

	LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY		E2100350 -v1-
	SPECIFICATION		Document No Rev.
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CIT Bake Lab Vacuum Oven Procedures			

AUTHOR(S)	DATE	Document Change Notice, Release or Approval
Jordan Vanosky		see LIGO DCC record Status

1 Scope

This document defines the steps for pumping down a vacuum oven, running the RGA scans, and venting the vacuum ovens

2 Terminology

ABO: Air Bake Oven

VBO: Vacuum Bake Oven

RGA: Residual Gas Analyzer

4 Additional Documents

<https://dcc.ligo.org/LIGO-E960022> - LIGO Clean and Bake Methods and Procedure

5 Pump Down of the vacuum oven

1. Once the front flange is installed and sealed, make sure all vent valves are closed.
2. Turn on the corresponding oven scroll pump, using the switches on the bottom right of control panels
3. Watch pressure gauge readout, and wait until the pressure falls below 1 torr. (~15 minutes for VBO C, ~30 minutes for VBO D, and ~ 1 hour for VBO F)

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4. Turn on the corresponding main turbopump using the controls on the TURBO computer, click the appropriate Turbopump from the list and then click, Start
 - a. Current Turbopump COM ports, as of August 3rd, 2021
 - i. COM 3 - VBO F RGA
 - ii. COM 4 - VBO D Main
 - iii. COM 5 - VBO F Main
 - iv. COM 6 - VBO C RGA
 - v. COM 7 - VBO C Main

5. Watch and verify the pressure falls as the turbo spins up. The pump should ramp up the speed for ~2 minutes and then read "Normal Operation"

6 Temperature Controller Setup

1. Steps 1-4 only apply to the temperature controllers for VBO C and D, for operation of VBO F temperature controllers skip to step 5

2. To change the setpoint on the temperature controller, press $\odot$ once to display SP1, then press $\leftarrow$



3. Then using the arrows adjust to the correct temperature. Then press $\leftarrow$ to confirm.

4. Then, to change the ramp/soak time, press $\odot$ until it shows CNFG. Press $\leftarrow$ to enter the configuration menu. Then press $\odot$ until it shows RAMP, press $\leftarrow$ and verify it shows ENBL, press $\leftarrow$ again to display SOAK, verify it is set to ENBL. Press $\leftarrow$ again

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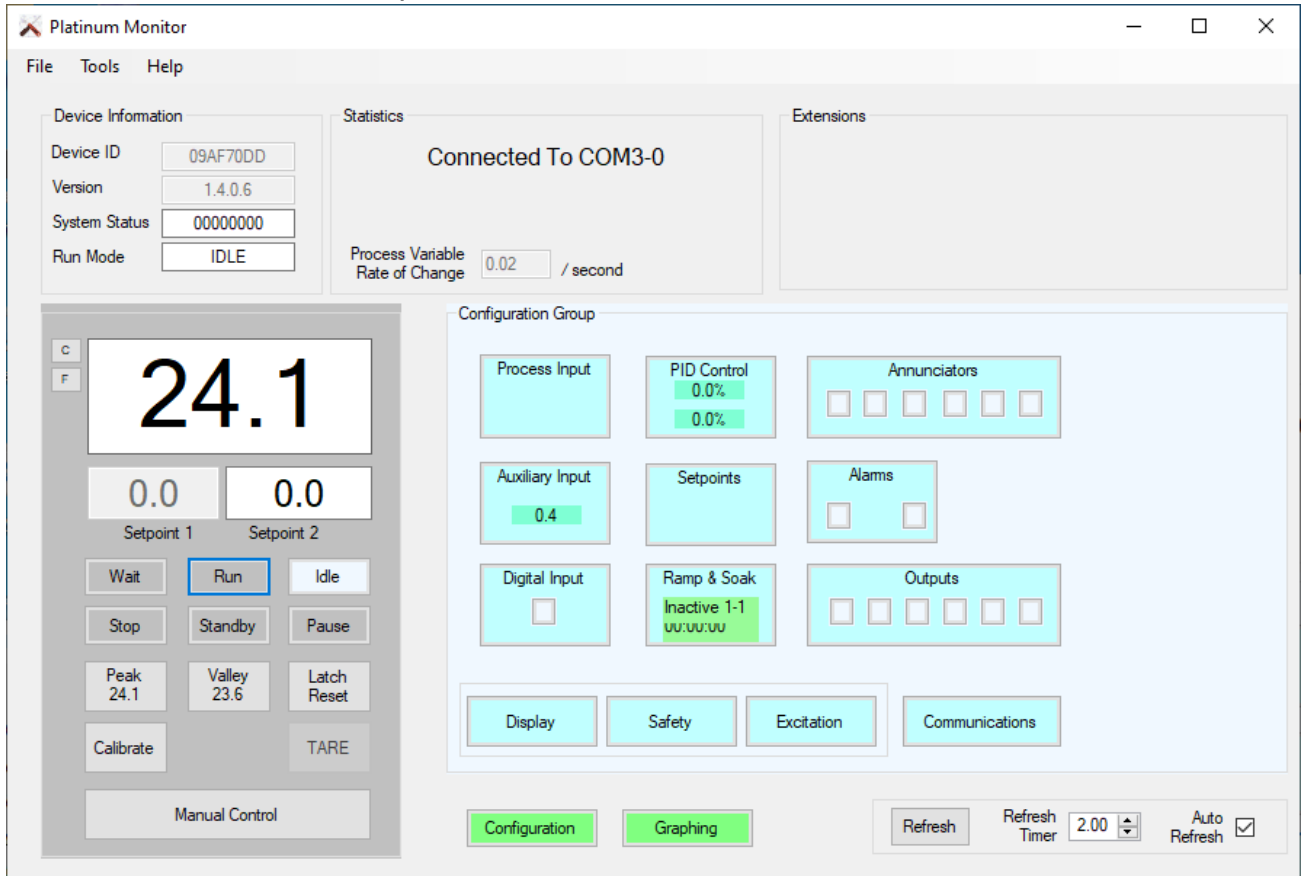
and you can change the ramp time. Use the arrows to adjust, then press ↵ to set it. If necessary, press ↵ and adjust the soak time.



