

Title: SPECIFICATION FOR BAKE OUT PROCEDURE ISOLATABLE SECTION

**SPECIFICATION FOR BAKE OUT PROCEDURE  
FOR LIGO VACUUM EQUIPMENT**

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1.0 PURPOSE

The purpose of this is to define the necessary steps to perform a bakeout of an isolatable section at 150 °C. This includes the steps necessary to prepare for the bake out sequence.

2.0 GENERAL

The procedure will general apply to all isolatable sections of the stations. Slight differences among each isolatable section will be due to different vacuum equipment, size of the isolatable section, and quantities involved relating instrumentation, equipment, etc. The stations are divided into the following bakeable sections:

Corner station WA	Vertex Section
	Diagonal Section
	Left Beam Manifold Section
	Right Beam Manifold Section

Mid station WA	One Section
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End station WA	One Section
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Corner station LA	Vertex Section
	Left Beam Manifold
	Right Beam Manifold

End station LA	One Section
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Required References

- A. Blanket System mechanical layout configuration and electric configuration drawings for vacuum envelope. All stations. All sections.
- B. Bakeout System Control Cart Operating Manual & Procedure.
- C. RGA Operating Manual
- D. EDP200/EH2600 Roughing pumps Operating Manuals
- E. STPH2000C Turbomolecular Pump Operating Manuals

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- F. QDP80 Dry Backing Pump Operating Manuals
- G. Vacuum Gauges: Cold Cathode & Pirani Gauges Operating Manuals
- IH 2500 L/s, 75L/s, 25 L/s Ion Pumps Operating Manuals

**3.0 RESPONSIBILITY**

The procedure is applicable to PSI Personnel.

**4.0 PROCEDURE**

**4.1 Bakeout System**

**4.1.1 Bake out carts check out**

Follow procedures for electric and data acquisition and control parameters checkout of the bake out control/electric system carts.

Refer to: Bakeout System Control Carts, Operating Manual & Setup Procedure.

**4.1.2 Blanket installation**

Each heating blanket is identified and will fit onto certain sections of the vacuum envelope. Install the assigned blankets according to the assigned locations per blanket system drawing layout and installation procedures.

In addition the following components will also be baked:

Cold cathode/ Pirani Gauge pairs on isolatable section.

RGA head with electronics removed.

Main Turbo Pump inlet.

The Main Ion pumps need to be warmed up also to ensure adequate warmup of the 14" gate.

Refer to: Blanket System mechanical layout configuration and electric configuration.

Refer to: Bakeout System Control Cart Operating Manual & Procedure.

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**4.4 Bakeout Sequence**

**4.4.1 Pumpdown**

**4.4.1.1 Pumpdown using roughing system**

**Corner Stations:**

Connecting the main turbo and Main roughing carts.

Follow procedures for connecting the main turbo and main roughing pumps.

Pumpdown the isolatable section following procedures for connecting and operating the roughing pump system. Pumpdown until a pressure of less 0.1 Torr is reached.

At the completion of roughing the section:

Close the 6" gate valve

Shutdown roughing pumps

Vent the rough line by opening the vent valve on the roughing cart.

Disconnect line and blankoff port.

Leak check the Conflat connection of the blankoff through the pumpout valve.

Evacuate the space between the blind and the gate using the aux turbo cart.

Open the 6" valve.

**End/Mid stations:**

Pumpdown the isolatable section following procedures for connecting and operating the turbo pump and backing pump system.

At the end of the roughing cycle using the roughing pump: close bypass valve and turn on the turbo.

Follow the operating procedure for operating the turbo pump cart.

**4.4.1.2 Pumpdown using turbo molecular pump**

**Corner, End, and Mid stations:**

Follow turbomolecular pump operating procedure for startup and operation of pump for pumpdown.

The turbomolecular pump will also be heated during bakeout.

**4.4.2 RGA data**

A residual gas analysis will be carried out as a reference point prior to start of bakeout.

Power up RGA only after pressure has dropped to less  $5 \times 10^{-5}$  Torr

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4.4.3 Ramp-up

Ramp rate:

Warm-up will occur over a period of 72 hours at a ramp rate of approximately 1.8°C/hr.

Set ramp rate for blanket system on control carts to 1.8°C/hr.

Set target setpoint to 150°C.

Pressure gauge pairs: Ramp rate of the pressure gauge pairs will be at least 5 °C/hr to ensure that the gauges remain hotter than the vacuum envelope at all times.

Bake out of the gauge pair will be done with the electronics removed.

Set ramp rate for blanket system on control carts to 5°C/hr.

Set target setpoint to 250°C.

*Do not start warmup until the pressure has dropped to less  $5 \times 10^{-5}$  Torr.*

RGA: The RGA needs to be baked also.

Bake the RGA independently i.e. isolated from the vacuum envelope bake.

This will be done using a 25L/s Ion pump.

Bake out of the RGA will be done with the electronics removed.

Bakeout temperature of the RGA will set at manufacturers recommended maximum (200°C)

4.4.4 Soak for 48 hours

The isolatable section will be heated to 150°C and soaked for 48 hours at 150°C±20°. The pressure gauge pairs will be soaked at 250°C.

4.4.5 Cooldown

Cooldown will be controlled by ramping the setpoints of the system to ambient temperature at a ramp rate of -1.8°/hr. The heating jackets for the pressure gauge pair will remain on and turned off when the system has cooled down.

4.4.6 RGA data

With the system baked and cooled down, a residual gas analysis will be carried out to determine the presence of any air leaks and cleanliness of the system.

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