

E990267-01-X  
E990445-00-X  
E000001-00-X

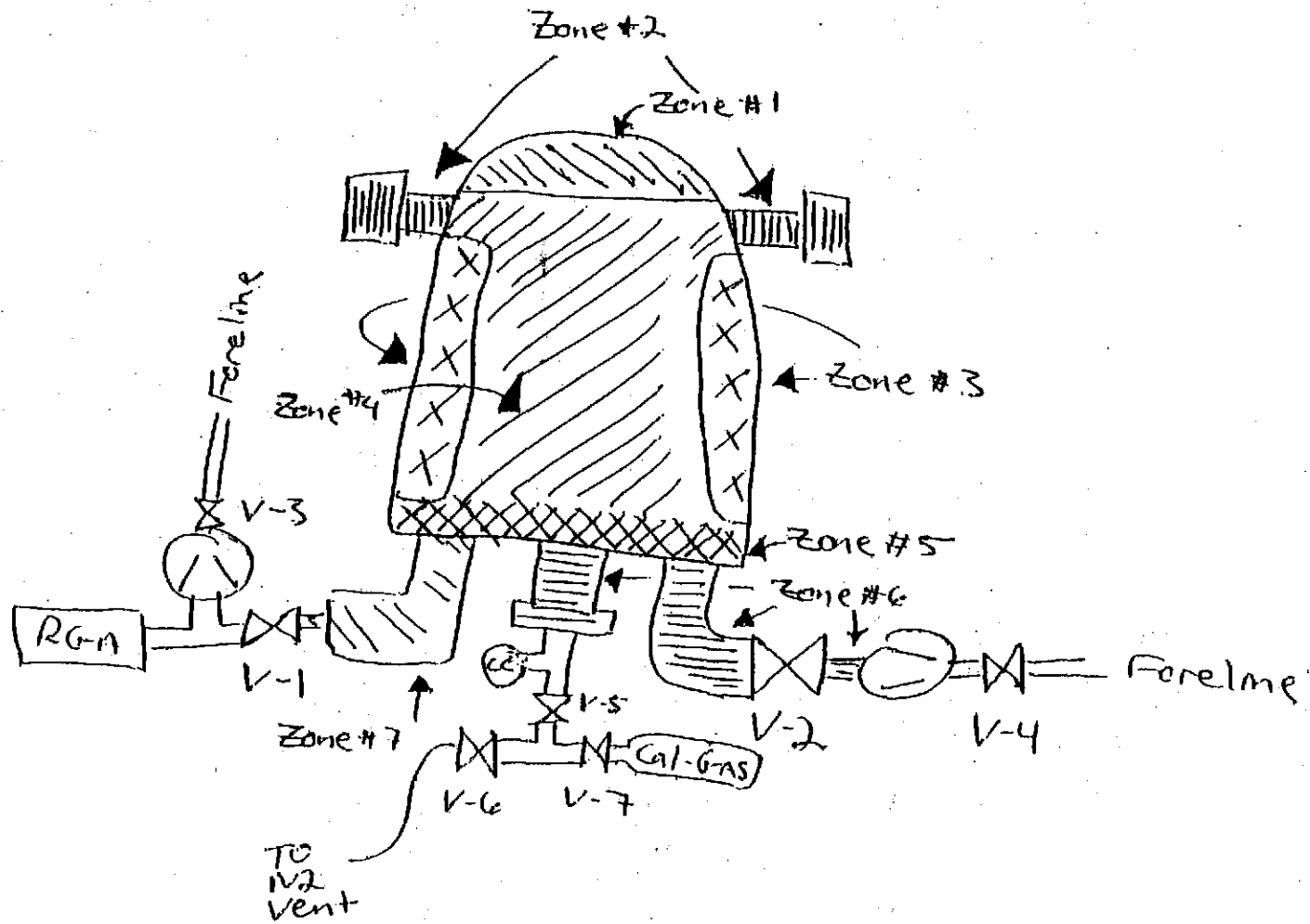
## Summary of LHO Vacuum Bake Oven A RGA Data Generation

The individual parts which comprise a "load" are cleaned as per LIGO-E960022 or as allowed by waiver(s) and loaded into the bake oven. The oven is then pumped down through the main pump "arm" (through V-2, RGA arm is valved off at this point). A heating profile is programmed and baking of the system begins. A typical "heating profile" consists of ramping up to material type soak temperature, soaking for approximately 48 hours, ramping down to approximately 70C, soaking and then ramping down to near room temperature. While soaking at 70C, an RGA background scan is taken. V-1 is then opened and V-2 closed. Enough time is allowed for the system to come into pressure equilibrium and then an elevated load temperature RGA scan is taken. V-1 is then closed and V-2 opened. Following this elevated temperature scan, the load is ramped down to near room temperature and the baking portion of the process is complete. Throughout the baking, temperature data is taken to verify the actual temperatures in the various "heat zones" of the bake oven system.

Once at near room temperature, another RGA background (V-1 closed) scan is taken. Next, V-1 and the cal-gas are opened and V-2 closed. After a 30 minute pressure equilibration time, a "calibration" scan is taken. The calculated pressure of Argon (constituent of the "mixed" calibration gas) is determined using the leak rate of Argon and the pump speed of the RGA arm port as seen by the oven chamber and compared (ratio) to the maximum amp value measured for Argon in the calibration scan. This "torr/amp" ratio becomes the Calibration Factor for the given load, converting measured current to pressure.

Finally, the cal-gas is valved out and enough time is allotted to allow all traces of it to be pumped away. A "post-bake" scan is then taken. Approval of the post-bake scan is a collective "pass/fail" determination made by either Dennis Coyne (CalTech) or Stan Whitcomb (CalTech). The data collected during the "elevated temperature scan" is entered into a spreadsheet which then calculates what the outgassing rates of AMUs 41, 43, 53, 55 and 57 ought to be at room temperature. These calculations are used to determine the room temperature outgassing rates when the signals are below the RGA's sensitivity (noise floor).

Refer to the LHO Vacuum Bake Oven A logbook for the actual ordered events of the load # of interest.



