



LIGO- E1101021-v4	08/14/12
AOS SLC ITM Elliptical Baffle Installation Procedure	
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CHANGE LOG

Date, version	Summary of Changes
2012-04-26 V2	<ul style="list-style-type: none"><input type="checkbox"/> Corrected Cal Tech Mail Stop address<input type="checkbox"/> Pasted sections from the arm cavity baffle installation procedure. The procedure is similar and needs to be modified to reflect the requirements of the ITM elliptical baffle.
2012-05-16 V3	<ul style="list-style-type: none"><input type="checkbox"/> Edited pastes in V2, reformatted
2012-08-14 V4	<ul style="list-style-type: none"><input type="checkbox"/> Removed inaccurate references to ACB<input type="checkbox"/> Updated installation procedure<input type="checkbox"/> Highlight areas of concern



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1 SCOPE

This document describes the assembly and installation procedures for the ITM Elliptical Baffle. Two ITM Elliptical Baffles are required for each interferometer. Both are located in the BSC2 chamber along with the beam splitter.

The scope of this procedure is installation of for the ITM Elliptical Baffle sub-assemblies (see Figure 1), which are defined in the following documents:

- [D1003238](#): AOS ITM Elliptical Baffle Final Assembly H1/L1
- [E1101039](#): BOM_aLIGO AOS ITM ELLIPTICAL BAFFLE FINAL ASSY
- [T1100446](#): ITM Elliptical Baffle Final Design

All of these documents are provided as “related document” links in the Document Control Center (DCC) entry for the top level chamber assembly drawing, [D1003238](#).

The ITM Elliptical baffle assembly is shown in Figures 1 and 2.

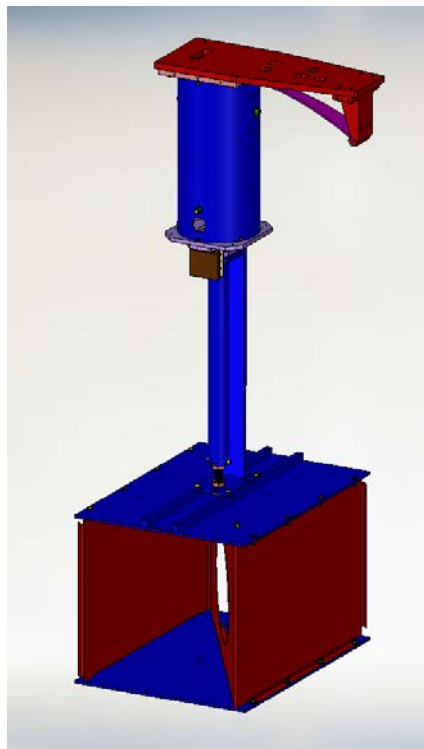


Figure 1: ITM Elliptical Baffle

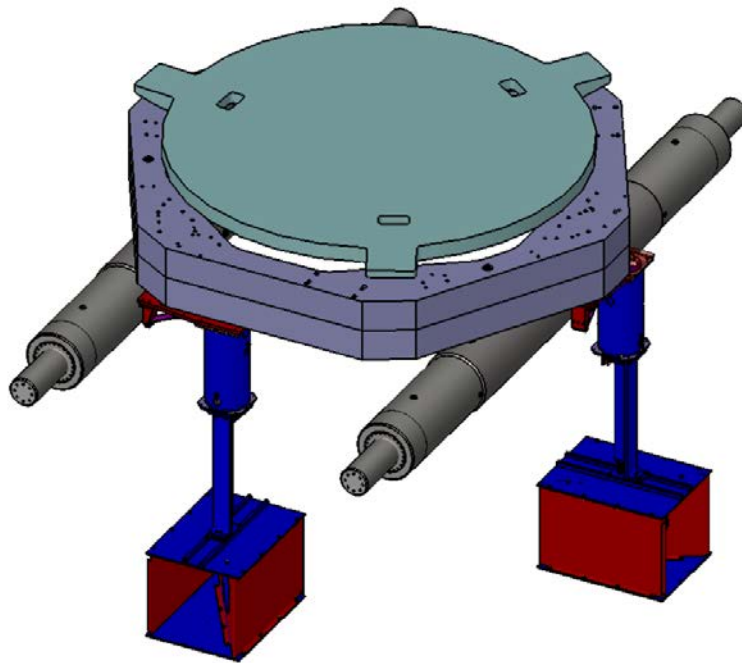


Figure 2: Elliptical Baffles mounted on stage 0.

The 102 lb ITM Elliptical Baffle is suspended from the ISI Stage 0 inside the BSC, as shown in Figure 3.

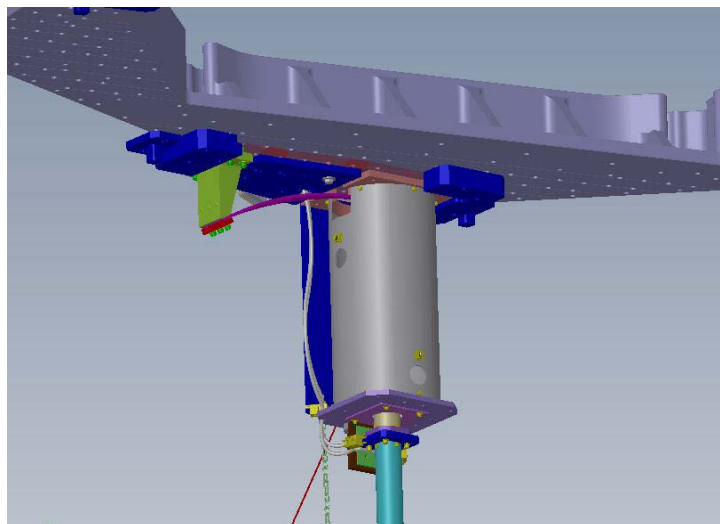
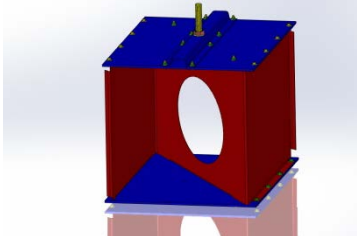
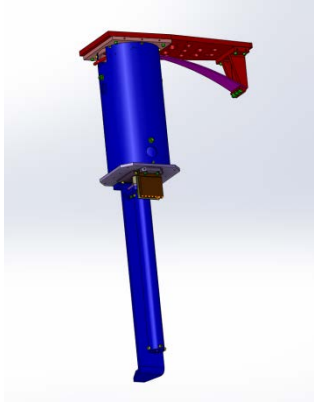
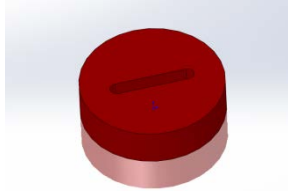


Figure 3: Baffle & Beam Dump Suspension, Mounted to ISI Stage 0

This installation includes the following major sub-assemblies and components:

Assy Dwg	Sub-Assembly Name	Image
D1101806	aLIGO ITM Elliptical Baffle Assembly	
D1101885	aLIGO ITM Elliptical Baffle Suspension Assembly including: Baffle Tube Up Assy. (D1002582) Baffle Tube LO Assy. (D1101887) Baffle Blade Assy. (D1200140) SLC Eddy Current Damping Assy. (D1002564) NOTE: The Arm Cavity Baffle Suspension Assembly must have the following tooling attached: “ACB Bend Fixture Holder Assembly” (D1102325) with “Bend Fix Plate Handle” (D1102193-02) removed and attached to the Suspension Stand with wire, “Transport, Locking, ACB” (D1101285), and “Height, Adjustment, ACB” (D1101578). NOTE: “ACB_Stage Zero Interface Fixture Mover” (D1101700) must <u>NOT</u> be installed.	
D1200779	1.25 lb. Baffle Balancing Weight	

This procedure starts with the integration of the ITM Elliptical Baffle Assemblies on the Arm Cavity Baffle Installation Stand ([D1101957](#)) and then proceeds to the integration of the assemblies onto the ISI stage 0 in the LBSC2 chamber. The Elliptical Baffles will not be installed onto the BSC2 “cartridge assembly” during its integration on the test stand outside the BSC2 chamber as the Elliptical Baffles will interfere with the BSC test stand. The Elliptical Baffles will be installed after the ISI assemble is integrated into the BSC2 chamber. Alignment is done once the baffles are installed in the chamber.

