TEGA Low-Emission Atmosphere Run

Reconciled with block: tega_atmos_r33_s104

Objectives: The purpose of this block is to drain the high pressure cal gas out of the manifold. We will also be able to calculate the leak rate of the carrier valve and obtain residual measurements from the EGA.

Configuration: Instrument is in its normal configuration.

Constraints: Mode table V123 must have been successfully loaded

Gas(es) used: (none intentionally?)

Filaments used: 1, Low Emission

SW Version (386): V513 **SW Version (EGA):** V321

Sweep and hop mode version(s): MODE TABLE V123.

Super modes and Sweep modes used: Supermodes 1, 2, 3, 6; sweeps 37, 38

Inputs:

Filament: 1

Heat dur: 0

High_current: 0

Calibration_set: 3

Channels: 0xD

Mult_volt: 3300

Four_volt: 2800

Pump_nudge: 0

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
   - 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 FS

Deleted: rpose of this block is to analyze Mars atmosphere at low emission. It will use Cal Gas and Carrier Gas. The run will emphasize getting data on CO_2 isotopes, but it will also look for H_2O in the cal gas with the tank set at O C and the manifold and all plumbing set at TA-sample-run temperatures.

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Pause 3 Minutes (collect engineering data at a high rate before turning down)¶
Call Sequence 30A

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2. Turn on EGA
   - 2.1.1. TEGA/FSW:EGA:Change EGA State
   - 2.1.2. Restore the modes from EEPROM 0
   - 2.1.3. EGA Commands:Restore Mode
   - 2.1.4. Run mode 37

3. OPEN GEC Vent Valve

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6.5 Add Definition for SuperMode 30 (Hop Mode 6)

4. Warm up EGA: CALL tega_ega_emission_warmup (filament 1, calibration_set, high_current, mult_volt, four_volt, channels) 6 inputs

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   - 4.1.1. Note: IF pass through was selected as HIGH, calibration set cannot equal 3

   4.2. Calls **tega_ega_prep, filament-1**

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      - 4.2.1.1. Sets JPlate 0 to -107V
      - 4.2.1.2. Sets Jplate 1 to -92V
      - 4.2.1.3. Start SM 1 pause 1 sec
      - 4.2.1.4. Set MV 3300V Pause 1 sec
      - 4.2.1.5. Ion Pump ON
      - 4.2.1.6. Pause 1 second
      - 4.2.1.7. Emission ON
      - 4.2.1.8. Pause 2 Minutes
      - 4.2.1.9. Stop SM 1

   4.3. If pass thru = 1, emission current will change to HIGH

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   4.4. Change engineering transmit time to 10 seconds

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   4.5. Call ega_calibration_scans (Set =3, exit = 3300V) inputs calibration_set, high_emission, channels, scan_voltage, chan_four_voltage, exit_voltage

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   4.6. Start SM 3

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   4.7. Pause 20 minutes

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   4.8. Stop SM 3

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   4.9. Pause 1 minute

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   4.10. Calls **tega_ega_gain**

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      - 4.10.1.1.1. Start SM 2
      - 4.10.1.1.2. Pause 1 minute
      - 4.10.1.1.3. Set MV 2600 – 3400V (1 minute per voltage)
      - 4.10.1.1.4. Remain at 3300V
      - 4.10.1.1.5. Stop SM 2

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4.10.1.1.6. Run Sweep 38

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

(no pump nudge)

Measure residuals and get set up

5. Calibrate EGA: CALL tega_ega_calibration_scans (set = 3, exit=3300 V)) inputs calibration_set, high_emission, channels, scan_voltage, chan_four_voltage, exit_voltage

6. Start Supermode 6

7. Execute Sequence 24 B to increase readings on temperature regulation.

8. TA Manifold +65C

9. EGA manifold to +35 C

10. Pause 15 minutes for manifolds to come to temperature

11. Change TA manifold and Outlet Pressure to timer1

12. Open bypass valve

13. Pause 5 mins to vent manifold

14. Close bypass valve

15. Pause ten minutes for leak rate calculation

16. Stop SM6

17. Disable Heaters

18. CLOSE GEC Vent Valve

19. Turn off EGA: CALL tega_ega_off
    - 19.1.1. EGA Shutdown:
    - 19.1.2. Multiplier Voltage OFF
    - 19.1.3. Wait 5 secs
    - 19.1.4. Emission Off
    - 19.1.5. Wait 5 secs
    - 19.1.6. Ion Pump Control OFF
    - 19.1.7. Activate Sequence 7A to turn the EGA OFF