# **LHO VACUUM BAKE OVEN A: CONTENTS LOAD #70**

**BEAM DUMP ASSEMBLIES, BSC4**

**BEAM DUMP FLEX HINGE CLEVIS SERIAL NUMBER D990029-A-011**

**B.S.C. ISOLATION STACK LEG ASSEMBLY PINS AND SCREWS**

**B.S.C. LEG SCREW SERIAL NUMBER D972717-D-1 (24ea)**

**B.S.C. LEG SCREW SERIAL NUMBER D972717-D-3 (24ea)**

**B.S.C. LEG SCREW SERIAL NUMBER D972717-D-5 (24ea)**

**B.S.C. SAFETY PIN SERIAL NUMBER D972717-D-9 (24ea)**

**MISC. SS NOZZLES SERIAL NUMBER N/A (3ea)**





**LHO VACUUM BAKE OVEN A LOAD #70  
ELEVATED TEMPERATURE BACKGROUND  
SCAN**

V-1 Closed

**NO ELEVATED BACKGROUND SCAN  
AVAILABLE**

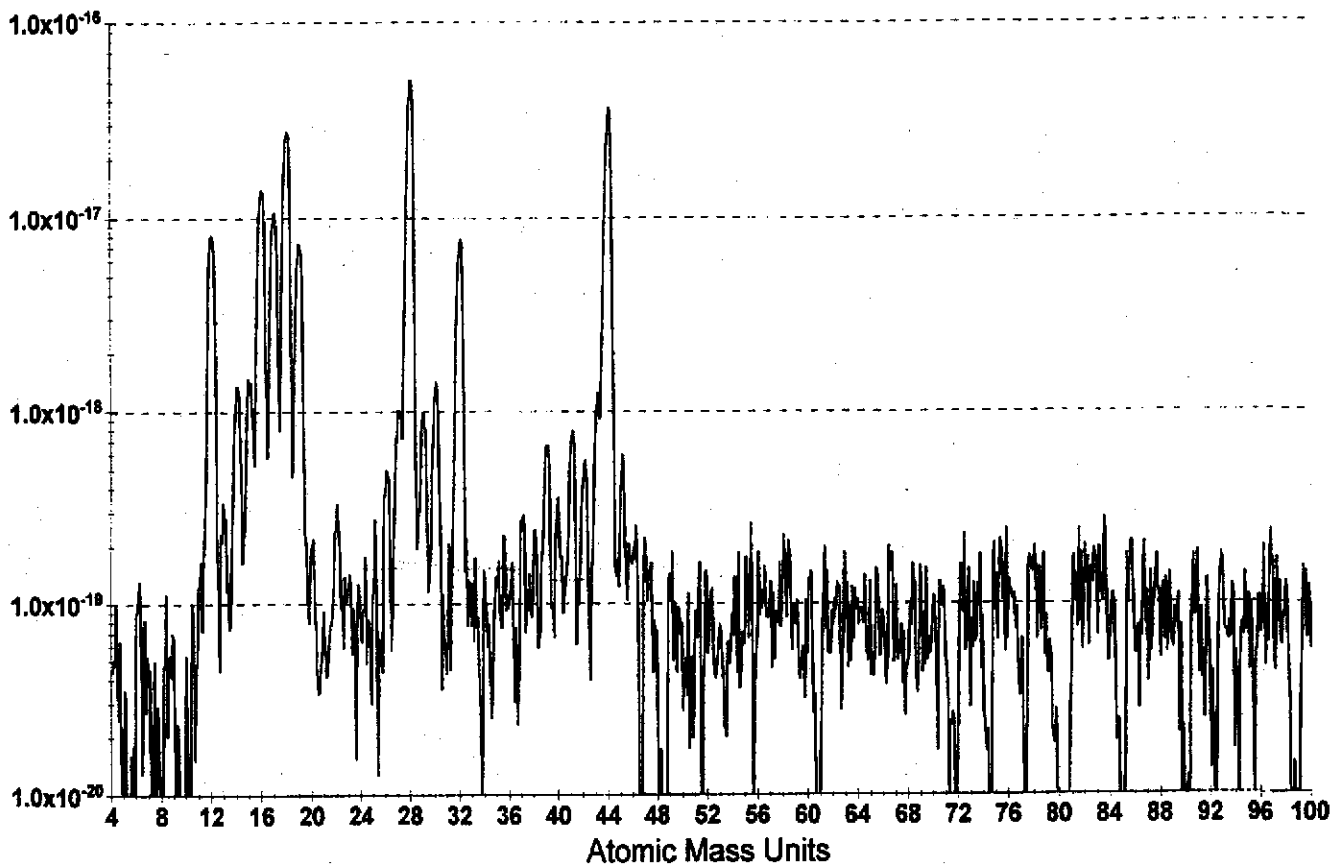
# LHO VACUUM BAKE OVEN A LOAD #70 ELEVATED TEMPERATURE SCAN

V-1 Open, Cal-Gas and V-2 Closed, 70°C

121999b

Dec 19, 1999 08:54:38 PM

Amps



## LHO Bake Oven A Load # 70

1<sup>st</sup> Order Desorption Outgassing Rate Estimates using  $Q_{low} = SP_{low} = SP_{high} [e^{-(E_s/kT_{high})}] / [e^{-(E_s/kT_{low})}]$

Number of units in bake load	Pump Speed (L/sec)	AMU	RGA background current (amps)	RGA current (amps) @ High Temp	Calibration Factor CF (torr/amps)	High Temp (K)	Low Temp (K)	Es/k	Extrapolated outgassing rate (torr*L/sec) @ T <sub>low</sub>
1	5	41	no scan	7.90E-19	1.00E+07	3.43E+02	2.96E+02	13000	#VALUE!
1	5	43	no scan	3.14E-18	1.00E+07	3.43E+02	2.96E+02	8000	#VALUE!
1	5	53	no scan	7.80E-20	1.00E+07	3.43E+02	2.96E+02	13000	#VALUE!
1	5	55	no scan	2.60E-19	1.00E+07	3.43E+02	2.96E+02	15000	#VALUE!
1	5	57	no scan	1.50E-19	1.00E+07	3.43E+02	2.96E+02	15000	#VALUE!



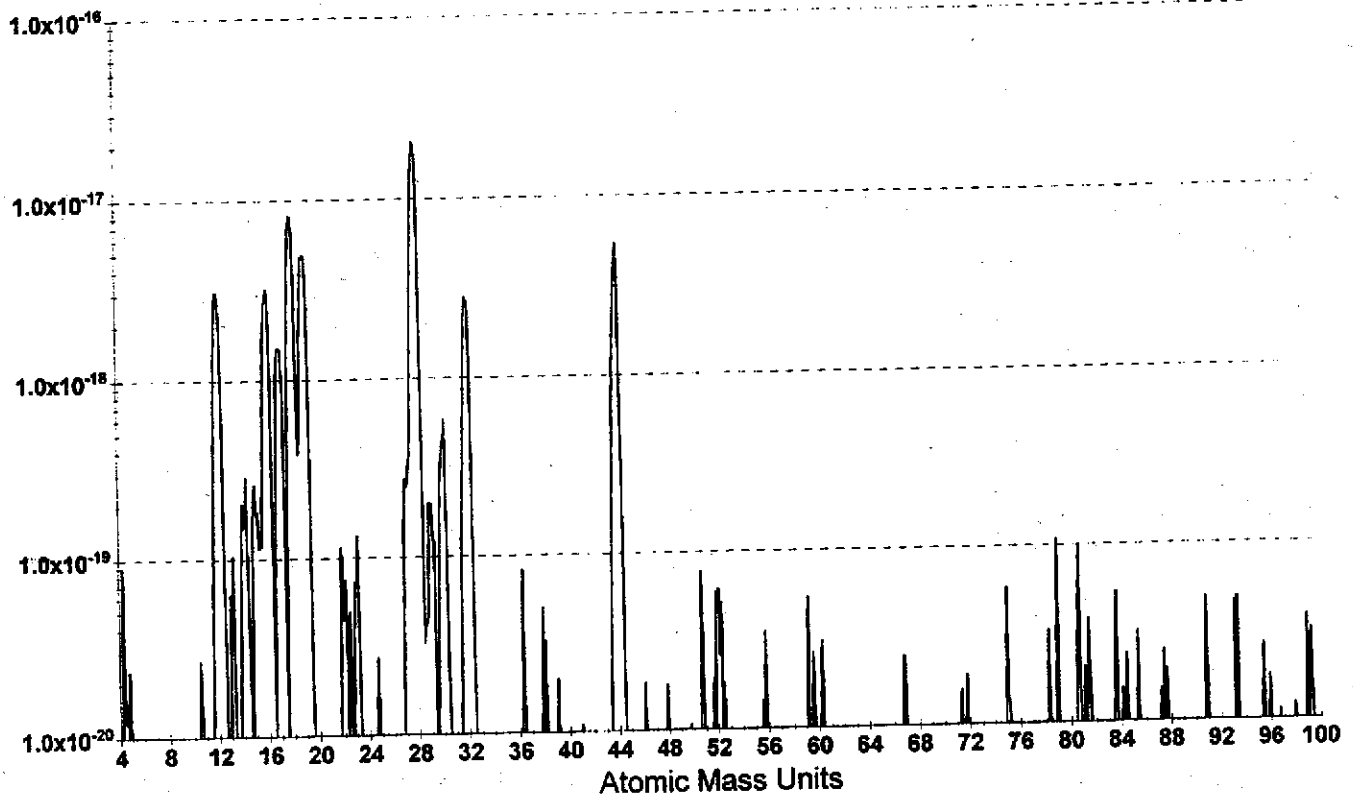
# LHO Vacuum Bake Oven A Load #70 RGA Background

V-1 closed, room temperature

122399a

Dec 23, 1999 09:50:02 AM

Amps



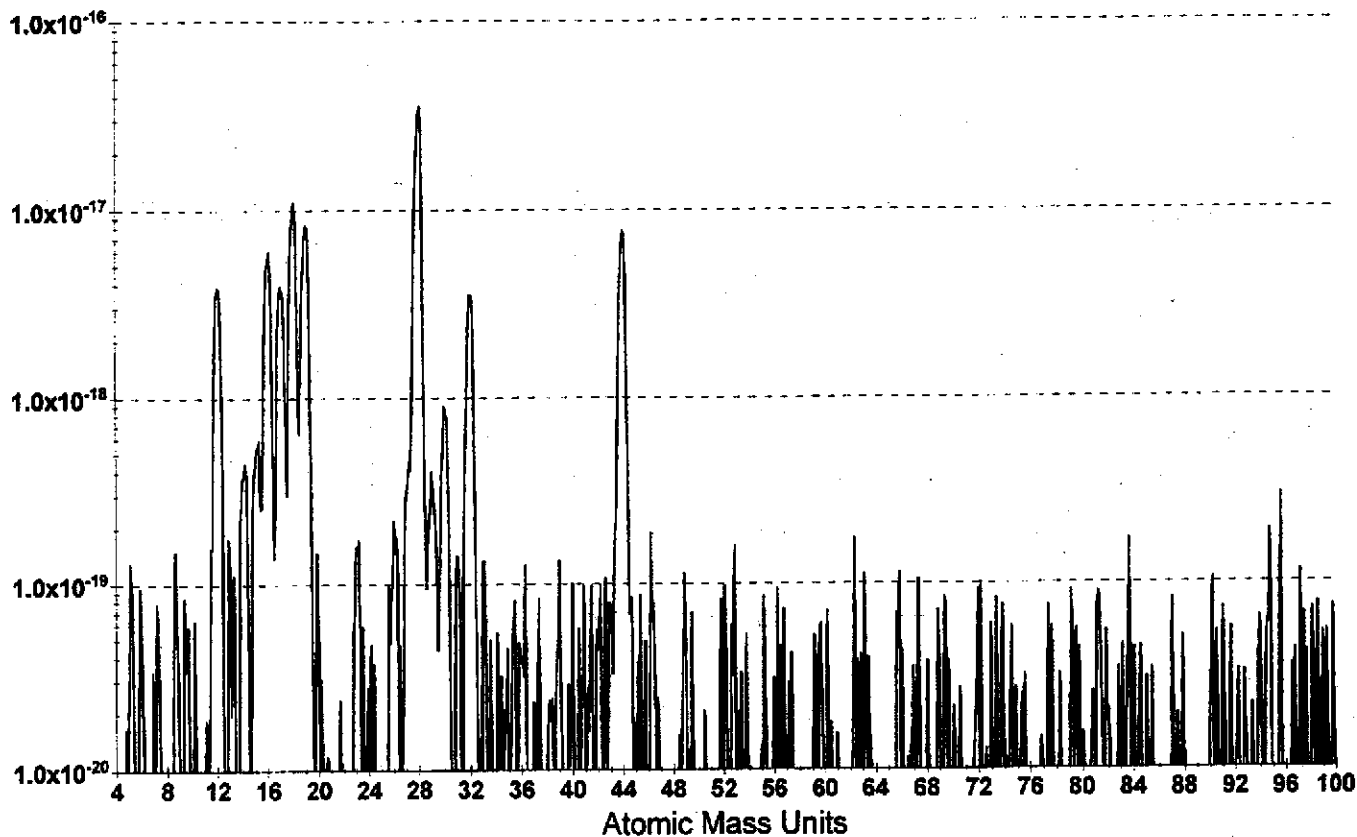
# LHO Vacuum Bake Oven A Load #70 Post-Bake Scan Room Temp.