2 INSTALLATION ONTO THE TEST STAND

2.1 Required Equipment List

All of the following items must be cleaned to Class B per [E0900047](#):

1. ACB Installation Stand ([D1101957](#)) 1 each
 - a. ACB Stage 0 Narrow Guide Block" ([D1101595](#))
 - b. ACB_Stage Zero Narrow-Dog Clamp, End" ([D1101613](#))
2. Lifting Table ([D1002192](#)) 1 each
3. Tall step ladders for reaching top of Test Stand 3 each
4. Wedge Lift, Baffle, Suspension Table ([D1101952](#)) 3 each
5. Suspension Lift Table ([D1102061](#))
 - a. Table, Secondary, Suspension ([D1101962](#))
 - b. Dog Clamps" ([D1001376-2](#)) 4 each
6. SHCS (1/4-20 x .62") 2 each
7. SHCS (3/8-16 x 2 1/2") 9 each
8. 3/8" washers 9 each
9. 3/16" Hex Allen tool for 1/4-20 SHCS 2 each
10. 5/16" Hex Allen tool for 3/8-16 SHCS 2 each
11. Plain Grip Looped T-Handle Hex Key 3/16" Hex 2 each
12. Dog clamps for mounting to the Test Stand 12 each

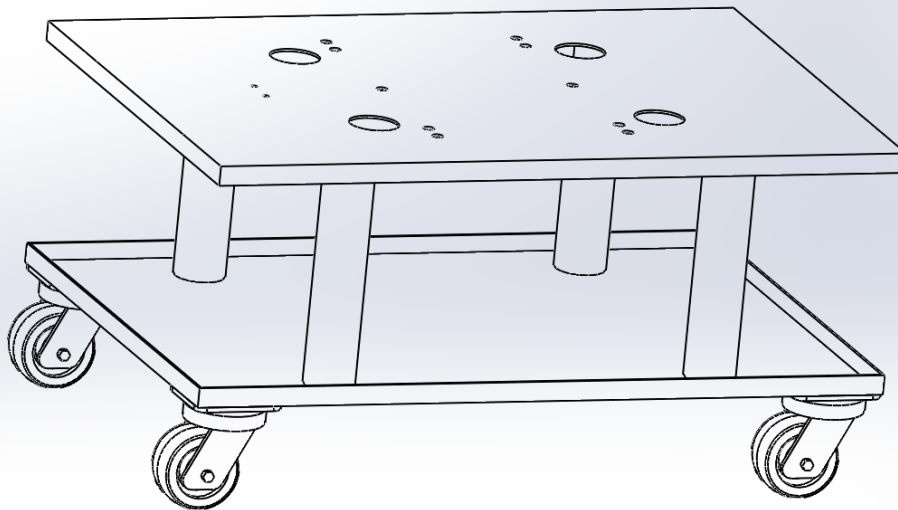


Figure 4: Modified Rolling Cart ([D1002192](#)). Note: the stock rolling cart (Vestil MT-2436-LP) needs to be modified so that the Installation Stand can be centered on the lifting table.

2.2 Assembly of ACB Installation Stand ([D1101957](#))

Need a procedure!

2.3 Test Stand Installation Preparation



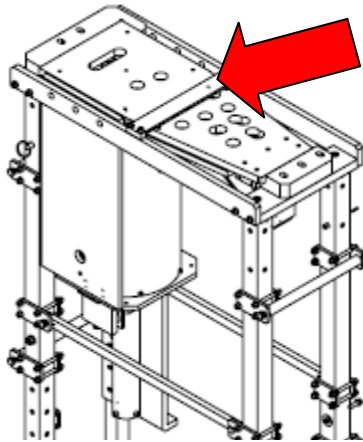
- Adjust position of lifting Table ([D1002192](#)) to sit directly below Baffle attachment area on Test Stand.
- Verify Jacks are in completely collapsed state.

2.4 ITM Elliptical Baffle Suspension Assembly ([D1101885](#)) Installation onto Test Stand

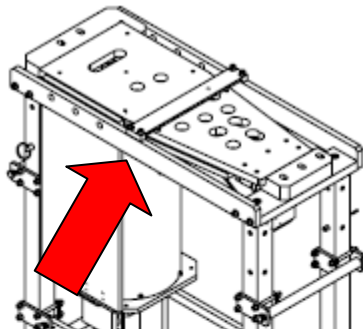
- Position the **ACB Installation Stand** ([D1101957](#)) on the clean room floor on top of aluminum foil
- Remove the upper clamp [D1102062](#) - save the hardware for later use
- Remove both side beams [D1102026](#) - save the hardware for later use
- Place **ACB Stage Zero Narrow-Dog Clamp, End** ([D1101613](#)) on top of stand at the side nearest the three horizontal clearance holes in the side beam
- Place **ACB Stage Zero Narrow Guide Block** ([D1101595](#)) on top of stand on the other side
- Verify that the short transport bracket [D1101285](#) and the long transport bracket [D1101578](#) are attached
- Using two people, lift the ITM Elliptical Baffle Suspension Assembly ([D1101885](#)), while a third person holds the stand, and place the Stage Zero Interface plate on top of the stand between the Narrow-Dog Clamp and the Narrow Guide Block with the wide end of the interface plate next to the Narrow-Dog Clamp.



- Replace and fasten the upper clamp [D1102062](#) and the side beam [D1102026](#) with the saved hardware
- CHECK THE LEVEL OF THE MOUNTING SURFACE OF THE TEST STAND! It is PARAMOUNT that this surface be level to within 0.14 deg. This will ensure that the upper tube can be positioned after balancing to within 1 mm of the centerline position of the earthquake stop flange opening and allow a range of motion > 2 mm of the upper tube.
- Using two people carry the Elliptical Baffle Suspension Assembly” ([D1101885](#)), which is secured in the expandable “Installation Stand” (D1101957) in its collapsed and locked configuration, and carefully place it on top of the “Table, Secondary, Suspension” (D1101962); the **orientation on the table should match the orientation of the Elliptical Baffle Box when it is installed later**. Total weight is about 100 lbs. There are handles on the Installation Stand for lifting and carrying.
NOTE: Two people remain on each side of the “Suspension Lift Assembly” (D1101953).
- Secure Installation Stand to Secondary Table with the four Table Dog Clamps attached to the Table. **Note: We need to tap new holes on the Secondary Table so that the Installation Stand can be positioned at the middle of the Secondary Table for ease of access to the two lifting people.**
- Loosen Table Dog Clamps that secure the Installation Stand and align to placement location on Test Stand.
- Tighten Table Dog Clamps to secure Installation Stand.
- With Installation Stand secured, remove four SHCS and “Upper Clamp” (D1102062) from top of Installation Stand. Remove parts and set aside.



- Remove four 1/4-20 SHCS and “SIDE BEAM” (D1102026) from Installation Stand on both sides of the Installation Stand. Remove and set aside.



- Crank the lifting table to the **lowest** position.
- Two people grab the lifting bars on each side of the **Installation Stand** and a third person removes the locking pins that secure the telescoping legs. Raise the installation stand to the nearest telescoping leg locking hole that brings the installation stand closest to the Test Stand mounting surface. Insert the locking pins and secure the telescoping legs.
Note: we need a better platform for the two lifting people to stand on during the lifting.
- Slowly crank the lifting Table (D1002192) upwards lift the Installation Stand while positioning it to align the Interface Mounting Plate to the Test Stand plate mounting locations. Continue cranking until top of **Interface Mounting Plate** touches the Test Stand.



- Remove four 1/4-20 SHCS and “SIDE BEAM” (D1102026) from each side (one at a time, clamping that side before removing the other side).
- Attach **Interface Mounting Plate** (D1001700) to Test Stand with available Dog Clamps, screws and shims.



