

## TEGA High-Temp Soil (TA7\_plugged)

Reconciled with block: tega\_sporty\_ht\_ramp\_ta7

### Objectives:

Power on and perform a full high-temperature ramp on the sample in TA7, which has been previously heated via a mid-temperature ramp. This sample had a plugged frit during the low and mid-T runs, and is assumed to be plugged here. The purpose of this run is to look for the enthalpy associated with decomposition of altered minerals and to measure the gases given off by the decompositions.

### Configuration:

Mid-temperature ramp has been completed previously. The carrier valve is closed and the TA manifold has full tank pressure (about 6500 dN). The carrier valve will not be operated due to its erratic behavior.

Software updates were made post Sol 113 to the 386SW and the mode table was changed to V125

Deleted: Changed the EGA Current Limit to 5000dn to accommodate the crosstalk from the short in TA7.¶

### Inputs:

Multiplier Voltage: \_\_3300

Calibration Set: 3

Ch 4 Calibration Voltage: 2800

Pump Nudge needed: Yes

Venting Oven #: Will not vent - (none)

Pre-heat duration: 30 secs

Calibrate Channels: 1,4

Oven Close Time: NA

Select TA #: 7

TA# for Check: N/A

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Emission: Low

Cal Tank Temperature: -99C

### Constraints:

**Gas(es) used:** Mars ATM will be collected through the TA Sample valve.

**Filaments used:** 1

**SW Version (386):** V515

**SW Version (EGA):** V321

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Sweep and hop mode version(s): MODE TABLE V125.

Supermodes and Sweep modes used: Supermodes 1, 2, 3, 4, 6, and 7; Sweeps 37, and 38.

Supermodes used in Ramp: 4, 6, & 7 (and 29, which is a dummy call to not change the supermode)

Note: TEGA is checked to see if TEGA is safed. If so, abort self to end activity

1. Turn ON TEGA – Call TEGA\_power\_on – This is controlled by the interop science master

- 1.1.1. TEGA\_MAIN1\_PWR "ON"
- 1.1.2. TEGA\_MAIN2\_PWR "ON"
- 1.1.3. TEGA\_MAIN3\_PWR "ON"
- 1.1.4. Start the TEGA 386 FSW

2. Pause 3 Minutes (collect engineering data at a high rate before turning down)

3. Call Sequence 30A

4. Pre-heat delay 30 secs

5. Turn on EGA

- 5.1.1. TEGA/FSW:EGA:Change EGA State
- 5.1.2. Restore the modes from EEPROM 0
- 5.1.3. EGA Commands:Restore Mode

6. OPEN GEC Vent Valve

7. Activate Sequence 24 A (Turns up readings for regulating temps)

8. Set Manifold Heater to -30C (execute Sequence 3b)

9. Set Emission on delay to 5 sec (allows best chance for emission start if large Ion pump current)

10. Warm up EGA: CALL tega\_ega\_emission\_warmup

10.1. (LOW), Calibration Set 3

10.2. Calls tega\_ega\_prep, filament-1

- 10.2.1.1. Sets Jplate 0 to -107V
- 10.2.1.2. Sets Jplate 1 to -92V
- 10.2.1.3. Pause 5 seconds
- 10.2.1.4. Set MV 3300 (input variable)
- 10.2.1.5. Ion Pump ON
- 10.2.1.6. Start SM 1, pause 1 sec
- 10.2.1.7. Emission ON

Deleted: (Increased time between ion pump on and check for pressure from 800ms to 5sec to ensure the emission would come on and not fault out due to high pressure in the EGA)¶

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## TEGA High-Temp Soil (TA7\_plugged)

- [10.2.1.8.](#) Pause 2 Minutes
- [10.2.1.9.](#) Stop SM 1
- [10.2.1.10.](#) Emission ON
- [10.2.1.11.](#) Pause 2 Minutes
- [10.2.1.12.](#) Stop SM 1

[10.3.](#) Pause 2 minutes (provides time for ion pump to stabilize)

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[10.4.](#) Change engineering transmit to 10 secs

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[10.4.1.](#) IF pass thru = 1, emission current will change to HIGH

[10.5.](#) Call tega\_ega\_calibration\_scans

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[10.5.1.](#) calibration\_set 3

[10.5.2.](#) hi\_emission LOW

[10.5.3.](#) cal\_channels 1.4

[10.5.4.](#) cal\_voltage 3300V

[10.5.5.](#) cal\_4\_voltage 2800V

[10.5.6.](#) exit\_voltage 3300V

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[10.6.](#) Wait 1 second

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[10.7.](#) Start SM 3

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[10.8.](#) Pause 20 minutes

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[10.9.](#) Stop SM 3

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[10.10.](#) Pause 1 minute

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[10.11.](#) Calls tega\_ega\_gain

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[10.11.1.1.1.](#) Start SM 2

[10.11.1.1.2.](#) Pause 1 minute

[10.11.1.1.3.](#) Set MV 2600 – 3400V (1 minute per voltage)

[10.11.1.1.4.](#) Exit at 3300\_V (input variable)

[10.11.1.1.5.](#) Stop SM 2

[10.11.1.1.6.](#) Run Sweep 38

## EGA is warmed up and ready to go (54 mins)

### 11. Reinforce Emission on

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(IF pump nudge is YES Steps [12](#) to [14](#) are followed, if NO skip to [15](#).)