V-1 open, Cal-Gas and V-2 Closed

Amps

122399c

Dec 23, 1999 11:36:04 AM



# LIGO PROCESS TRAVELER

E990445-00-X  
 DCC Number: E98-00-X  
 Date Prepared: 12.15.99

Originator <b>B RIVERA</b>	Cognizant Engineer <b>MIKE FINE</b>	Ext./Phone# <b>X 3307</b>	Project <b>LIGO</b>	Account Number <b>SF511</b>
Dwg/Part Number	Rev	Part Description	Serial Number	Qty
<i>D970717-3 D970717-5 D970717-9</i>	<b>D</b>	<b>BSC DISLOCATION STACK LEG. ASSEMBLY P. 25 SCREWS BSC LEG SCREW 1, 3, 3 BSC SAFETY PIN 9</b>		<b>24 24 24</b>
Used In (next higher assembly):				
Vendor Name			PO/Contract Number	
			<b>P</b>	

**Data Package, Receiving/Inspection Remarks:**

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
<b>YES</b>	<b>NO</b>	<b>MINOR CHIPPING AND WEAR OF SILVER PLATING</b>	<b>B RIVERA</b>	<b>12.15.99</b>

**Process Flow:**

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Clean & Vacuum Bake per LIGO Vacuum Prep. Form	12.15.99	<del>CIT</del> <b>LHO</b>	per E960022-A	<b>B RIVERA</b>	
2	Control Point		NA	Review/approve RGA scan # <u>1223990.RGA</u> <b>LOAD TO</b>	<b>RFW</b>	<b>1/4/00</b>
3	Wrap & Tag vacuum clean parts per E960022-A		CIT	_____ per package		
4			CIT	<b>Note: Copy this traveler and give to the DCC</b>		

END: Go to Traveler associated with next higher assembly processing

**N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.**

**LIGO PROCESS TRAVELER**

**Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:**

DCC Number: E990445-00-X  
B98-00-X


# LIGO PROCESS TRAVELER

4000001-00-X  
 DCC Number: E98-00-X  
 Date Prepared:

Originator <b>B. RIVERA</b>	Organization/Engineer <b>BETSY WEAVER</b>	Dxt/Phone# <b>8191</b>	Project <b>LIGO</b>	Account Number
Dwg/Part Number <b>N/A</b>	Rev <b>NA</b>	Part Description <b>MISC. SS NOZZLES</b>	Serial Number <b>N/A</b>	Qty <b>3</b>
Used In (next higher assembly)				
Vendor Name			PO/Contract Number	
P				

**Data Package, Receiving/Inspection Remarks:**

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
NO	NO		B. RIVERA	

**Process Flow:**

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Clean & Vacuum Bake per LIGO Vacuum Prep. Form		CIT LHO	per E960022-A	B. RIVERA	12-23-99
2	Control Point		NA	Review/approve RGA scan # <u>1225990.PCL</u> Load #70	B. RIVERA	1/4/00
3	Wrap & Tag vacuum clean parts per E960022-A		CIT LHO	_____ per package	B. RIVERA	
4			CIT	<b>Note: Copy this traveler and give to the DCC</b>		

**END: Go to Traveler associated with next higher assembly processing**

*N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.*

# LIGO PROCESS TRAVELER

Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:

DCC Number:

6000001 00-2  
~~E98~~ ~~00-X~~


# LIGO PROCESS TRAVELER

DCC Number: **E990267-01-X**  
 Date Prepared: **6/30/99**

<b>Originator</b>	<b>Cognizant Engineer</b>	<b>Ext./Phone#</b>	<b>Project</b>	<b>Account Number</b>
Michael Smith	Michael Smith	2062	COS	5F515

Dwg/Part Number	Rev	Part Description	Serial Number	Qty	VBO load 40 6/ 28	VBO load 41 7/1	VBO load 43 7/ 12	VBO load 46 7/ 26	VBO load 48 7/	VBO Load 50	
<b>Beam Dump Assemblies, BSC4</b>											
D980087	A	"glass retaining bracket, top left, cavity BD"	006-008	3	3		3				3
D980088	A	"glass retaining bracket, top right, cavity BD"	006-008	3	3		3				3
D980092	A	"glass plate 1, cavity BD"		3							
D980093	A	"glass plate 2, cavity BD"		3							
D980289	B	"glass mounting plate1, cavity BD"	006-008	3	3						
D980292	B	"glass mounting plate2, cavity BD"	007,008,015	3	2		1	1			
D980296	A	"glass retaining bracket, bottom left, cavity BD"	006-008	3	3		3				3
D980297	A	"glass retaining bracket, bottom right cavity BD"	006-008	3	3		3				3
D980348	B	"side plate, cavity BD"	012-017	6	5	1					
D980378	B	"Stiffener Block, cavity BD"	006-008	3	3						
D980685	A	"clamp, plate beam dump"		12							
D990028	A	Beam Dump Flex Hinge Tongue	004, 005, 006, 007, 010, 015	6	1	3	2	2			
D990029	A	Beam Dump Flex Hinge Clevis	005, 008-012	6	1		1	5		1 (011)	
D990030	A	Beam Dump Flex Hinge Tee	005-010	6	6			6			
D990031	A	Beam Dump Flex Hinge Saddle	004-009	6		4		2			
D990032	A	Beam Dump Flex Hinge Attach	004-006, 009- 011	6		4		2			
D990033	A	Beam Dump Flex Hinge Adapter	004, 005, 008- 010, 014	6		6					
D990140	D	Beam Dump Housing Plate	012, 014	3				3			
D990149	C	"Cavity Beam Dump, Mounting Bracket Angle "	005-008	4	1			3			
D990150	B	"Cavity Beam Dump, Mounting Bracket Gusset "	005-008	4	4						

*N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.*

VBO  
Load  
52

3  
3

# LIGO PROCESS TRAVELER

DCC Number: **E990267-01-X**

Dwg/Part Number	Rev	Part Description	Serial Number	Qty	VBO load 40 6/ 28	VBO load 41 7/1	VBO load 43 7/ 12	VBO load 46 7/ 26	VBO load 48 7/	VBO Load 50 5
D990151	B	"Cavity Beam Dump, Mounting Bracket Backplate 1"	005-008	4	4					
D990152	C	"Cavity Beam Dump, Mounting Bracket Backplate 2"	005-008	4	4					
D990198	B	Beam Dump Flex Hinge H_tube	007, 010, 005, 005	4	1	2			1	
D990199	A	Beam Dump Flex Hinge Low Strap	004-009	6	1	5				
D990200	A	Beam Dump Flex Hinge Backup	016-018, 020-022, 010-015	12	2	10				
D990201	A	Beam Dump Flex Hinge Cap	007-017, 019	12	2	2		8		
D990202	B	Beam Dump Flex Hinge Top Strap	005-010	6	1	4		1		
D990207	B	"rail, plate beam dump"	003-006, 008, 009	6		6				
D990218	B	"glass, plate beam dump" other traveler	NA	3			3	3		
D990222	A	Beam Dump Housing Tube 2KBSAR3		0						
D990223	C	Beam Dump Housing Tube 2KFM		0						
D990225	D	"Beam Dump Housing Tube 4KITMHR3,4KITMHR4"		0						
D990236	B	"backplate_offset, plate beam dump"		0						
D990240	B	"backplate, plate beam dump"		2	1					
D990252	B	"Beam Dump Housing Tube ITMARI,2KRMHR3"	001, 005, 007	3	1	2	1			
D990253	A	Extension Tube	003	1			1		1	
D990335	A	"Beam Dump Flex Hinge H_tube, 2KITMXAR4 " η	001	1			1		1	
D990336	A	"Beam Dump Flex Hinge H_tube, 2KITMYAR4" X	002	1			1		1	
WFV-10		#10 X 0.31 THK FLAT VENTED WASHER		24	24					
WFV-10		#10 X 0.31 THK FLAT VENTED WASHER		4	4					
92196A245		#10-24 X 0.75 SHCS		4	4					
93615A355		#10-24 X 0.75 LOW HD SCS		24	24					
WFV-06		#6 X 0.016 THK FLAT VENTED WASHER		4	4					
92196A144		#6-32 X .25 SHCS		4	4					
WFV-08		#8 FLAT VENTED WASHER		102	102					