- Slowly crank the lifting Table (D1002192) downwards with attached **Installation Stand**. Watch the Suspension Assembly for any possible obstruction. Note: Describe the rework needed to keep the installation stand from catching on the bolt heads of the dog clamps.
- Loosen the four Table Dog Clamps on the Table securing the Installation Stand, rotate to release Stand and tighten.
- Carefully remove empty Installation Stand and set aside.
- Remove the twelve 1/4-20 SHCS attaching the **Secondary Table** to the **Lift Table**. Set screws aside for use in next step.
- Carefully remove the **Secondary Table** and set aside.



2.5 ITM Elliptical Baffle Assembly ([D1101806](#)) Installation onto Suspension Assembly

2.5.1 Required Equipment List

All of the following items must be cleaned to Class B per [E0900047](#):

- | | |
|--|--------|
| 1. Plain Grip Looped T-Handle Hex Key 3/16" Hex | 2 each |
| 2. Wedge Lift, Baffle, Suspension Table (D1101952) | 2 each |
| 3. 3/16" Hex Allen tool of 1/4-20 SHCS | 2 each |
| 4. Slide, Baffle Carrier Assembly (D1101958) | 1 each |
| 5. 3/8" Wrench for #10 Shoulder Screw Nut | 1 each |
| 6. 1/8" Hex L-Key tool for #10 Shoulder Screw | 1 each |
| 7. SHCS (1/4-20 x 7/8") | 4 each |

2.5.2 Procedure

- Use the lifting Table (D1002192) that was used for installation of the Suspension Assembly and crank it to the lowest level. Verify Jacks are in completely collapsed state.
- Attach the two Wedge Lifts, Baffle, Suspension Table (D1101952) to Jacks with eight 1/4-20 SHCS.
- Set the "Slide, Baffle Carrier Assembly" (D1101958) into guides on top of the Table.
Note: the D1101958 was not used in this step. Should it have been?
- Two people must assist with the lift of the **Elliptical Baffle Assembly** ([D1101806](#)). The **Baffle Box** weighs about 45 lbs. Carefully lift the **Baffle Box** and place centered onto **Slide Assembly** which is on the **Table**.
Note: the screws on the bottom of Elliptical Baffle Assembly interfere with the wedge lift table; we placed additional shims under the box to lift the screws away from the wedge lift table. Perhaps, the "Slide, Baffle Carrier Assembly" (D1101958) should have been underneath the Elliptical Baffle Assembly?
- Install the balance weights in their nominal positions depending upon the specific Elliptical Baffle installation.
- Position the **Baffle Box** under the Suspension Assembly, stopping at the approximate location needed to mate the **Baffle Box Assembly** with the **Suspension Assembly**.
- Crank lifting Table (D1002192) upwards to lift the **Baffle Box Assembly** and align to top hinge plate at bottom of **Suspension Assembly**. Adjust **Baffle Box** position by moving the cranked lower lifting table as needed for alignment. Continue lift until plates touch.
- Attach four 1/4-20 SHCS through Top Plate on Suspension Assembly to Baffle Box Assembly.
- Slowly crank the lifting table downwards until the lifting table is approximately one inch below the bottom of the ACB box.



3 INITIAL BAFFLE BALANCE

3.1 Required Equipment List

All of the following items must be cleaned to Class B per [E0900047](#):

1. 3/16" Hex L-Key tool for 1/4-20 SHCS 2 each

3.2 Procedure

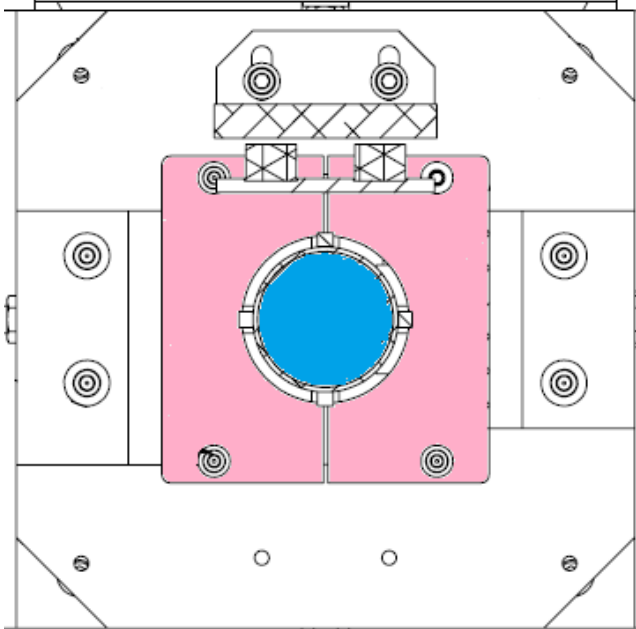
Note: The following balancing steps are critically dependent upon the mounting surface of the Test Stand being level.

- Verify Transport, Locking, ACB (D1101285) is in place.
- Loosen two SHCS in the slotted holes of D1101285 attached to the Lo Tube connector plate D1002618 so that the lo tube can slide freely in the vertical direction.
- Remove "Height, Adjustment, ACB" (D1101578) and hardware. Set aside with hardware for **Step 2.6.10.**
- Slowly lower the lifting table with the crank while watching to see if the "ACB Bend Fixture Holder Assembly" (D1102325) pulls away from the interface plate.
 - o **If the bend fixture becomes free, stop!! Raise the lifting table with the crank until the bend fixture is again captured by the tip of the blade spring.**
 - o **Remove some of the free balance weights and repeat [step 2.6.2](#), continuing to repeat this process and removing weights until there is a stable gap of approximately 0.010 between the bend fixture and the interface plate after the lifting table has been lowered so that it no longer supports the ITM Elliptical Baffle. At this point, the proper amount of balance weight has been determined.**
 - o **If, after removing all of the free balance weights, the baffle is still hanging too low, as seen by observing the gap between the hole in the upper tube and the earthquake rods, proceed to the following steps**
- Estimate the vertical offset of the upper tube within the earthquake stop rods, and note this dimension.

Vertical offset dimension		mm
---------------------------	--	----

- Verify that the "ACB Bend Fixture Holder Assembly" (D1102325) is in place.
- Remove the Elliptical Baffle Assembly from the Test Stand following the procedure of section 4; disassemble the Suspension Assembly and repeat the assembly step described in [E1100867](#) in which the length of the pivot rod was set by screwing it into the upper tube. However, this time insert the pivot rod into the upper tube by the additional amount noted in [2.6.3.4](#) to raise the upper tube within the earthquake rod holes.
- After repeating all of the balance steps above beginning with [2.6.3](#), proceed to the following steps.
- Remove the "ACB Bend Fixture Holder Assembly" (D1102325).
- Remove Transport, Locking, ACB" (D1101285) and save parts and hardware for future use.
- Balance the ACB in the axial and transverse directions by shifting the balance weights axially and laterally until the "SLC Baffle Tube Up Assembly" (D1002582) is evenly spaced inside "SLC Earthquake Stop Ring" (D1001120) circumference.

Note: DO NOT ROTATE THE ELLIPTICAL BOX ASSEMBLY WHILE THE TRANSPORT, LOCKING, ACB” (D1101285) IS REMOVED!!



- Adjust and re-position weights on top of baffle to balance suspended assembly. Additional weights may be required.
- When balancing is complete, re-attach “**Transport, Locking, ACB**” (D1101285) and “**Height, Adjustment, ACB**” (D1101578).

NOTE: Do NOT re-insert “**ACB Bend Fixture Holder Assembly**” (D1102325).