- Once the temperature and the ramp/soak profile has been programmed, press the down arrow twice to reset the controller and the heating profile will begin.

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- For programming the controllers for VBO F, go to the computer for VBO F and there should be 5 windows of the Omega Platinum software open. Each window is connected to a different temperature controller.



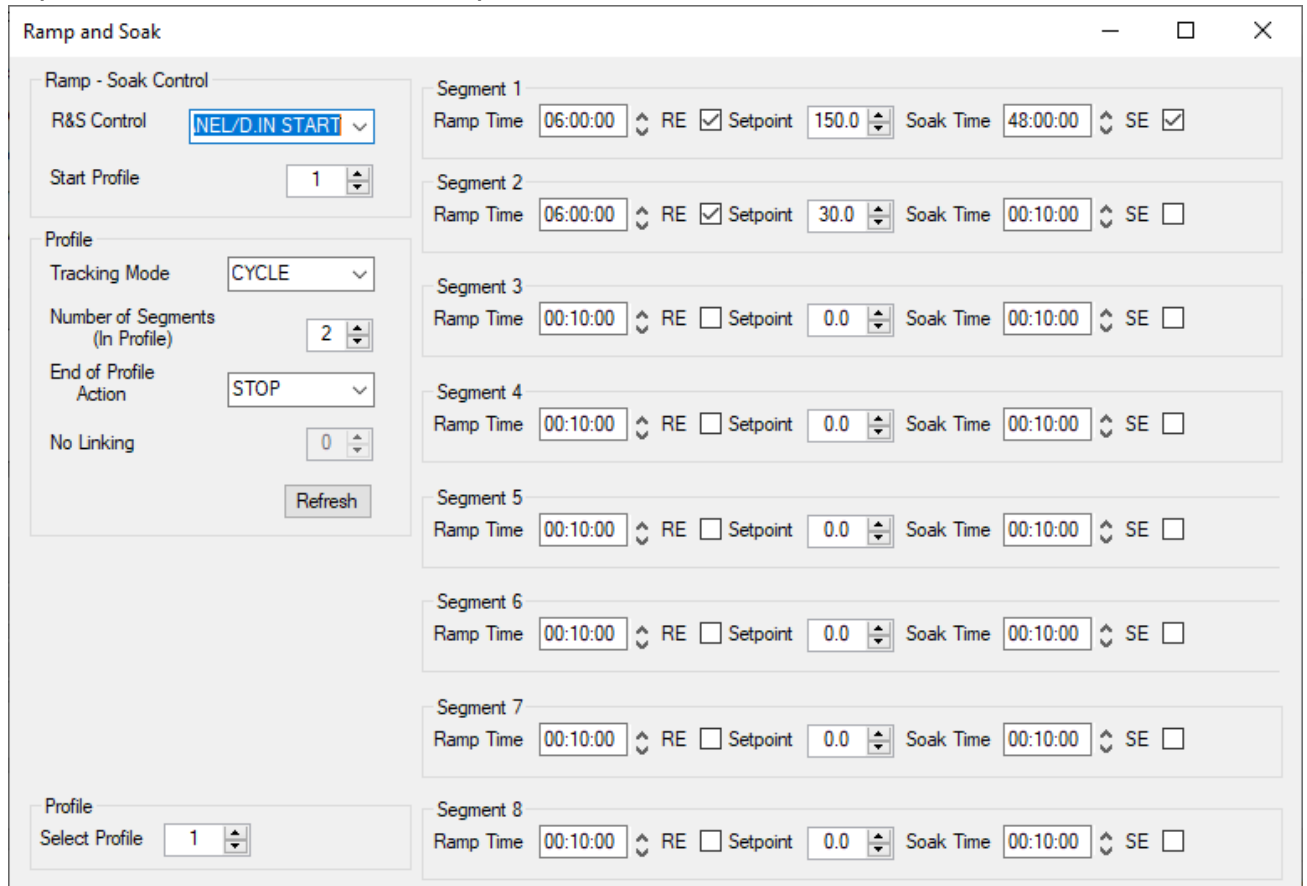
The screenshot shows the Platinum Monitor software interface. The main display area shows a large digital readout (DRO) of 24.1. Below the DRO are two setpoint fields, both showing 0.0. To the right of the DRO are several control buttons: Wait, Run (highlighted), Idle, Stop, Standby, Pause, Peak (24.1), Valley (23.6), Latch Reset, Calibrate, and TARE. A Manual Control button is at the bottom left. The right side of the interface features a Configuration Group with various control options: Process Input, PID Control (0.0%), Annunciators (5 buttons), Auxiliary Input (0.4), Setpoints, Alarms (2 buttons), Digital Input, Ramp & Soak (Inactive 1-1, uu:uu:uu), Outputs (5 buttons), Display, Safety, Excitation, and Communications. At the bottom right, there are buttons for Configuration and Graphing, and a Refresh section with a Refresh button, a Refresh Timer set to 2.00, and an Auto Refresh checkbox.