# LIGO PROCESS TRAVELER

DCC Number: **E990267-01-X**

Dwg/Part Number	Rev	Part Description	Serial Number	Qty	VBO load 40 6/ 28	VBO load 41 7/1	VBO load 43 7/ 12	VBO load 46 7/ 26	VBO load 48 7/ 5
92185A194		#8-32 X .50 SHCS		102	102				
91500A194		#8-32 X .500 FHPS		54	54				
91944A450		0.406ID X 0.88OD X 0.25 THK SPHER WASH		24	24				
92141A029		1/4 FLAT WASHER		48	48				
92141A029		1/4 FLAT WASHER		36	36				
N-2520-A		1/4-20 HEX NUT		24	24				
93615A410		1/4-20 X .500 LOW HEAD SOCKET SCREW		12	12				
92196A540		1/4-20 X 0.75 SHCS		48	48				
92196A540		1/4-20 X 0.75 SHCS		24	24				
92196A542		1/4-20 X 1.00 SHCS		48	48				
C-2016-NA		"1/4-20 X 1.00 SHCS, AG/SS"		48	48				
C-2016-NA		"1/4-20 X 1.00 SHCS, AG/SS"		12	12				
92196A544		1/4-20 X 1.25 SHCS		24	24				
C-2820-NA		"1/4-28 X 1.25 SHCS, AG/SS"		36	36				
91950A031		3/8 X 0.063 FLAT WASHER		3	3				
91950A031		3/8 X 0.063 FLAT WASHER		6	6				
WFV-38		3/8 X 0.032 THK FLAT VENTED WASHER		3	3				
WFV-38		3/8 X 0.032 THK FLAT VENTED WASHER		32	32				
WFV-38		3/8 X 0.032 THK FLAT VENTED WASHER		8	8				
94804A320		3/8-16 HEX NUT		8	8				
N-3816-A		3/8-16 HEX NUT		6	6				
TOP-1616-NA		3/8-16 X 1.00 SOCKT SET SCRW-OVL PT AG/SS		12	12				
90585A626		3/8-16 X 1.25 FLT HD CAP SCREW		8	8				
92186A626		3/8-16 X 1.25 HEX HD SCREW		16	16				
C-1620-NA		"3/8-16 X 1.25 SHCS, AG/SS"		12	12				
92186A630		3/8-16 X 1.75 HEX HD SCREW		6	6				

# LIGO PROCESS TRAVELER

DCC Number: **E990267-01-X**  
 Date Prepared: **6/30/99**

Dwg/Part Number	Rev	Part Description	Serial Number	Qty	VBO load 40 6/ 28	VBO load 41 7/1	VBO load 43 7/ 12	VBO load 46 7/ 26	VBO load 48 7/
92196A630		3/8-16 X 1.75 SHCS		18	18				
92186A999		3/8-16 X 7.00 HEX HD SCREW		16	16				
099-966-12-20x		BERYLLIUM-CU GND STRP		12	12				
6.32-400		Flex Pivot		12	12				

VBO load 52

Used In (next higher assembly): D990230, BSC Beam dump Installation, top assembly

Data Package, Receiving/Inspection Remarks:

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
y		Inspect for breakage during shipment		

Process Flow:

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Control Point	NA	NA		NA	NA
2	Clean		LHO	per LIGO-E960022, as applicable	B. Weaver	
3	Vacuum Bake		LHO	per LIGO-E960022	K. Ryan	
4	wrap and bag		LHO	per LIGO-E960022	B. Weaver	
5	Control Point	6/24/99 6/28/99 7/6/99 7/20/99	LHO	Review/approve RGA: VBO Load# 40 scan # 062899C.RGA VBO Load# 41 scan # 070299C.RGA VBO Load# 43 scan # Rejected VBO Load# 46 scan # 072699C.RGA VBO Load# 48 scan # 080599C.RGA VBO Load# 50 scan # 081099C.RGA VBO Load# 52 scan # 082099C.RGA VBO Load# 61 scan # 101899C.RGA Note: attach RGA scan(s) to this traveler.	K. Ryan  REW REW REW REW	7/28/99 8/10/99 8/10/99 9/14/99

N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.

# LIGO PROCESS TRAVELER

DCC Number: **E990267-01-X**  
 Date Prepared: **6/30/99**

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.																			
	Box for shipment to LHO			Ship in LIGO-provided container <table border="1"> <thead> <tr> <th>No.</th> <th>Qty per package</th> <th>Part</th> </tr> </thead> <tbody> <tr> <td>ALL</td> <td></td> <td>BSC4 BEAM DUMP PARTS</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> (see also qty. for each shipping destination below)	No.	Qty per package	Part	ALL		BSC4 BEAM DUMP PARTS															
No.	Qty per package	Part																							
ALL		BSC4 BEAM DUMP PARTS																							
7	Ship			<table border="1"> <thead> <tr> <th rowspan="2">No.</th> <th colspan="3">Ship Qty.</th> <th rowspan="2">Part Description</th> </tr> <tr> <th>LHO</th> <th>LLO</th> <th>Other</th> </tr> </thead> <tbody> <tr> <td></td> <td>all</td> <td></td> <td></td> <td>BSC4 beam dump parts</td> </tr> </tbody> </table> <table border="1"> <tr> <td></td> <td>LHO:</td> <td>Attn: Betsy Weaver, COS LIGO Hanford Observatory (LHO) Specific Purpose: beam dump BSC8</td> </tr> <tr> <td></td> <td>LLO:</td> <td>Attn: Jonathan Kern LIGO Livingston Observatory (LLO) Specific Purpose: beam dump BSC8</td> </tr> </table>	No.	Ship Qty.			Part Description	LHO	LLO	Other		all			BSC4 beam dump parts		LHO:	Attn: Betsy Weaver, COS LIGO Hanford Observatory (LHO) Specific Purpose: beam dump BSC8		LLO:	Attn: Jonathan Kern LIGO Livingston Observatory (LLO) Specific Purpose: beam dump BSC8		
No.	Ship Qty.			Part Description																					
	LHO	LLO	Other																						
	all			BSC4 beam dump parts																					
	LHO:	Attn: Betsy Weaver, COS LIGO Hanford Observatory (LHO) Specific Purpose: beam dump BSC8																							
	LLO:	Attn: Jonathan Kern LIGO Livingston Observatory (LLO) Specific Purpose: beam dump BSC8																							
END: Go to Traveler associated with next higher assembly processing																									

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# LIGO PROCESS TRAVELER

DCC Number: **E990267-01-X**  
Date Prepared: **6/30/99**

## Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:

Attention: Betsy Weaver, Jonathan Kern, hold cleaned and baked parts for COS assembly
VBO Load 43 - Rejected Scan. Dennis Coyne sent all stainless steel items to be electropolished and all aluminum items to LNL anodizing to be etched, from this load. 7/15 B. Weaver
Parts received back from etching and polishing companies. Recleaned as per Dennis' email attached. 7/23 B. Weaver
S/N 006-008 of parts D980087, D980088, D980296, D980297 sent back to Spacecraft Specialists, Inc. for rework. They were rushed during manufacturing these parts, and therefore forgot to finish. 7/21 B. Weaver
6 D990030, 1 D990252 tubes sent to Electropolisher/etcher for recleaning even though they had been baked at LHO & passed. - Dennis thought they looked suspect to dirt! 8/2 - B. Weaver
Clavis D990029-011 sent out for rework to make modification as per D990029-B 8/4 - B. Weaver DCN: E990273-B 7/9
Side plate D980348 s/n 014 sent to Brockman Mfg. for rework - holes made into slots to compensate for low clearance. B. Weaver 9/10
D980348 s/n 014 given to B. Rivera for vacuum baking. B. Weaver 10/11
Clavis D990029 s/n 011 sent out <u>again</u> to have 1/4-20 tapped holes retapped. 12/1/99 B. Weaver
Received clavis D990029 s/n 011 <u>back</u> from Brockman - reworking above! Giving to B. Rivera for recleaning & VBOing LOAD # 70 12/14/99 B. Weaver
RECEIVED AND BAKED D990029 s/n 011 IN LOAD # 70 B. RIVERA 1-4-00

N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.