- Note: steps 2.6.11 – 2.6.13 may be eliminated with the redesign of the counter weights.**

4 REMOVAL FROM THE TEST STAND

4.1 Preparation

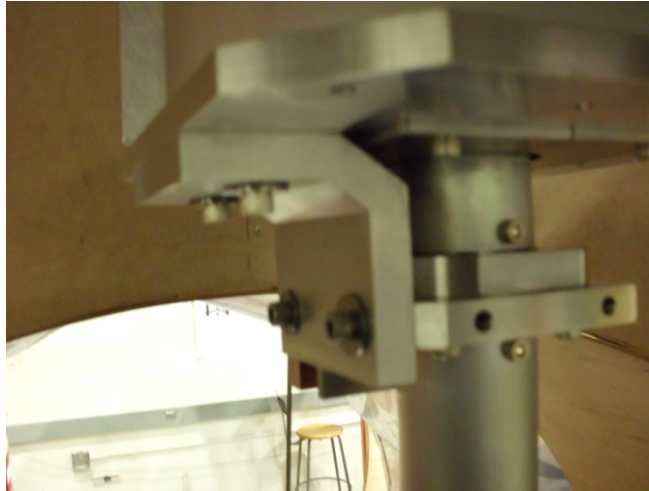
4.1.1 Required Equipment List

All of the following items must be cleaned to Class B per [E0900047](#):

- | | |
|---------------------------------------|--------|
| 1. 3/16” Hex L-Key tool for ¼-20 SHCS | 1 each |
| 2. Transport, Locking, ACB (D1101285) | |
| 3. Height, Adjustment, ACB (D1101578) | |

4.1.2 Procedure

- Verify “**Transport, Locking, ACB**” (D1101285) is in place. Verify all SHCS are tight.



- Verify “**Height, Adjustment, ACB**” (D1101578) is in place. Verify all SHCS are tight.
- Verify **Jacks** are in completely collapsed state.
- Position **Slider** underneath the **Baffle Box**.

4.2 Removal of Baffle Box

4.2.1 Required Equipment List

Use the lifting Table (D1002192) that was used for installation of the ITM Elliptical Baffle box with the two “**Wedge Lift, Baffle, Suspension Table**” (D1101952) attached to Jacks with eight 1/4-20 SHCS from Step **2.3.15**.

4.2.2 Procedure

- Verify Jacks are in completely collapsed state.
- Raise the lifting table with the crank until the table touches the bottom of the ITM Elliptical Baffle Assembly and partially supports it.
- The two people on each side of the Table uniformly raise the Jacks until the Wedge Plates fully support the ITM Elliptical Baffle Assembly.
- Remove the four 1/4-20 SHCS that attach the Top Plate on Suspension Assembly to ITM Elliptical Baffle Assembly.
- Lower the lifting table with the crank until the ITM Elliptical Baffle box is free from the suspension structure
- Two people must assist with the lift of the ITM Elliptical Baffle Assembly ([D1101806](#)). The Elliptical Baffle Assembly weighs about 45 lbs. Carefully lift the ITM Elliptical Baffle Assembly and set aside.
- Remove the Slider Assembly from the Rails.

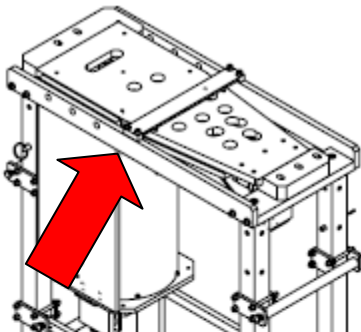
4.3 Suspension Assembly Removal

4.3.1 Required Equipment List

Use the lifting Table (D1002192) that was used for installation of the ITM Elliptical Baffle box with the two “**Wedge** with the two “**Wedge Lifts, Baffle, Suspension Table**” (D1101952) attached to Jacks with eight 1/4-20 SHCS from Step **2.3.15**.

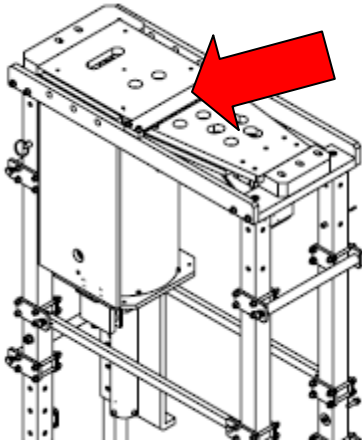
4.3.2 Procedure

- Remove the **Wedge Lifts** from **Jacks**, set screws aside for use in next step.
- Verify **Jacks** are in completely collapsed state.
- Verify Dog Clamps are mounted on Secondary Table.
- Attach **Secondary Table** to **Lift Assembly** with screws from **Step 3.3.2**.
NOTE: Two people must remain beside the “Suspension Lift Assembly” (D1101953).
- Secure Installation Stand to Secondary Table with the four Table Dog Clamps attached to the Table.
- Loosen Table Dog Clamps that secure the Installation Stand and align to suspended Suspension Assembly.
- Tighten Table Dog Clamps to secure Installation Stand
- Verify “**Upper Clamp**” (D1102062) from top of **Installation Stand** and “**SIDE BEAM**” (D1102026) are removed.
- Crank the lift table to the lowest position. Two people grab the lifting bars on each side of the **Installation Stand** and a third person removes the locking pins that secure the telescoping legs. Raise the installation stand to the nearest telescoping leg locking hole that brings the installation stand closest to the Test Stand mounting surface with the **Suspension Assembly** nested inside. Insert the locking pins and secure the telescoping legs.
- Slowly crank the lifting table upwards until the Suspension assembly rests on top of the installation stand.
NOTE: The “**ACB Stage Zero Narrow Guide Block**” (D1101595) and “**ACB Stage Zero Narrow-Dog Clamp, End**” (D1101613) must be present in the **Stand**.
- Attach the two “**SIDE BEAM**” (D1102026) to the **Installation Stand** with four 1/4-20 SHCS.



- Two people on each side of the Table uniformly lower the **Jacks** to completely collapsed state which causes the **Installation Stand** to lower in preparation for removal.

- While the two people on each side of the **Table** completely lower the **Installation Stand** with the **Suspension Assembly** in side.
- Attach the “**Upper Clamp**” (D1102062) to top of **Installation Stand** with four SHCS.



- Slowly crank the lifting table downwards with attached **Installation Stand**. Watch the Suspension Assembly for any possible obstruction.
Note: Describe the rework needed to keep the installation stand from catching on the bolt heads of the dog clamps?
- Loosen the four **Table Dog Clamps** on the **Secondary Table** securing the **Installation Stand**, rotate to release **Stand** and tighten.
- Carefully remove **Installation Stand** with **Suspension Assembly** from Secondary Table and place in secure location.



5 INSTALLATION ONTO THE BSC ISI STAGE-0

5.1 Prerequisites for Installation

1. Cartridge assembly should already be installed into BSC2.
2. BSC flooring must be in place before installation can begin.
3. QUAD must be secured and protected (ask SUS)
 - a. Put at least the penultimate and final masses on their stops
 - b. Attach the "face guard" (the plate attached to the frame in front of the optic -- not sure if this is it's proper name)
 - c. Cover with a C3 fabric "sock"

5.2 Required Equipment Lists

5.2.1 Vacuum Components (Class B)

All of the following items must be cleaned to Class B per [E0900047](#):

1. Slide, Baffle Carrier Assembly" (D1101958)
2. Suspension Lift Assembly" (D1101953), with "Table, Secondary, Suspension" (D1101962), refer to "Installation Suspension Table-Rail Assembly" (D1101971) drawing. Attach four "Table Dog Clamps" (D1001376-2) using four SHCS (1/4-20 x 2")
3. ACB Installation Stand (D1101957), with "Elliptical Baffle Suspension Assembly" ([D1101885](#)), "ACB Stage Zero Narrow Guide Block" (D1101595) and "ACB Stage Zero Narrow-Dog Clamp, End" (D1101613).

NOTE: The Elliptical Baffle Suspension Assembly must also have the following tooling attached: "Transport, Locking, ACB" (D1101285), "Height, Adjustment, ACB" (D1101578), and "ACB Stage Zero Interface Fixture Mover" (D1101700).

