

This document covers the technical content for acceptance review of a subset of the Advanced LIGO (aLIGO) installation. See document [M1300468](#) for an overview of the aLIGO acceptance process. Acceptance by Systems Engineering is to be indicated in the metadata for this document in the LIGO Document Control Center (DCC).

1 Installation Instance/Subset Definition

Insert a brief description of the subset of the aLIGO equipment which is covered under this installation acceptance document. Complete the entries in the following table. If elements of the table are not applicable, enter "not applicable".

This installation covers the BSC chamber LBSC1 and all of the equipment within and attached plus associated electronics racks.

Interferometer [<i>L1 or HI</i>]:	L1
Building(s)/Room(s): [<i>e.g. corner/LVEA</i>]	LVEA
Vacuum Chamber(s):	LBSC1
Electronics Rack Designation(s): <i>All drawings for the racks can be found by navigating through G1001032</i>	L1-SUS-R6 L1-SEI-C4 L1-SUS-C5. Note that the Capacitive Position Sensor readout boxes which sit on the cable trays do not have an official designation.
Optics Table(s)/Enclosure(s) Designation(s), and other equipment/assemblies related to this installation:	TCS-Y Table, STS-2 Ground Seismometer, Cryopump Manifold Baffle (CMBY).

2 Procedures

If there are any caveats or explanatory notes regarding the procedure documentation cited in the table below, then add these notes to the table entries.

Baseline or initial Installation Procedure(s): <i>[enter linked DCC document #(s); found under E1200023]</i>	E1200634 -v9 was the initial procedure
As-Built/Installed Procedure(s), either: <ol style="list-style-type: none"> a) Enter hyperlinked DCC number for revised or red-lined baseline install procedure, and/or b) Enter hyperlinked DCC number for separate document with installation notes on deviations, changes in procedure, changes in tooling, etc., and/or c) Enter a list of hyperlinked electronic log entries detailing the experience in applying the baseline installation procedure 	No as-built notes were recorded in document E1200634. However some as-built notes ("red lines") were recorded in the file name BSC2BSC1INSTALL.pdf which is filed as an "other file" with E1200344 -v4, the BSC Cartridge installation procedure. This installation event (including cartridge weight measurement) was occurred 12 Nov 2012 and was



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	recorded in LLO elog #5322
Baseline or initial Alignment Procedure(s): <i>[enter linked DCC document #(s); found under E1100734]</i>	E1200640-v5 was the initial procedure
As-Built/Aligned Procedure(s), either: a) Enter hyperlinked DCC number for revised or red-lined baseline alignment procedure, and/or b) Enter hyperlinked DCC number for separate document with alignment notes on deviations, changes in procedure, changes in tooling, etc., and/or c) Enter a list of hyperlinked electronic log entries detailing the experience in applying the baseline alignment procedure	E1200640-v7 is the as-built alignment procedure, with embedded notes. The LBSC1 cartridge alignment was recorded in LLO elog #4975 The ACBy, CMBBy installation was recorded in LLO elog #8779 The in-chamber ITMy alignment was completed. The only information recorded is the numbers quoted in LIGO-E1200640-v7 . The ITMy ACB alignment was recorded in LLO elog #9796 The CO2P relay optics alignment was recorded in LLO elog #8729 , #10914 OptLev alignment: #9582

3 Drawings

Enter hyperlinked DCC document number(s) for each drawing in the table below. If elements of the table are not applicable, enter "not applicable". All chamber-level, assembly drawings can be found listed at [E1200562](#) and found linked under [D0901491](#).

Applicable Building/Room Top-Level Drawing(s):	D0901466 aLIGO Systems Layout LLO Corner Station
Top-Level Chamber Assembly Drawing(s):	D0900442 aLIGO Systems, LBSC1-L1 Top Level Chamber Assembly
Electronics Rack Drawing(s):	All drawings for the racks can be found by navigating through G1001032 .
Optics Table/Enclosure Drawing(s):	LIGO-D1000634 TCS CO2P Table Assembly, H1/L1
ITM Optical Lever Drawing(s):	LIGO-G1000700 Floor Occupancy, Optical Levers, LLO Corner Station and
Cryopump Manifold Baffle Dwg(s):	LIGO-D0902617 aLIGO_Manifold_Cryo_Baffle_Assembly, ITM



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4 Serial Number Records

Serial numbers are used to track a subset of the parts, particularly active elements (see [M1000051](#)) and electronics (with S-numbered documents; see [T0900520](#)). Enter the hyperlinked DCC document number(s), and name(s) for the highest level assembly(ies) covered by this installation acceptance document in the table below. Also enter the hyperlink to the ICS entry for the instance of this assembly in the Inventory Control System (ICS). If elements of the table are not applicable, enter "not applicable". If elements of the table are not available/missing, then enter "not available".