VBO LOAD 48

X-POP3-Rcpt: bweaver@apex  
Date: Thu, 22 Jul 1999 12:12:31 -0700  
From: Dennis Coyne <coyne@ligo.caltech.edu>  
Organization: Caltech/LIGO  
X-Mailer: Mozilla 3.01Gold (Win95; I)  
To: Betsy Weaver <weaver\_b@ligo.caltech.edu>  
CC: Stan Whitcomb <stan@acrux.ligo.caltech.edu>, Mike Smith <smith@acrux.ligo.caltech.edu>, Bartie Rivera <rivera\_b@ligo-wa.caltech.edu>  
Subject: Re: cleaning

Betsy,  
You should clean as follows (E960022-05 except since the parts are too large to ultrasonically clean, I've tailored the cleaning):

- 1) clean with Liquinox first (solution per E960022-05) and using a rubbing/scrubbing action (i.e. not just rinsing the liquinox over the surfaces). All holes must be cleaned with a brush (stainless steel, phosphor-bronze preferred, but nylon is acceptable). It is ESSENTIAL that the liquinox NOT dry before being rinsed with DI water.
- 2) Thoroughly rinse with DI water. All surfaces and holes must be rinsed THOROUGHLY.
- 3) Rinse & rub (with gloved hand only) all surfaces with either methanol or isopropal alcohol. Squirt the solvent into all holes.
- 4) Blow dry with clean, filtered air or N2, or allow to dry on a clean bench. Do not leave exposed for longer than about 15 minutes, before covering with UHV foil.

With regard to cleaning the lens, please see Stan for a confirmation, but I believe the rule that we operate under is that if all surfaces are polished, then an optics cleaning and wetting test is adequate and no baking is required. However, if the sides of the optic are not polished (as I suspect is the case for the ETM optics), then it should be cleaned and baked and re-cleaned. However, please confirm this with Stan and he may grant a waiver if he examines the surface condition of the optics.  
Dennis

Betsy Weaver wrote:

- >
- > Hi Dennis-
- >
- > Two cleaning questions for you:
- >
- > 1. We just received the aluminum load (COS) from the etching company.
- > How should we clean them here, before baking them? (They are

- > obviously too large to put in the ultrasonic cleaner...)
- >
- > 2. Mike has one large and two small lenses that are going to be
- > used in the ETM Telescope Assembly. If they wet well during cleaning,
- > do they really need to be baked? A while ago, Stan told me that the
- > small steering mirrors for IO and COS did not need to be baked, as the oven
- > would just make them dirtier, because they wetted so well during cleaning.
- > Is this the same for the lenses? If they do need to be baked, can I put
- > them in
- > the next load with the one Large Optic?
- >
- > Thanks-
- > Betsy

-  
Dennis Coyne (Detector Installation Manager)  
LIGO Laboratory, Caltech, Physics Department  
626.395.2034 @CIT / 225.686.3168 @Livingston / 509.372.8166 @Hanford  
cell 626.695.8350



## Summary of LHO Vacuum Bake Oven A RGA Data Generation

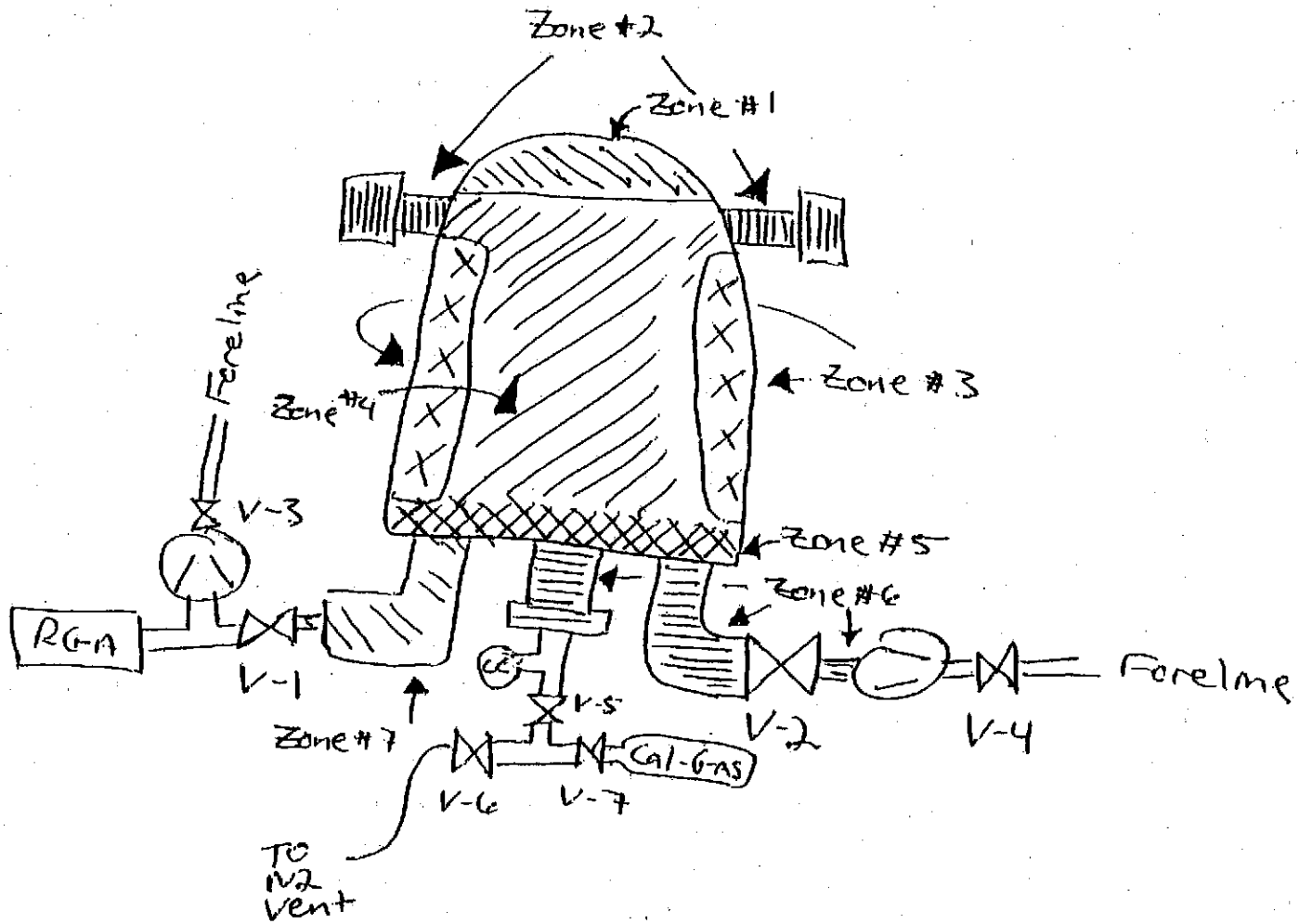
The individual parts which comprise a "load" are cleaned as per LIGO-E960022 or as allowed by waiver(s) and loaded into the bake oven. The oven is then pumped down through the main pump "arm" (through V-2, RGA arm is valved off at this point). A heating profile is programmed and baking of the system begins. A typical "heating profile" consists of ramping up to material type soak temperature, soaking for approximately 48 hours, ramping down to approximately 70C, soaking and then ramping down to near room temperature. While soaking at 70C, an RGA background scan is taken. V-1 is then opened and V-2 closed. Enough time is allowed for the system to come into pressure equilibrium and then an elevated load temperature RGA scan is taken. V-1 is then closed and V-2 opened. Following this elevated temperature scan, the load is ramped down to near room temperature and the baking portion of the process is complete. Throughout the baking, temperature data is taken to verify the actual temperatures in the various "heat zones" of the bake oven system.

Once at near room temperature, another RGA background (V-1 closed) scan is taken. Next, V-1 and the cal-gas are opened and V-2 closed. After a 30 minute pressure equilibration time, a "calibration" scan is taken. The calculated pressure of Argon (constituent of the "mixed" calibration gas) is determined using the leak rate of Argon and the pump speed of the RGA arm port as seen by the oven chamber and compared (ratio) to the maximum amp value measured for Argon in the calibration scan. This "torr/amp" ratio becomes the Calibration Factor for the given load, converting measured current to pressure.

Finally, the cal-gas is valved out and enough time is allotted to allow all traces of it to be pumped away. A "post-bake" scan is then taken. Approval of the post-bake scan is a collective "pass/fail" determination made by either Dennis Coyne (CalTech) or Stan Whitcomb (CalTech). The data collected during the "elevated temperature scan" is entered into a spreadsheet which then calculates what the outgassing rates of AMUs 41, 43, 53, 55 and 57 ought to be at room temperature. These calculations are used to determine the room temperature outgassing rates when the signals are below the RGA's sensitivity (noise floor).

Refer to the LHO Vacuum Bake Oven A logbook for the actual ordered events of the load # of interest.