5.2.2 Vacuum Components (Class A)

- | | |
|--|---------|
| 1. SHCS (3/8-16 x 2 1/2") | 5 each |
| 2. 3/8" washers | 5 each |
| 3. SHCS (1/4-20 x 7/8") | 4 each |
| 4. SHCS (1/4-20 x 1") | 6 each |
| 5. 1/4" washers | 12 each |
| 6. 1/4-20 silver-plated Nuts | 6 each |
| 7. SLC Interface Mounting Clamps" (D1001700) | 4 each |
| 8. SHCS (3/8-16 x 2 1/2") | 4 each |
| 9. 3/8" washers | 4 each |

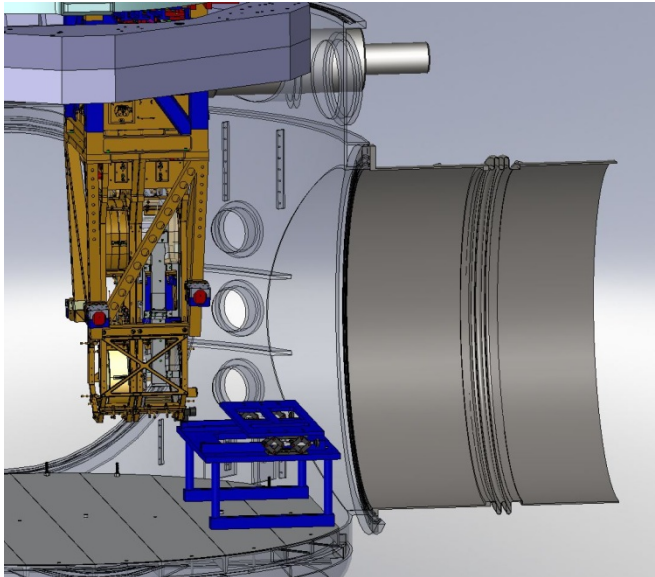
5.2.3 Non-Vacuum Components (Class ?)

- | | |
|---|--------|
| 1. Wedge Lift, Baffle, Suspension Table" (D1101952) | 2 each |
| 2. SHCS (1/4-20 x .62") | 2 each |
| 3. ACB_Interface Fixture Pusher-BSC" (D1101715) | 2 each |
| 4. SHCS (3/8-16 x 1") | 8 each |
| 5. SHCS (3/8-16 x 2 1/2") | 4 each |

6. Plain Grip Looped T-Handle Hex Key 3/16" Hex for Jacks 2 each
7. 3/16" Hex L-Key tool for 1/4-20 SHCS 2 each
8. 5/16" Hex L-Key tool of 3/8-16 SHCS 2 each
9. 3/8" Wrench for #10 Shoulder Screw Nut 1 each
10. 1/8" Hex L-Key tool for #10 Shoulder Screw 1 each
11. 1/4" Hex L-Key tool for Pushers 2 each
12. Stainless Steel Open-End Wrench for 1-1/8" Nuts 2 each

5.3 Installation Preparation

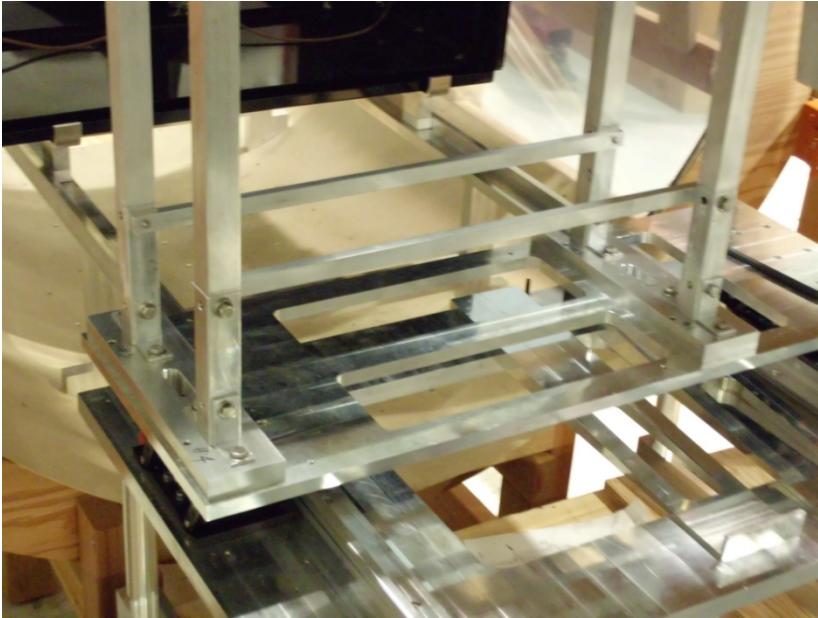
- Verify all items in **Section 4.2** have been fully assembled.
- All ITM Elliptical Baffle assemblies and installation tooling (for BSC2) will be brought through **the manifold tube leading to the respective chambers and staged in the manifold tube.**
- One person inside the spool piece will help pass the "Suspension Lift Assembly" (D1101953), with "Table, Secondary, Suspension" (D1101962) and 4 "Table Dog Clamps" (D1001376-2) attached, to two people inside the chamber. The Lift Assembly weighs about **115 lbs.** and the Secondary Table weighs about 20 lbs.



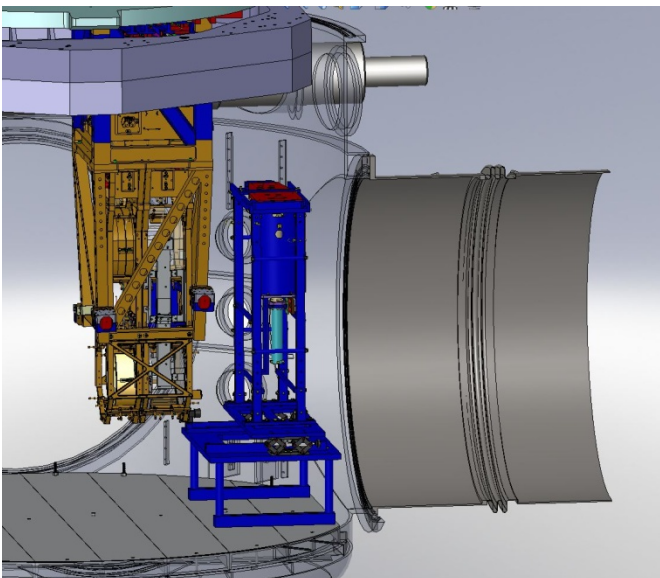
- Adjust position of installation tooling to sit secure and below baffle installation area.
- Attach two "ACB_Interface Fixture Pusher-BSC" (D1101715) to **STAGE-0** at **A14, B40 and B42** and **A27, B40 and 42** with four SHCS (3/8-16 x 1") and 3/8" washers.
- Verify **Jacks** are in completely collapsed state.

5.4 Installation of ITM Elliptical Suspension Assembly (D1101885)

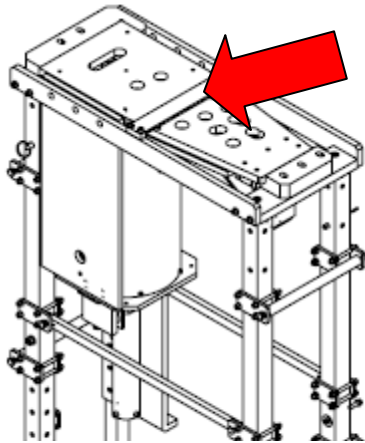
- Two people will enter the spool and pass through into the manifold. They will lift and carry the ITM Elliptical Baffle Suspension Assembly” (D1101885), which is secured in the expandable “Installation Stand” (D1101957) in its collapsed and locked configuration and help pass it to another person in the chamber. One person will exit the spool and help the person inside the chamber to carefully place it on top of the “Table, Secondary, Suspension” (D1101962). Total weight is about 100 lbs. There are handles on the Installation Stand for lifting and carrying.