Assembly DCC D-Number	Assembly Name	ICS entry
D0900442	aLIGO Systems, LBSC1-L1 Top Level Chamber Assembly	https://ics-redux.ligo-la.caltech.edu/JIRA/browse/ASSY-D0900442-NA
D1000513	HEPI	N/A (assembly and install done in 2004, before ICS)

5 Testing

All post-installation, stand-alone, in situ, checkout/testing (phases 2 and 3 per [M1000211](#)) must be completed, be successful and be documented:

- phase 2: pre-installed, post-storage, test results for the assembly (testable item)
- phase 3: stand-alone, in situ test results for the assembly (testable item)

Note that integrated testing (phase 4 testing per [M1000211](#)) is covered under the system acceptance review, not this installation acceptance review. In the table below, enter hyperlinked DCC document number(s) for all of the relevant testing for the major subassemblies/subsystems covered within this installation instance/subset. If elements of the table are not applicable, enter "not applicable". If elements of the table are not available/missing, then enter "not available".

Subsystem	Testable Item	DCC document numbers	
		Phase 2	Phase 3
SEI	BSC-ISI	LIGO-E1100856	
SEI	HEPI	N/A	E1300930
SUS	BSC1 Suspension (under <i>Test Results</i>)	E1300917	
AOS/SLC/Viewports	Leak and pressure testing.	E1200445 Leak and pressure testing was completed, refer to above link. All viewports were tagged at time of inspection and testing.	Visual inspection in-situ not completed, refer to bug list.



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AOS/ OptLev	ITMy OptLev Impulse Hammer Modal Testing	T1100152	Not completed.
AOS/CMB	Impulse Hammer Modal Testing	8618	
AOS/TCS/ RHy	Collection, refer to link.	N/R	T1300495 and G1400018
AOS/TCS/ CO2Py	Collection, refer to link.	N/R	T1300495 and G1400018
ESD	ESD install/testing for the quads	(E1300848)	LBSC1 has its wires cut and is not cabled. Refer to TRB recommendation and subsequent management decision at L1200291 .
AOS/ACB	Photodiode continuity testing. In-situ operation.	Note completed for LBSC3. Refer to E1300375 for LBSC4. Not envisioned at start. Diodes used for alignment of beam thus confirmed working.	
AOS/ACB	Impulse Hammer Modal Testing	One instance of testing completed, refer to LHO e-log entry 8656 .	

6 Installation Completeness

If/as applicable, provide a hyperlink reference to a list of remaining tasks to be completed before the installation is finished (i.e. a 'punch' list).

Installation tasks remaining to be completed:	All items are installed.
ICS Assembly Record needs to be updated	There are some issues with ICS which are affecting this task. Some TCS and SLC records have been added but do not appear. Still need to add viewports, Oplev periscope and perhaps misc. other items to the ICS records.



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7 Installation/Integration Issues and ECRs

If/as applicable, provide a hyperlinked list of integration issues and Engineering Change Requests (ECRs) encountered during installation and which are relevant to the installation subset/instance covered by this acceptance document. See [M1300323](#) for a description of the Integration Issue and ECR Tracker.

Tracker # [hyperlinked]	Title/description
#821	LBSC1 (ITMY) Issue Tracker
#761	In Situ, Visual Inspections of All Viewport Windows
#20 closed	ECR: Change the CP design (wedge angle direction) in the ITMy suspension assembly
#63 closed	ECR: Dog Clamps for SLC suspended baffles
#118 closed	ECR: HEPI medm screen update
#182 closed	ECR: BSC-ISI and HEPI MEDM
#186 closed	ECR: Topology Changes to SUS models as a result of ISC Informed Interaction
#205 closed	ECR: Add Cartesian bias monitoring and offsets to the ISI models
#207 closed	ECR: Model and screens update to allow sensor correction to the ISI using Ground seismometers (STS-2)
#217 closed	Coil Driver was giving over-temp warnings. Replaced with a spare
#283	CPS Circuit Modification to eliminate a high frequency oscillation
#355 closed	ECR: Modify HAM-ISI and BSC-ISI simulink control filters to monitor gain for ODC
#375 closed	ECR: Migrate the ISI Checker Script functions to the frontend code
#385 closed	ECR: create science frame channels for the SEI models
#445 closed	ECR: Update the SAFE level for the BSC and HEPI model watchdog
#482	ECR: ODC changes in SUS, SEI, HPI and PSL
#487 closed	ECR: Remove ISI IPC links which come from SUS offload
#500 closed	ECR: HEPI MEDM Update
#530 closed	ECR: update to the HEPI master model and related MEDM screens



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#551 closed	ECR: HEPI script update
#650	ECR: ISI model update - Jan 2014
#721	ECR: Replace the custom cartesian-bias-ramping code with cdsFiltCtrl2 parts
#722	ECR: Adding Independent ASC IPC Paths for Dither Alignment to Most SUS
#615	Unresponsive GS13 (V2) on ITMY (BSC1)
#202 closed	Locked ACB mass on STAGE 0