**LHO VACUUM BAKE OVEN A:  
CONTENTS LOAD #67**

**B.S.C. BELLOW SERIAL NUMBER D972122-015**

**B.S.C. BELLOW SERIAL NUMBER D972122-055**

**B.S.C. BELLOW SERIAL NUMBER D972122-057**

**ELLIPTICAL BAFFLE COUNTERWEIGHT SERIAL NUMBER D990173**

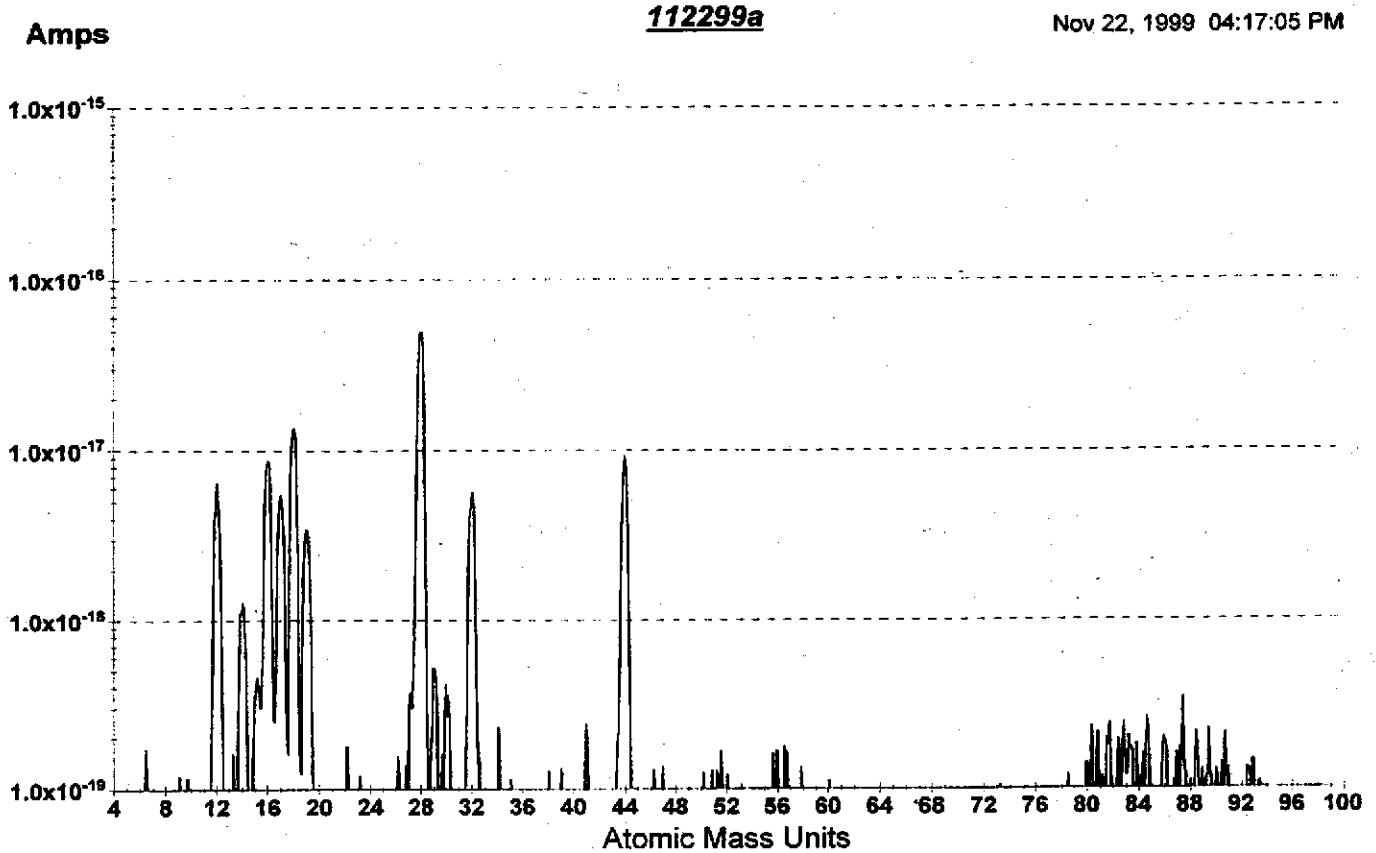
**ELLIPTICAL BAFFLE MOUNTING SCREW SERIAL NUMBER D990174**

**MISC. STAINLESS STEEL FASTNERS SERIAL NUMBER N/A**



# LHO VACUUM BAKE OVEN A LOAD #67 ELEVATED TEMPERATURE BACKGROUND SCAN

V-1 Closed



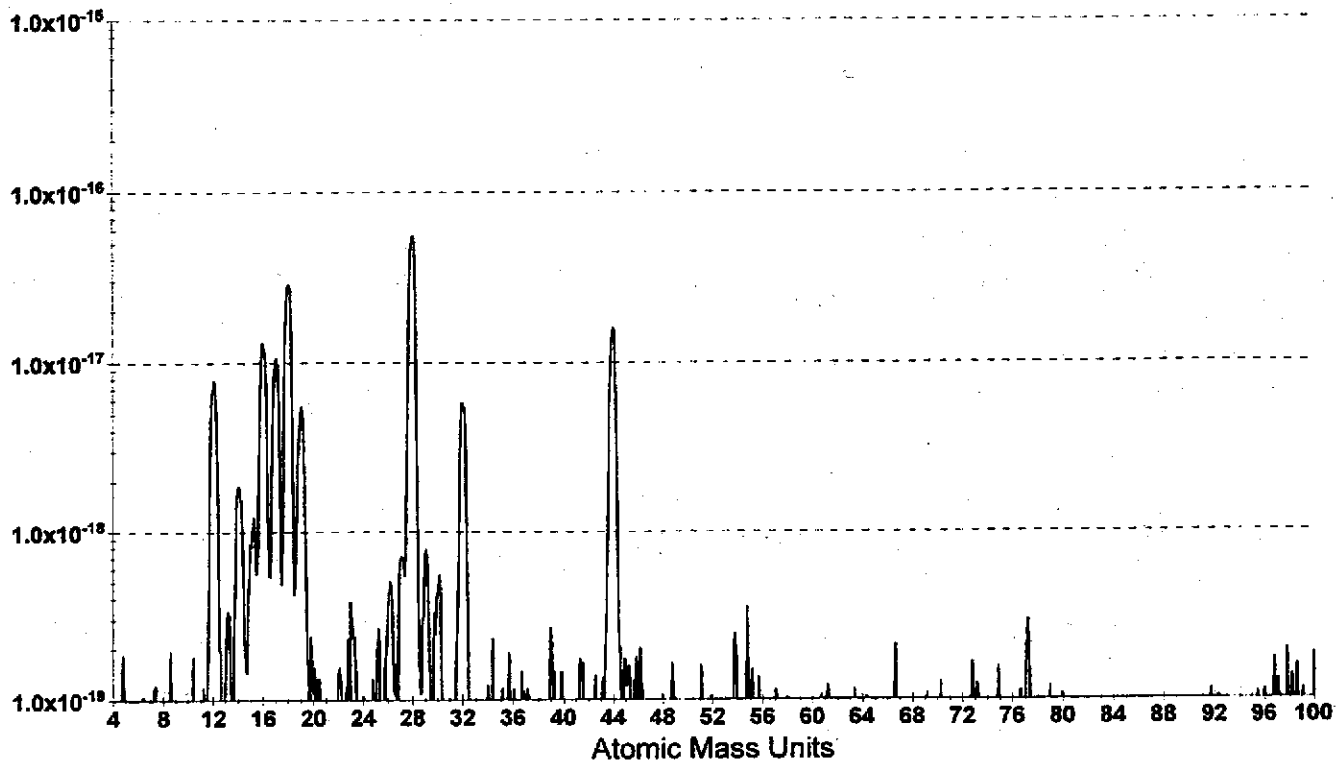
# LHO VACUUM BAKE OVEN A LOAD #67 ELEVATED TEMPERATURE SCAN

V-1 Open, Cal-Gas and V-2 Closed, 60°C

Amps

112299b

Nov 22, 1999 04:51:41 PM



## LHO Bake Oven A Load # 67

**1<sup>st</sup> Order Desorption Outgassing Rate Estimates using  $Q_{low} = SP_{low} = SP_{high} [e^{-(E_s/kT_{high})}] / [e^{-(E_s/kT_{low})}]$**

Number of units in bake load	Pump Speed (L/sec)	AMU	RGA background current (amps)	RGA current (amps) @ High Temp	Calibration Factor CF (torr/amps)	High Temp (K)	Low Temp (K)	Es/k	Extrapolated outgassing rate (torr*L/sec) @ T <sub>low</sub>
1	5	41	9.60E-20	1.40E-19	1.00E+07	3.33E+02	2.96E+02	13000	1.67E-14
1	5	43	4.00E-19	8.90E-19	1.00E+07	3.33E+02	2.96E+02	8000	1.22E-12
1	5	53	1.00E-19	below noise	1.00E+07	3.33E+02	2.96E+02	13000	#VALUE!
1	5	55	0.00E+00	3.50E-19	1.00E+07	3.33E+02	2.96E+02	15000	6.28E-14
1	5	57	1.70E-19	below noise	1.00E+07	3.33E+02	2.96E+02	15000	#VALUE!