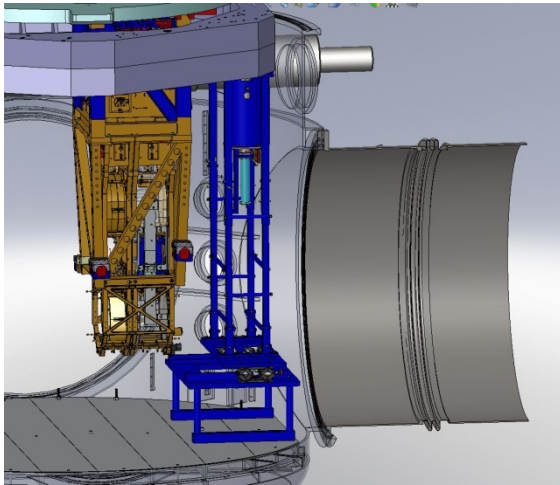
- The two people inside the chamber will adjust the Table, Secondary, Suspension” (D1101962) so that it is directly below the Stage 0 position where the ACB suspension will be attached.



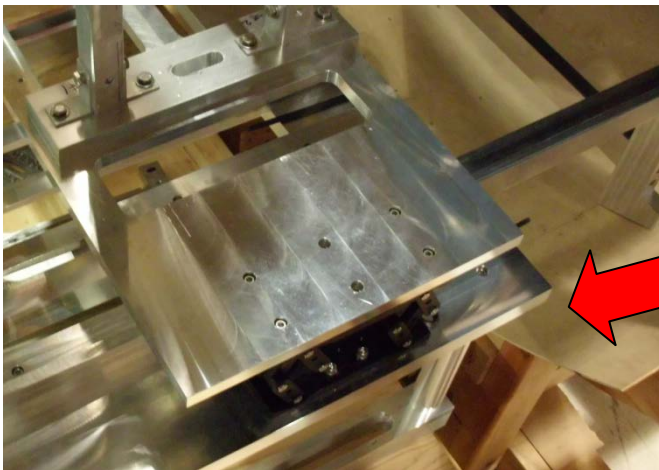
- One person (minimum) remains positioned inside the spool during the entire installation.
- Two people remain in the chamber, one on each side of the “**Suspension Lift Assembly**” (D1101953).
- Secure **Installation Stand** to **Secondary Table** with the four **Table Dog Clamps** attached to the **Table**.
- Loosen **Table Dog Clamps** that secure the **Installation Stand** to the **Secondary Table**. Either slide the **Suspension Lift Assembly**” (D1101953), and/or loosen the dog clamps and move the **Installation Stand** to align “**ACB Stage Zero Narrow Guide Block**” (D1101595) and “**ACB Stage Zero Narrow-Dog Clamp, End**” (D1101613) .
- Tighten **Table Dog Clamps** to secure **Installation Stand**.
- With **Installation Stand** secured, remove four **SHCS** and “**Upper Clamp**” (D1102062) from top of **Installation Stand**. Remove parts from vacuum system.



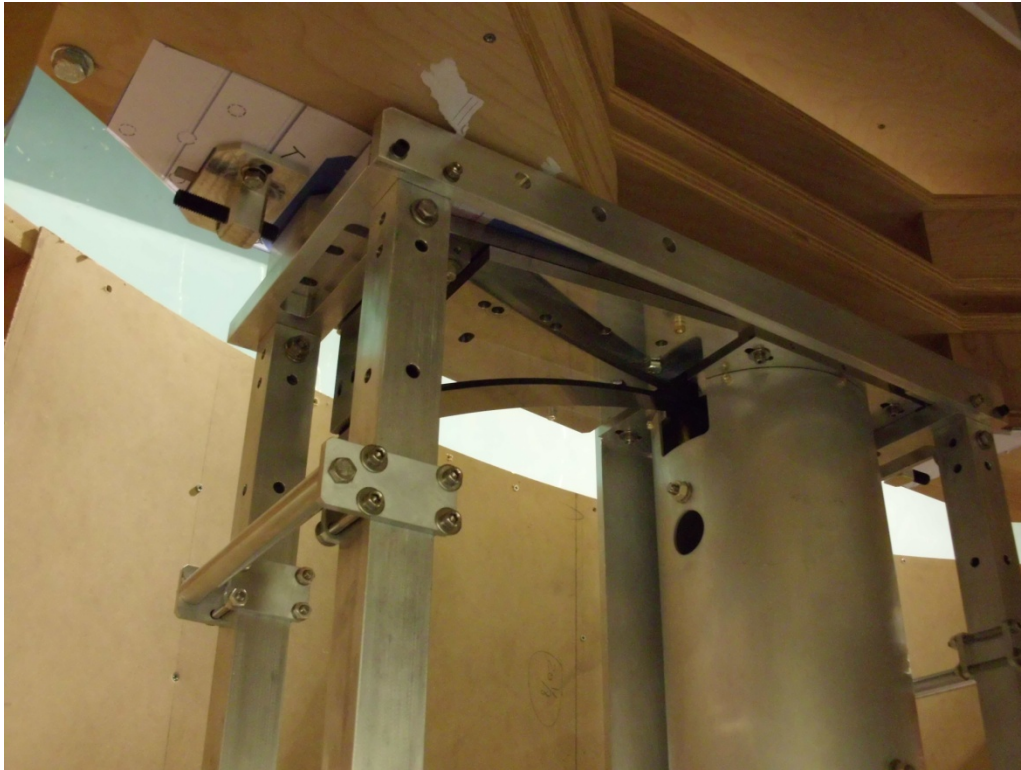
- The person positioned in the spool pulls out the four **Locking Pins** in the **Installation Stand** legs.
- The two people on each side of the **Table** grasps the handles on **Installation Stand** and lifts the **Stand** until it nearly touch **STAGE-0**. The person in the spool locks the **Stand** into position by inserting the four **Locking Pins**. Some adjustment to the expansion height may be needed to align the holes for locking.



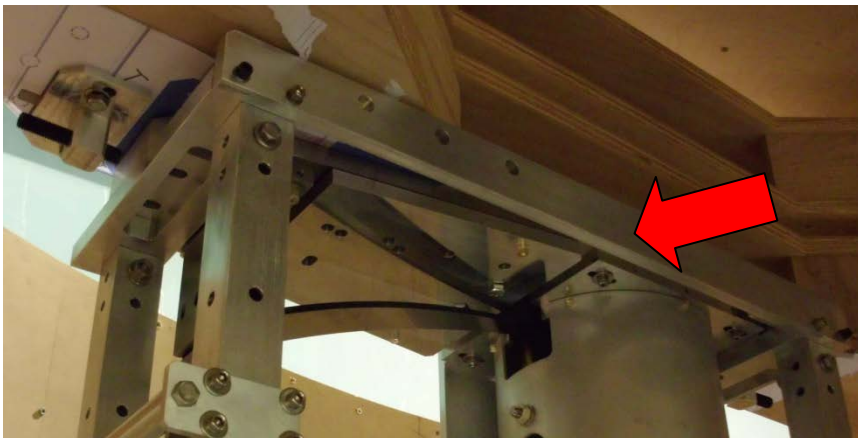
NOTE: There is approximately 8 inches between the **Installation Stand** and the **QUAD**.



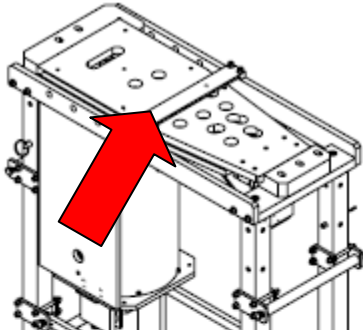
- The two people on each side of the **Table** uniformly raise the **Jacks** to lift the **Installation Stand** and align **Interface Mounting Plate** to **STAGE-0** mounting locations. Continue until top of **Interface Mounting Plate** touches **STAGE-0**



- Attach “ACB_Stage Zero Narrow_Guide Block” (D1101595) and “ACB_Stage Zero Narrow-Dog Clamp, End” (D1101613) to STAGE-0 with five SHCS (3/8-16 x 2 1/2”) and 3/8” washers.
- Attach “ACB_Stage Zero Interface Fixture Mover” (D1101700), which is attached to the “SLC ACB Interface Mounting Plate” (D1001138), to STAGE-0 with four SHCS (3/8-16 x 2 1/2”) and 3/8” washers.

