

TEGA Cal-Gas Run

Reconciled with block:

Objectives: The purpose of this block is to run Cal Gas and Carrier Gas. The Cal Gas will be run at both high and low emission to calibrate past (and future) TEGA runs. The run will emphasize getting data on CO₂ isotopes and D/H ratio. We will also spend a few minutes collecting some data to help understand some peculiar things noticed in hops not being reproducible and we will spend some time conditioning channel 2 with O⁺ ions.

Configuration: Instrument is in its normal configuration.

Constraints:

Gas(es) used: Carrier and Calibration.

Filaments used: 1, High and Low Emission

SW Version (386): V513

SW Version (EGA): V321

Sweep and hop mode version(s): MODE TABLE V122.

Super modes and Sweep modes used: Supermodes 1, 2, 3, 4, 5, 11, 12, 13, & 15; sweeps 37, 38.

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 FSW
2. Pause 3 Minutes (collect engineering data at a high rate before turning down)
3. Call Sequence 30A
4. Turn on EGA
 - 4.1.1. TEGA/FSW:EGA:Change EGA State
 - 4.1.2. Restore the modes from EEPROM 0
 - 4.1.3. EGA Commands:Restore Mode
5. OPEN GEC Vent Valve

Where do we do mode 37 sweep?

6. Warm up EGA: CALL tega_ega_emission_warmup (filament 1, emission low, cal set 3)
 - 6.1.1. Note: IF pass through was selected as HIGH, calibration set cannot equal 3

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- 6.2. Calls **tega_ega_prep, filament-1**
 - 6.2.1.1. Sets JPlate 0 to -110V
 - 6.2.1.2. Sets Jplate 1 to -92V
 - 6.2.1.3. Start SM 1 pause 1 sec
 - 6.2.1.4. Set MV 2800V Pause 1 sec
 - 6.2.1.5. Ion Pump ON
 - 6.2.1.6. Pause 30 seconds
 - 6.2.1.7. Emission ON
 - 6.2.1.8. Pause 2 Minutes
 - 6.2.1.9. Stop SM 1
- 6.3. Change engineering transmit to 10 secs
 - 6.3.1. IF pass thru = 1, emission current will change to HIGH
- 6.4. Call ega_calibration_scans (Set =3, exit = 3200V)
- 6.5. Wait 2 Minutes
- 6.6. Start SM 3
- 6.7. Pause 20 minutes
- 6.8. Stop SM 3
- 6.9. Pause 1 minute
- 6.10. Calls **tega_ega_gain**
 - 6.10.1.1.1. Start SM 2
 - 6.10.1.1.2. Pause 1 minute
 - 6.10.1.1.3. Set MV 2600 – 3400V (1 minute per voltage)
 - 6.10.1.1.4. Remain at 3200V
 - 6.10.1.1.5. Stop SM 2
 - 6.10.1.1.6. Run Sweep 38

EGA is warmed up and ready to go (54 mins)**Measure residuals and get set up**

7. Start Supermode 4 (Atmosphere: Low Emission)
8. Select Oven 3 (or any other oven that is not yet closed) **Should be tweakable**
9. Open oven inlet valve (to vent manifold)
10. Set EGA manifold heater to -10 C

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11. Set Cal Tank heater to +20 C
12. Calibrate EGA: CALL tega_ega_calibration_scans (set = 3, exit=3200 V)
13. Set TA manifold heater to 0 C (This heater is turned on after venting the manifold so we get two points at the same ambient pressure and different temperatures)
14. Run Heater Init (tega_init_heater_control)

Note different temperatures below

Execute Sequence 24 B to increase readings on temperature regulation.

- 14.1.1. Plumbing 1 +35C
 - 14.1.2. Plumbing 2 +35C
 - 14.1.3. Transfer Tube +35C
 - 14.1.4. EGA Plumbing -10 C
 - 14.1.5. EGA manifold to -10 C
 - 14.1.6. Wedge Heater @ 10% duty cycle
15. Pause 5 minutes for residuals at low emission
 16. Switch to **high emission**
 17. Pause 5 minutes for residuals at high emission
 18. Open TA Sample valve (to watch onset of Cal Gas build up)
 19. Pause 1 minute
 20. Stop SM 4
 21. Start SM 1 (Quick Start)
 22. Pause 30 sec
 23. Close oven inlet valve
 24. Open bypass valve

Start flowing Cal Gas

25. Start regulating Cal Gas at 35 mbar
26. Pause 90 sec (Quick Start is used to get good data on rise time of gas to arrive)
27. Stop SM 1

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28. Start SM 13 (Cal Gas with conditioning)
29. Pause 30 min (this is twice as long as needed to get precision sufficient to meet requirements on CO₂)
30. Stop SM 13
31. Start SM 15 (Hop Test)
32. Pause 80 seconds
33. Stop SM 15
34. Start Supermode 4 (Atmosphere: Low Emission)
35. Pause 2 min

Change to low emission (to get a brief calibration at low emission)

36. Pause 10 minutes (good enough for CO₂ abundance, but not for isotopes; also watch for decay from high emission)
37. Set parameter so hop and sweep modes do not control ionization level
38. Pause 2 minutes
39. Stop SM 4
40. Run sweep mode 40 (Water Peaks)
41. Run sweep mode 41 (Ar Peak)
42. Start Supermode 4 (Atmosphere: Low Emission)
43. Pause 2 min

Change to Ionization Level 2 (to check on Ar⁺⁺ and H₃O⁺)

44. Change ionization energy to level 2
45. Pause 2 minutes
46. Stop SM 4
47. Run sweep mode 40 (Water Peaks)

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48. Run sweep mode 41 (Ar Peak)

Deleted: <#>Stop SM 4¶

Flow carrier gas to blow Cal Gas out of CML volume mainly to determine arrival time from manifold to EGA.

49. Start SM 1 (Quick Start)

50. Pause 30 sec

51. Turn OFF Cal Tank Heater

52. Stop regulating Cal Gas

53. Begin regulation Carrier Gas at 35 mbar

54. Pause 2 minutes

55. Stop SM 1

56. Start SM 4 (Atmosphere: Low Emission)

57. Pause 10 minutes (get calibration for N₂ and check residuals on CO₂)

58. Stop regulating Carrier Gas (to allow Carrier Gas to vent out of CML volume)

59. Pause 5 minutes

60. Stop SM 4

61. Close TA Sample Valve

Shut down

62. Run tega_disable_heater_control (Turn all remaining heaters off)

63. Close bypass valve

Deleted: <#>Stop SM 4¶

64. CLOSE GEC Vent Valve

65. Turn off EGA: CALL tega_ega_off

65.1.1. EGA Shutdown:

65.1.2. Multiplier Voltage OFF

65.1.3. Wait 5 secs

65.1.4. Emission Off

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65.1.5. Wait 5 secs

65.1.6. Ion Pump Control OFF

65.1.7. Activate Sequence 7A to turn the EGA OFF

66. Turn off TEGA: CALL tega_power_off

66.1.1. Turn off the third TEGA switch

66.1.2. Turn off the second TEGA switch

66.1.3. Turn off the first TEGA switch

66.1.4. FPGA Dump – Aker Valve state