013)

19 Commands

Time (s)	Command	Comments
3	Loop, , Begin, 3, , Aux Data, tION, , , , Aux Data, AD590, , , , Aux Data, i5V, , , , Aux Data, i28V, , , , Time Delay, , , , 1, Loop, , End, , ,	Measure the temperature of the ion trap and AD590. Measure the currents of the 5V and 28V voltage rails.
30	Set MS, IT 3, On, , , Time Delay, , , , 2, Calibrations, RF Cal., , , , Time Delay, , , , 10, Set MS, , Off, , ,	Switch on the mass spectrometer. Perform an RF calibration. Wait 10 seconds then switch off the mass spectrometer.
3	Loop, , Begin, 3, , Aux Data, tION, , , , Aux Data, AD590, , , , Aux Data, i5V, , , , Aux Data, i28V, , , , Time Delay, , , , 1, Loop, , End, , ,	Measure the temperature of the ion trap and AD590. Measure the currents of the 5V and 28V voltage rails.

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