

New Folder Name QT PROCEDURE

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## FACSIMILE COVER SHEET

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Comments on the QT procedure. Note that Rai will be discussing additional comments beyond 3.2 with Warren next week.

## Comments on QT Pumpdown, Bake Out and Outgassing Test Procedure (Rev. 3)

### 1.0 RECORD KEEPING

Include the state of the cold cathode gauges in the state vector record.

The list of files and their generic headings should be included for identification later. The scripts for the RGA instrument state should be identified.

Type of file	File	Example
log notebook files	data.log	122294.log
system state file	date.sta	122294.sta
continuous pressure and temp	date.dat	122294.dat
RGA selected AMU files	date.rga	122294.rga
RGA full sweep files	date.swe	122294.swe
rga transient files	datet.rgx	122294t.rg3
pressure and temp transient files	datet.dtx	122294t.dt2
rga instrument state scripts	#_date.scr	4_122294.scr

### 2.0 PREPARATION

Since this procedure covers leak checking of the final 5 girth seams, the statement that "...all weld seams) shall have been leak tested..." is not correct. Describe or reference procedures planned.

Modify cleaning procedure call outs to reflect what was actually done.

#### 3.1 Pre evacuation check list

Correct 5. by updating thermocouple quantity and locations (or reference Figure).

Add guidance to 10. describing how to adjust to maintain viscous flow.

Add the following:

- Confirm venting system is operating.
- Confirm LIGO approval for pumpdown has been secured.
- Confirm proper calibration on all applicable equipment.
- Note: QC sign off is needed for all items.

#### 3.2 Pump Down Procedure

Questions on state vectors:

- What is the meaning of RGA=0 and RGA=1? The emission on would be a good signature for
  1. State vector symbols should be defined somewhere.
- We're assuming that LNTx=1 means that the trap is full of liquid nitrogen.

- The label LNT3 should be added to the schematic.
- The label CC6 on the schematic appears to be a CC8; increasing the font size (on at least selected items) would reduce confusion.

Add descriptive text prior to first system state vector listing: "Enter system state vector."

Label each step under 3.2 with a substep number: 3.2.1, 3.2.2, 3.2.3, etc. (Note: this is a general comment that applies throughout this procedure.)

3.2.1: state vector list and those following: Valves V25-V29 are not shown on the schematic.

3.2.4; "The beam tube and.....until the pressure reaches." Specify which pressure gage is referenced.

Sheet 4, Section starting, "During the pump down..." should be moved to just after 3.2.4.

Sheet 4, NOTE following the section "During the pump down...": this should be moved to prior to the section "After the auxiliary..." Also, the length of delay sufficient to stabilize the RGA reading should be noted.

The calibrated leaks (except for air) should be evacuated in all of this procedure except for special calibration accumulation sequences or when readings are being taken.

The RGA volume is pumped through the leak manifold via V4 and V15; this is OK as long as the pumping speed is adequate through the manifold.

We suggest that the viscous inbleed valves (V23, in this case) be opened once the pressure gets below 1 torr.

When does RP2 get started? Is it 12H after the start or 5M after the end of the 12H? Same comment about when the viscous inbleed valve gets opened. When does the RGA pumping system get started? We recommend that it be turned on at 1 torr in the foreline.

Are the Pirani gauges recorded in the continuous record during pumpdown?

Why wait until the hydrogen measurements to turn on TM2? We recommend that it be turned on as part of the pump down sequence, and once this is done V7=0, V8=1. This helps clear out the oil and contamination in the pump TMP2.

We need to include a step to turn off the viscous inbleed valves once the turbo pumps are running at full speed.

The step to evaluate the pressure in the auxiliary pumping system (Sheet 4) and RGA would be best carried out by isolating that system to the RGA alone, so V15=0 for this step.



Modify the last sentence in the second and third paragraphs as follows:

“The bake out will continue for 30 days after the tube temperature reaches 140C, or when TBD, whichever occurs first. If the bake is to be terminated prior to 30 days, confirm LIGO approval for termination is secured prior to termination.”

The maximum piping systems temperature will be 150C, and the minimum will be 130C. Monitor tube wall temperature near thrust restraints; add thrust restraint heaters if necessary to control this area to within tolerances.

#### 10.1 Water Vapor Outgassing Rate Calibration

At the end of this section, add the following statement, “Do not continue this procedure until LIGO confirmation of proper measurement of water outgassing has been secured.”

#### 11.0 HYDROGEN OUTGAS TEST

Add descriptive text prior to first system state vector listing: “Enter system state vector.”

#### 12.0 AIR SIGNATURE OUTGASSING TEST

Change title to read “AIR SIGNATURE TEST”

Add descriptive text prior to first system state vector listing: “Enter system state vector.”

#### 12.1 Air Signature Outgassing Calibration

Change title to read “Air Signature Calibration”

After the last section, add the following instruction: “Secure LIGO confirmation of proper measurement of hydrogen outgassing and air signature data.”