- Click the box titled “Ramp & Soak”, you can cycle through the already programmed ramp and soak profiles to find one that matches what you need, or you can program a new one by typing in the Ramp up time, set point and soak time in Segment 1. Make sure RE (ramp enabled) and SE (Soak enabled) are checked. Then in segment 2 you can type in the ramp down time, and the end temperature (should be around room temperature) Once the profile has been created, click “Update”. Then make sure the profile number you created is listed in the “Start Profile Field”, click

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“Update” and then close the Ramp and Soak window



8. Click “Run” on the main platinum window, and repeat for the remaining controllers

6 RGA Scan Procedure

Initial conditions:

- RGA Turbo Valve (V1) is closed
 - Chamber/RGA valve (V2) open
 - Main Turbo Valve (V3) open
 - Oven has cooled to room temperature
 - RGA electronics head installed, powered on and connected to computer using the DB9 connector
1. On computer, open RGA software
 - a. Click “Open Connector List”

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- b. Click on the RGA unit listed
 - c. Click "Connect" in lower right corner

2. Turn on the filament and CEM
 - a. Click "Toggle On Filament"
 - b. Click "Toggle On CEM"
 - c. Wait for RGA to warm up, ideally for at least 24 hours, but 3 hours minimum

3. Set Scan Parameters
 - a. Click Scan -> Scan Parameters
 - b. Change Scan Speed to "1"
 - c. Change Stop Mass to "100", click OK

4. Change Units
 - a. Click "Graph" -> Units
 - b. Change units from Torr to Amps

5. Scan RGA Volume
 - a. V1 open, V2 closed, V3 open, Cal leak Off
 - b. Click Scan -> Start Scan
 - c. Scan until the peak heights are no longer changing between scans
 - d. Click Scan -> Stop at End
 - e. Once ended, File-> Save As, and save the file as
RGAVolume_dd_mm_yy.rga, in the appropriate folder on the RGA network

6. Scan RGA and Chamber
 - a. V1 open, V2 open, V3 closed, Cal Leak Off
 - b. Click Scan -> Start Scan
 - c. Scan until the peak heights are no longer changing between scans
 - d. Click Scan -> Stop at End
 - e. Once ended, File-> Save As, and save the file as
RGAV+Oven_dd_mm_yy.rga, in the appropriate folder on the RGA network

7. Scan RGA and Chamber with Cal Leak Open

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- a. V1 open, V2 open, V3 closed, Cal Leak On
- b. Click Scan -> Start Scan
- c. Scan until the peak heights are no longer changing between scans
- d. Click Scan -> Stop at End
- e. Once ended, File-> Save As, and save the file as
RGAV+Oven+Cal_dd_mm_yy.rga, in the appropriate folder on the RGA network

7 Venting the ovens

1. After RGA scans are approved in ICS, you can now vent the oven to remove the parts
2. V1 closed, V2 open, V3 open, Cal Off
3. Turn off the corresponding main turbopump using the controls on the TURBO computer, click the appropriate Turbopump from the list and then click, Stop
4. The turbopump will take ~1 hour to ramp down
5. Once, the turbo has ramped down, turn off the oven scroll pump
6. Open the valve on the nitrogen tank, The nitrogen pressure should be set to ~1 psi using the regulator.
7. Slightly open the vent valve on the oven.
8. Once the chamber pressure gauge **and** the foreline pressure gauge read atmospheric pressure (~760 torr), the oven is vented and you can remove the front flange