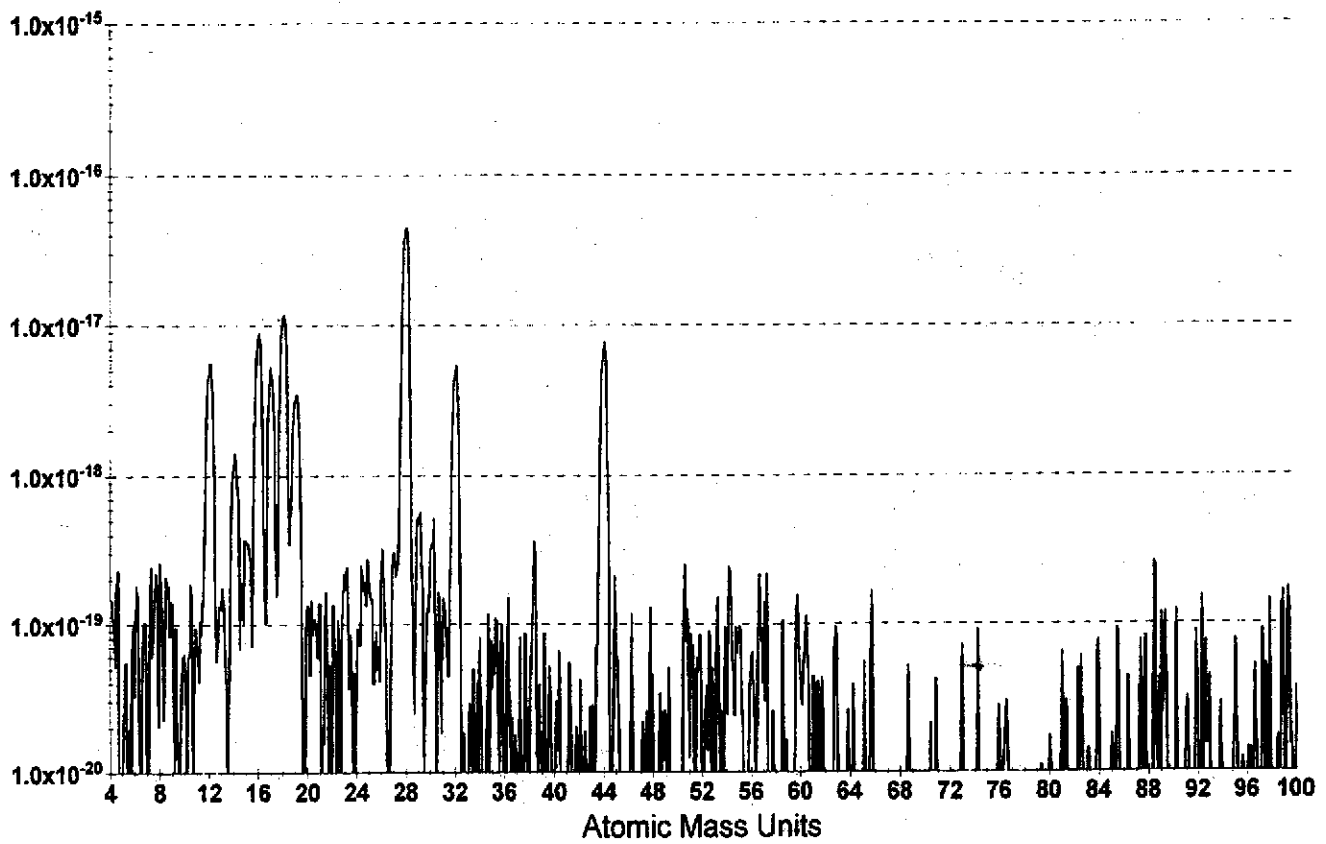
# LHO Vacuum Bake Oven A Load #67 RGA Background

V-1 closed, room temperature

Amps

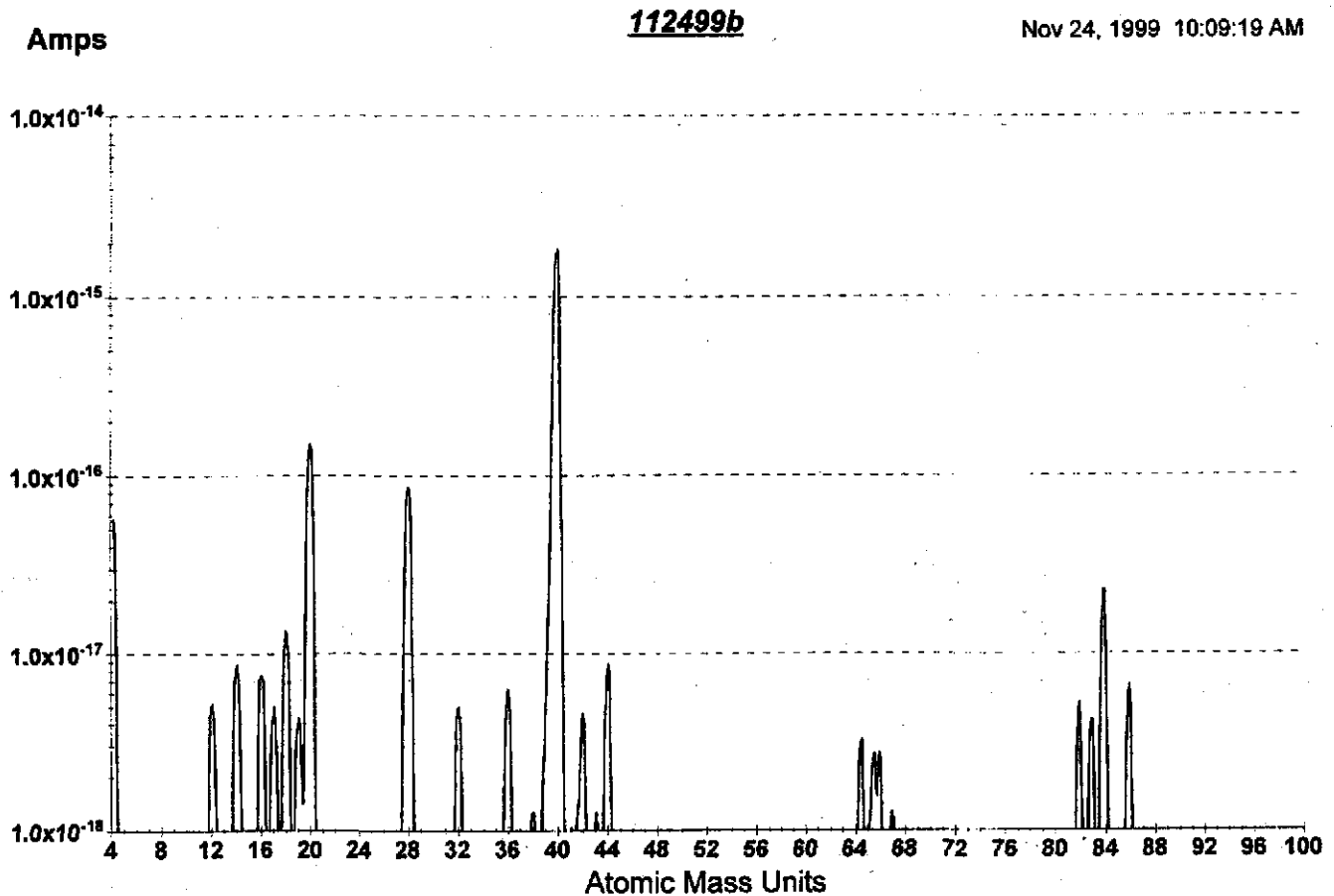
112499a

Nov 24, 1999 08:36:29 AM



# LHO Vacuum Bake Oven A Load #67 Calibration

V-1 and cal-gas open V-2 closed in pressure equilibrium at room temperature



CF defined as  $P_{(40)calc} / I_{(40)meas}$

$$P_{(40)calc} = (\text{leak rate}) / (\text{pump speed}) = (1.1\text{E-}7\text{torr}\cdot\text{L}/\text{sec})(0.86) / (5 \text{ L}/\text{sec}) = 1.8\text{E-}8 \text{ torr}$$

$$I_{(40)meas} = 1.8\text{E-}15 \text{ amps} \quad (\text{taken from 112499b.asc})$$

$$CF = (1.8\text{E-}8 \text{ torr}) / (1.8\text{E-}15 \text{ amps}) = 1\text{E}7 \text{ torr}/\text{amps}$$