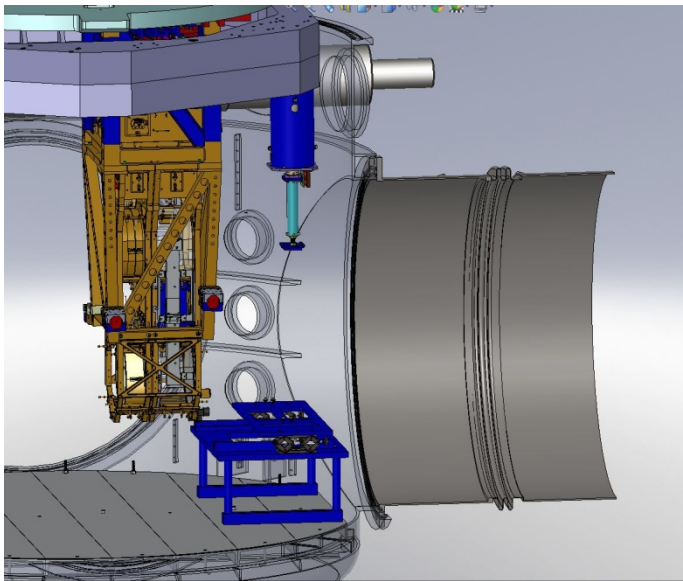


- Remove four 1/4-20 SHCS and “SIDE BEAM” (D1102026) from **Installation Stand** on the side closest to the chamber wall. Remove from vacuum system.

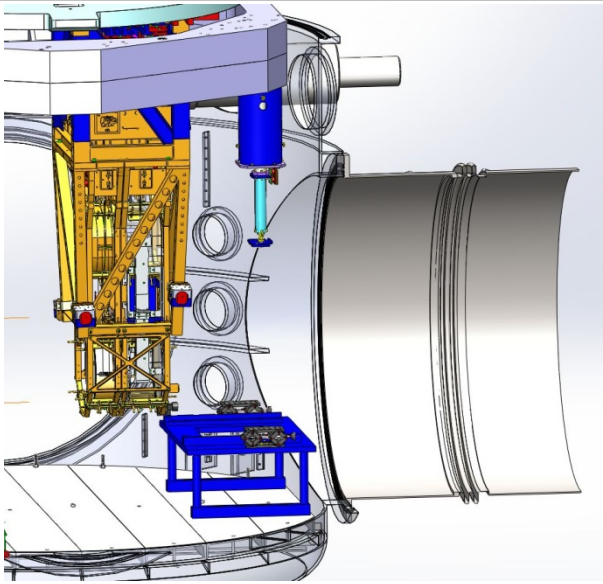


- The two people on each side of the **Table** uniformly lower the Jacks to their completely collapsed state which causes the **Installation Stand** to lower in preparation for removal. Watch the **Suspension Assembly** for any possible obstruction.
- While the two people on each side of the **Table** grasps the handles on **Installation Stand**, the person positioned in the spool disengages the four **Locking Pins** in **Installation Stand** legs.
- The two people grasping the handles slowly lower the **Installation Stand** until it returns to the completely collapsed position.
- The person positioned in the spool then inserts the four **Locking Pins** into the **Installation Stand** legs.
- Loosen the four **Table Dog Clamps** on the **Table** securing the **Installation Stand**, rotate to release **Stand** and tighten.
- Carefully remove the empty **Installation Stand** from the BSC through the chamber door.



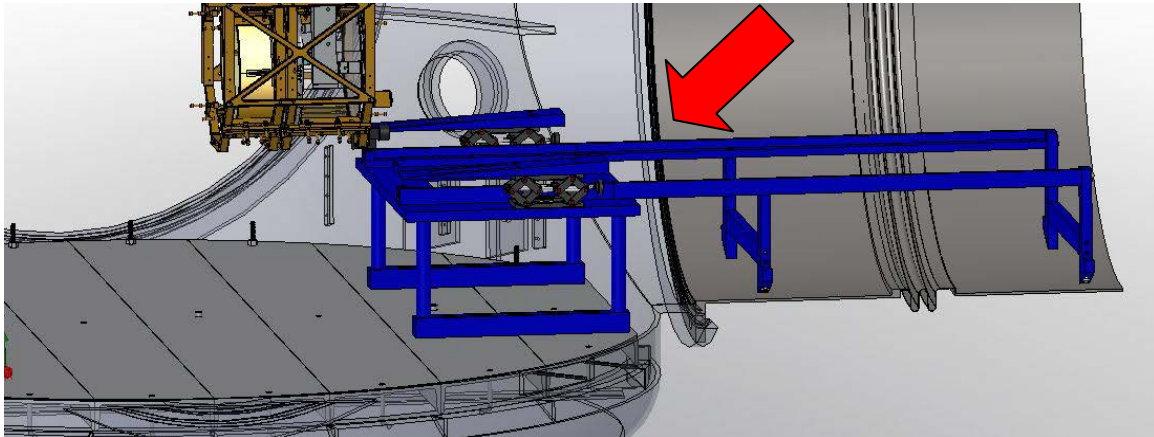


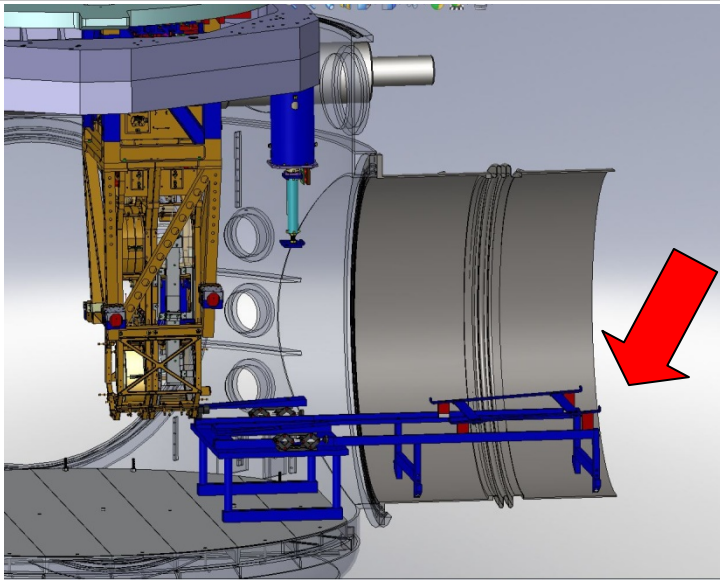
- Remove the twelve 1/4-20 SHCS attaching the **Secondary Table** to the **Suspension Lift Assembly**. Place SHCS on aluminum foil container in bottom of spool for use in next step. Carefully remove the **Secondary Table** from vacuum system.



5.5 Installation of ITM Elliptical Baffle Box Assembly([D1101806](#))

- Verify **Jacks** are in completely collapsed state.
- Attach the two “**Wedge Lift, Baffle, Suspension Table**” (D1101952) stored in manifold to Jacks with eight 1/4-20 SHCS from **Step 5.2.23**.





- Two people will carry the Baffle Box and place on the **Slide, Baffle Carrier Assembly (supporting the baffle box)** into the guides; one person will be positioned in the spool behind the Baffle Box and another in front of the baffle box. The **Baffle Box** weighs about 45 lbs.
- The two people on each side of the **Table** uniformly raise the **Jacks** to lift **Baffle Box Assembly** and align to top hinge plate at bottom of **Suspension Assembly**. Adjust **Baffle Box** position as needed for alignment. Continue lifting until hinge plates touch.
- Attach four SHCS (1/4-20 x 7/8") through Top Hinge Plate on Suspension Assembly to the Baffle Box Assembly.
- The two people on each side of the **Table** uniformly lower the **Jacks** completely.
- Remove **Table** from BSC **through chamber door**.