[12.](#) Change to HIGH Emission

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[13.](#) Pause 5 minutes

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[14.](#) Change to LOW Emission

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[15.](#) Calibrate EGA: CALL tega\_ega\_calibration\_scans

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## TEGA High-Temp Soil (TA7\_plugged)

15.1.1. calibration\_set \_\_\_\_\_ 3 \_\_\_\_\_  
15.1.2. hi\_emission \_\_\_\_\_ LOW \_\_\_\_\_  
15.1.3. cal\_channels \_\_\_\_\_ 1,4 \_\_\_\_\_  
15.1.4. cal\_voltage \_\_\_\_\_ 3300V \_\_\_\_\_  
15.1.5. cal\_4\_voltage \_\_\_\_\_ 2800V \_\_\_\_\_  
15.1.6. exit\_voltage \_\_\_\_\_ 3300V \_\_\_\_\_

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16. Set EGA manifold heater to +35 C

17. Set TA manifold heater to +65 C

18. Set following readings to be taken every 1 second.

18.1. Manifold Pressure

18.2. Outlet Pressure

18.3. Bus A Current

18.4. Bus B Current

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19. Start Supermode 7: Soil volatiles

20. Select Oven TA\_7\_\_ (TWEAKABLE)

21. Set Ramp so it has no control over any of the valves(6 total)

**Remember to turn on current monitoring to shut down manifold heater  
(Do not turn manifold heat back on after turning it off in the ramp.)**

22. Start Ramp (TWEAKABLE)

22.1. Ramp Segments File:

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Deleted: <#>Pause for Delay\_1 (0 sec; ) - TWEAKABLE¶

23. Run Heater Init (tega\_init\_heater\_control)

Execute Sequence 24 B to increase readings on temperature regulation.

23.1.1. TA Manifold +65C

23.1.2. Plumbing 1 +65C

23.1.3. Plumbing 2 +35C

23.1.4. Transfer Tube +75C

23.1.5. EGA Plumbing +45C

23.1.6. EGA manifold to +35 C

23.1.7. Wedge Heater @ 10% duty cycle

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24. Pause for Delay\_2 (467 sec;) – TWEAKABLE

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### Measure Atmosphere

25. Open TA Sample valve to measure atmosphere.

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26. Pause for Delay\_3 (879 sec;) – TWEAKABLE TA Manifold = 4000 dN = 66 mbar

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**Flush atmosphere from oven and plumbing (assumes oven is not plugged at low T)**

27. Open oven inlet valve

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28. Pause 2 minutes (to measure leak rate of oven) TA Manifold = 18 mbar

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29. Open oven outlet valve (to flush oven)

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30. Pause 10 seconds (to get an idea on flow rate)

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31. Open bypass valve (to flush atmosphere out of EGA manifold)

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32. Pause 2 seconds

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33. Close bypass valve

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34. Close outlet valve (inlet remains open so TA manifold can record any pressure rise)

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35. Pause for Delay\_4 (2031 sec for 650 deg C ) - TWEAKABLE

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**Take gas sample at 650 C temperature.**

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36. Open oven outlet valve (to flush oven)

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37. Pause 10 seconds (to give gas a chance to escape in case it is not plugged)

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38. Open bypass valve (to let evolved gases get to EGA outlet manifold)

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39. Pause 2 seconds

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40. Close bypass valve

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41. Close outlet valve

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42. Pause 2 minutes (for concentration wave to reach EGA inlet)

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43. Close TA Sample valve (to capture gas for analysis)

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44. Pause 1 min (to measure transition with high time resolution SM 6)

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45. Stop SM

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46. Start SM 7

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## TEGA High-Temp Soil (TA7\_plugged)

47. Pause for Delay\_5 (774 sec) - TWEAKABLE

**Take gas sample at end of 5-min hold at 1000 deg C.**

48. Stop SM

49. Start SM 6 (for high time resolution data)

50. Pause 1 min

51. Open TA Sample valve (to empty out old gas)

52. Pause 1 min (to watch gas drain out of CML)

53. Open oven outlet valve (to flush oven)

54. Pause 10 seconds (to give gas a chance to escape in case it is not plugged)

55. Open bypass valve (to let evolved gases get to EGA outlet manifold)

56. Pause 2 minutes (for concentration wave to reach EGA inlet)

57. Close TA Sample valve (to capture gas for analysis)

58. Pause 1 minute (to monitor change in gas at high resolution)

59. Stop SM

60. Start SM 7

61. Wait for ramp to complete (timeout = 3370.9 sec) - TWEAKABLE

61.1. Ramp Ends as Follows:

61.1.1. SM 7 running

61.1.2. Carrier and Calibration Closed

61.1.3. Inlet & Outlet Open

61.1.4. TA Sample Closed

61.1.5. Bypass Open

62. Close outlet valve

63. Close inlet valve

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Deleted: <#>Pause

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## Shut down

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64. Open TA sample valve (to reduce pressure to ambient in CML volume)

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65. Close TA sample valve

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66. Run tega\_disable\_heater\_control (Turn all remaining heaters off)

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67. Close bypass valve

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68. CLOSE GEC Vent Valve

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69. Turn off EGA: CALL tega\_ega\_off

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69.1. EGA Shutdown:

69.1.1. Multiplier Voltage OFF

69.1.2. Wait 5 secs

69.1.3. Emission Off

69.1.4. Wait 5 secs

69.1.5. Ion Pump Control OFF

69.1.6. Activate Sequence 7A to turn the EGA OFF

70. Turn off TEGA: CALL tega\_power\_off

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70.1. Turn off the third TEGA switch

70.2. Turn off the second TEGA switch

70.3. Turn off the first TEGA switch

70.4. FPGA Dump – Aker Valve state