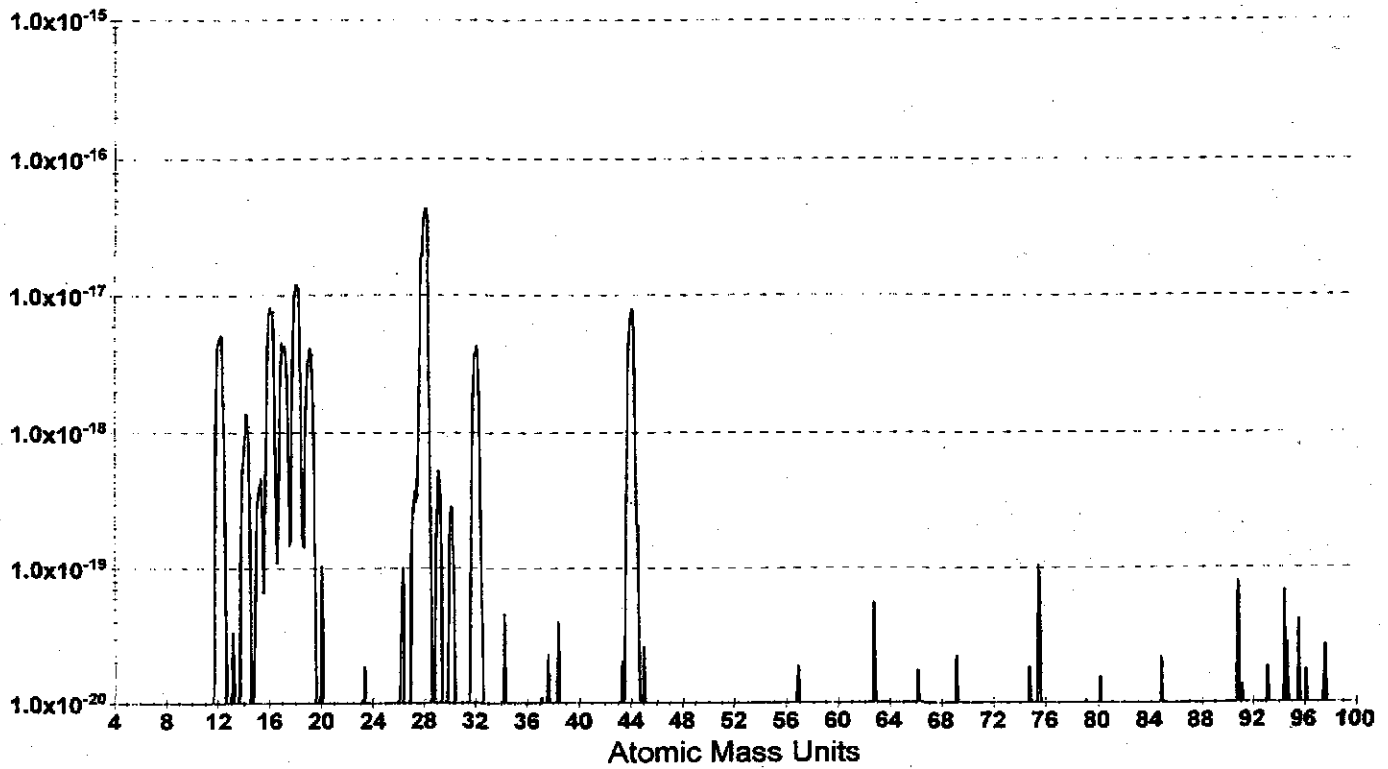
# LHO Vacuum Bake Oven A Load #67 Post-Bake Scan Room Temp.

V-1 open, Cal-Gas and V-2 Closed

Amps

112499c

Nov 24, 1999 12:23:01 PM



# LIG PROCESS TRAVELER

DCC Number: **E990159-00-D**  
 Date Prepared: **4/13/99**

Originator	Cognizant Engineer	Ext./Phone#	Project	Account Number
Michael Smith	Michael Smith	2092	COS	5F515
Dwg/Part Number	Rev	Part Description	Serial Number	Qty
D990173	00	ELLIPTICAL BAFFLE COUNTER WEIGHT ASSY		1
D990174	00	Counterweight, Elliptical Baffle, CRES Mounting Screw, Elliptical Baffle, CRES		2
Used In (next higher assembly):		D990014-A-D, Elliptical LOS Baffle Assembly		

Vendor Name	PO/Contract Number

**Data Package, Receiving/Inspection Remarks:**

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
N	N			

**Process Flow:**

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Control Point	NA	NA		NA	NA
2	Pack and ship	4/14/99	CIT		M. Smith	
4	Clean parts		LHO	CRES material, per LIGO-E960022	B. Weaver <i>(initials)</i>	4/19/99
5	Vacuum Bake		LHO	CRES material, per LIGO-E960022	Kyle Ryan <i>(initials)</i>	4-20-99

CLEAN PER 960022 11-18-99 LHO SCAM#

*(Signature)*  
 B. R. N. Z. A. 11-18-99

*N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.*

# LIC PROCESS TRAVELER

DCC Number:

E990159-00

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.						
6	Control Point		LHO	Review/approve RGA: scan # <u>1124990.RCA</u> #67 scan # _____ scan # _____ scan # _____ scan # _____ scan # _____ scan # _____ Note: attach RGA scan(s) to this traveler.	<del>Kyle Ryan</del> <i>BRN</i> <i>KRW</i>	12/10/99						
7	Box for shipment			<table border="1"> <thead> <tr> <th>No.</th> <th>Qty per package</th> <th>Part</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1 sets</td> <td>metal parts</td> </tr> </tbody> </table> <p>(see also qty. for each shipping destination below)</p>	No.	Qty per package	Part	1	1 sets	metal parts		
No.	Qty per package	Part										
1	1 sets	metal parts										

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
8	Ship					
			Ship Qty.		Part Description	
			No.	LHO LLO Other		
			1	1 assy		metal parts
			LHO:	Attn: Betsy Weaver, COS LIGO Hanford Observatory (LHO) Specific Purpose: ITMy elliptical baffle		
			LLO:	Attn: <u>NA</u> LIGO Livingston Observatory (LLO) Specific Purpose: _____		
END: Go to Traveler associated with next higher assembly processing						

**Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:**

Attention: Betsy Weaver, hold cleaned and baked parts for Michael Smith COS assembly on 4/19/99

Recleaning & Baking for cleanliness purposes. (BW) 11/17/99

# LIGO PROCESS TRAVELER

E990428-00-X

DCC Number: E98-00-X

Date Prepared: 12-1-99

Originator <u>BARTIE RIVERA</u>	Cognizant Engineer <u>MIKE FINE</u>	Ext./Phone# <u>626-395-3307</u>	Project <u>LIGO</u>	Account Number <u>5FS11</u>
Dwg/Part Number <u>D970122</u>	Rev	Part Description <u>B.S.C. BELLOWS</u>	Serial Number <u>015,055,057</u>	Qty <u>3</u>
Used In (next higher assembly):		<u>B.S.C. TOP ASSEMBLY</u>		
Vendor Name <u>SENIOR FLEXONICS</u>			PO/Contract Number <u>P PC 299000</u>	

**Data Package, Receiving/Inspection Remarks:**

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
<u>Y</u>			<u>B-RIVERA</u>	<u>11-17-99</u>

**Process Flow:**

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Clean & Vacuum Bake per LIGO Vacuum Prep. Form	<u>11-17-99</u>	<u>CIT</u> <u>LHC</u>	per E960022-A	<u>B-RIVERA</u>	<u>11-22-99</u>
2	Control Point		<u>NA</u>	Review/approve RGA scan # <u>112499C-12C14</u> <u>#67</u>	<u>B-RIVERA</u>	<u>12/1/99</u>
3	Wrap & Tag vacuum clean parts per E960022-A		<u>CIT</u>	<u>1</u> per package	<u>B-RIVERA</u>	
4			<u>CIT</u>	<b>Note: Copy this traveler and give to the DCC</b>		

END: Go to Traveler associated with next higher assembly processing

*N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.*

**LIGO PROCESS TRAVELER**

E990108-00-X

**Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:**

**DCC Number:** E98 \_\_\_ -00-X


# LIGO PROCESS TRAVELER

E 0003 01-00  
 DCC Number: E98-00-X  
 Date Prepared: 1-3-99

Originator <b>B. RIVERA</b>	Design Engineer <b>K. Ryan</b>	Dwg/Part Number <b>8129</b>	Project <b>LIGO</b>	Account Number
Dwg/Part Number <b>N/A</b>	Rev. <b>N/A</b>	Part Description <b>Custom nipples for class 100 PURGE AIR connection to HAM 6/10</b>	Serial Number <b>N/A</b>	Qty <b>9</b>
Used In (next higher assembly):		<b>ERSETT KOR</b>		

Vendor Name <b>NOR-CAL</b>	PO/Contract Number <b>P N/A</b>
-------------------------------	------------------------------------

Data Package, Receiving/Inspection Remarks:

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
YES	NO		B. RIVERA	12-23-99

Process Flow:

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Clean & Vacuum Bake per LIGO Vacuum Prep. Form	12-23-99	CIP LHO	per E960022-A		
2	Control Point		NA LHO	Review/approve RGA scan #128999C-RCA	B. RIVERA	12-29-99
3	Wrap & Tag vacuum clean parts per E960022-A	1-3-00	CIP LHO	1 per package	BRW	1/4/00
4			CIT		B. RIVERA	1-3-00

END: Go to Traveler associated with next higher assembly processing

**N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.**

# LIGO PROCESS TRAVELER

Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:

DCC Number: E00001-00-X  
E98-00-X