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Go to high emission to help fire ion pump

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Change Emission to high¶
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Pause 5 minutes

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Change Emission to low

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Select tega_select_oven venting_oven Oven 3 (or any other oven that is not yet clo**sed)**¶
Open oven inlet valve (to vent manifold)¶
Set Cal Tank heater to + 0 C.¶
Run Heater Init (tega_init_heater_control)¶
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20. Turn off TEGA: CALL tega_power_off
    - 20.1.1. Turn off the third TEGA switch
    - 20.1.2. Turn off the second TEGA switch
    - 20.1.3. Turn off the first TEGA switch
    - 20.1.4. FPGA Dump – Aker Valve state

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TA Manifold +65C
Plumbing 1 +65C
Plumbing 2 +35C
Transfer Tube +75C
EGA Plumbing +45C
EGA manifold to +35 C
Wedge Heater @ 10% duty cycle

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0 minutes for residuals for isotopes

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Stop SM 9

Run 100 iterations of hop mode 6 (Deuterium) (takes 264 seconds)

Stop hop mode 6

Start Supermode 6 (Soil: Low Emission Quick) (This mode does the same as SM 4, but adds organics, S, and CO)

Pause 5 minutes

Stop SM 6

Briefly measure atmosphere on TA inlet

Start SM 4 (Atmosphere: Low Emission Quick)

Pause 60 sec

Open TA Sample valve (to measure atmosphere)

Pause 120 sec

Stop SM 4 (done by cal scans block at step 29)

Run cal scans with set 3, exit 3300) inputs calibration_set, high_emission, channels, scan_voltage, chan_four_voltage, exit_voltage

Start SM 9 (Atmosphere: Low Emission)

Pause 15 minutes for atmosphere analysis

Stop SM 9

Start SM 4 (Atmosphere: Low Emission Quick)

Close oven inlet valve (to terminate venting of manifold)

Pause 30 seconds to get pre-Cal-Gas data on SM 4

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Measure Cal Gas

Start regulating Cal Gas at 210 mbar

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Close TA Sample Valve

Stop regulating Cal Gas

Turn OFF Cal Tank Heater

Pause 60 seconds

Open oven outlet valve to empty TA manifold

Stop SM 4

Start SM 6 (Soil: Low Emission Quick)

Pause 5 minutes

Close oven outlet valve.

Start SM 9 (Atmosphere: Low Emission)

Pause 20 min (to get precision sufficient to meet requirements on CO_2)

Stop SM 9

Run 100 iterations of hop mode 6 (Deuterium) (takes 264 seconds)

Stop hop mode 6

Start Supermode 4 (Atmosphere: Low Emission Quick)

Pause 1 minute

Open TA sample valve (This should be nearly all atmosphere now in the EGA manifold since we have not been flowing cal gas for

32 minutes)

Pause 5 min (to see if atmosphere is still diffusing in)

Close TA Sample valve

Measure background, which consists of atmosphere in the TA sample valve

Pause 1 min

Stop SM 4

Start SM 9

Pause 20 minutes

Stop SM 9

Run 100 iterations of hop mode 6 (Deuterium) (takes 264 seconds)

Stop hop mode 6

Run sweep 38

Run Supermode 4

Pause 1 minute

Measure atmosphere via Atmosphere inlet

Open Atmosphere valve

Pause 2 minutes

Stop SM 4

Start SM 9 (Atmosphere: Low Emission)

Pause 10 minutes

Run sweep

38

Run 100 iterations of hop mode 6 (Deuterium) (takes 264 seconds)

Stop hop mode 6

Start Supermode 9

Pause 20 minutes

Run Supermode 6

Pause 4 minutes

Watch for change in isotope ratios as count rate drops

Close Atmosphere valve

Pause 1 minute

Stop SM 6

Start Supermode 9

Pause 30 minutes

Begin regulation of carrier gas at 35 mbar (to flush atmosphere out of EGA manifold)

Stop SM 9

Start SM 6

Pause 4 minutes

Stop SM 6

Run 100 iterations of hop mode 6 (Deuterium) (takes 264 seconds)

Stop hop mode 6

Start SM 9

Pause 30 minutes

Stop SM 9

Start SM 4 (Atmosphere: Low Emission Quick)

Pause 2 minutes

Open TA sample valve to flush atmosphere out of CML volume

Open TA Sample valve

Stop Carrier from regulation

Pause 5 minutes for pressure to decay.

Close TA Sample Valve

Stop SM 4

Shut down

Run tega_disable_heater_control (Turn all remaining heaters off)