5.6 Removal of Fixtures and Tooling

- Remove fixed bracket.

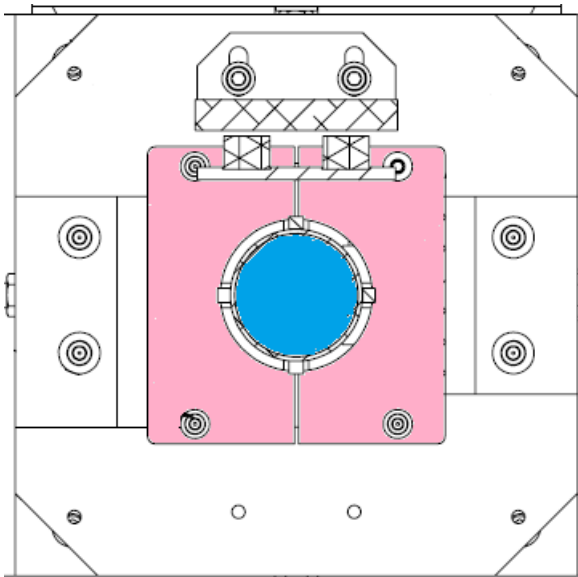
6 BAFFLE ALIGNMENT

6.1 Required Equipment List

1. 5/16" Hex L-Key tool of 3/8-16 SHCS
2. 1/4" Hex L-Key tool for Pushers
3. SLC Interface Mounting Clamps" (D1001700)
4. SHCS (3/8-16 x 2 1/2")
5. 3/8" washers
6. Tool for Bracket SHCS
7. Stainless Steel Open-End Wrench for 1-1/8" Nuts

6.2 Setup

- IAS group will set up theodolite from open end of manifold aligned with center of COC BS, according to procedure ([E1200392](#)).
- Remove the two 1/4-20 SHCS attaching the **Interface Fixture Mover** to the **Interface Mounting Plate**. Remove from vacuum system.
- Remove **Height Adjustment Variable** (D1102321) and **Bracket, Variable Height Adjustment** (D1102323) so that the Baffle can move freely. Save parts and hardware for future use.
- Remove **Transport, Locking, ACB** (D1101285) and save parts and hardware for future use.
- Verify balance of baffle. Shift balance weights as needed axially and laterally until the "SLC Baffle Tube Up Assembly" (D1002582) is evenly spaced inside "SLC Earthquake Stop Ring" (D1001120) circumference.



6.3 Lateral Alignment

- Slightly loosen five SHCS attaching **"STAGE-0 Guide Block"** (D1101595) and **"STAGE-0 Dog Clamp"** (D1101613)

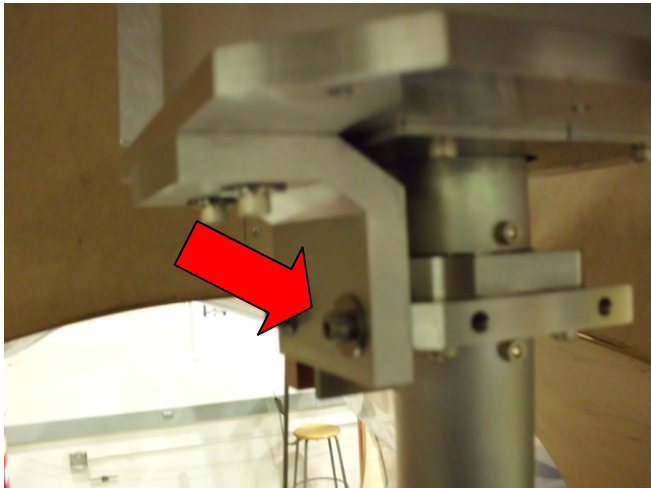
- Slightly loosen four SHCS attaching “**ACB_Stage Zero Interface Fixture Mover**” (D1101700), which is attached to the “**SLC ACB Interface Mounting Plate**” (D1001138), to **STAGE-0**
- Manually position **Suspension Assembly** (D1001011) into **Guide Block and Clamp** so that it is flush with **Guide Block** corners.
- Move the interface plate by turning the Threaded Thrust Screws on the “**ACB Interface Fixture Pusher-BSC**” (D1101715) to align the baffle laterally. There is a Pusher Assembly on both ends of the baffle attached to **STAGE-0** to move in either direction.

NOTE: DO NOT REMOVE THE LATERAL ALIGNMENT TOOLING UNTIL VERTICAL ALIGNMENT IS COMPLETE, IN CASE WE NEED TO ITERATE!

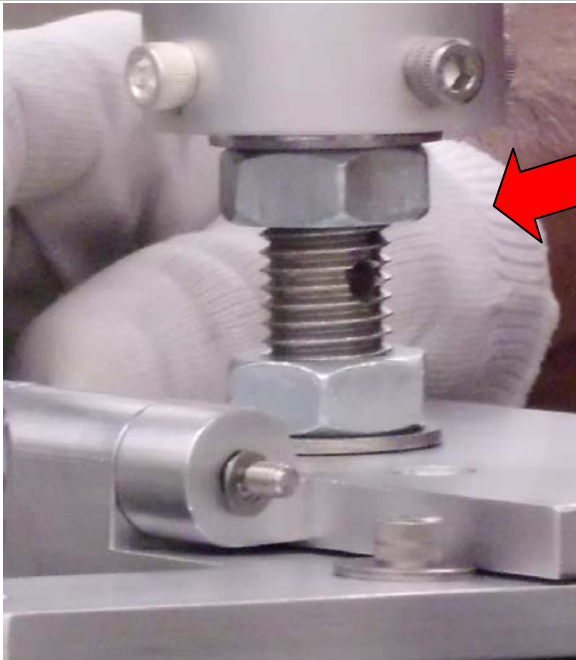
- Tighten the five SHCS attaching **Guide Block and Clamp** to **STAGE-0**.

6.4 Vertical Alignment

- Attach the “**Transport, Locking, ACB**” (D1101285). Tighten the two upper SHCS. Loosely attach the two lower SHCS in the slotted holes in order to keep the **Up Tube** from rotating, but allow vertical movement.



- Attach the Height Adjustment Variable (D1102321) and Bracket, Variable Height Adjustment (D1102323) to the Upper Hinge Plate and 8” Diameter Tube Plate. Tighten SHCS in slotted holes. Do not attach Bracket to the Up Tube.
- Insert Allen Tool in hole of “**Screw #3/4-10 X 4**” D1001186



- Loosen both “Nickel Copper Hex Nuts, $\frac{3}{4}$ ”-10”, D1102316.
- Loosen the SHCS of the **Variable Bracket Assembly** in the slotted holes, so that the ACB can move vertically when the height adjustment screw is turned.
- Adjust baffle height by turning the #3/4-10 X 4” screw until the lateral edges of the baffle hole are centered with the center of the TM, as determined by the theodolite readings.



- When correct height is obtained, tighten the SHCS of the **Variable Bracket Assembly** in the slotted holes.
- Tighten both “Nickel Copper Hex Nut, $\frac{3}{4}$ ”-10”, D1102316.
- Remove Allen Tool in hole of “Screw #3/4-10 X 4” D1001186.
- Iteration of Alignment Steps:
 - Remove the “**Transport, Locking, ACB**” (D1101285) so that the ACB hangs freely.



- Remove the Height Adjustment Variable (D1102321) and Bracket, Variable height Adjustment (D1102323)
- Verify alignment.
- Repeat the lateral alignment starting at Step 5.5.7, and the vertical alignment starting at Step 5.5.12, as needed.
- Attach the “Transport, Locking, ACB” (D1101285) and tighten all SHCS.
- Attach Height Adjustment Variable (D1102321) and Bracket, Variable height Adjustment (D1102323)
- Verify the “**STAGE-0 Guide Block**” (D1101595) and “**STAGE-0 Dog Clamp**” (D1101613) are securely holding the **Interface Mounting Plate**.
- Tighten the five SHCS attaching “**STAGE-0 Guide Block**” (D1101595) and “**STAGE-0 Dog Clamp**” (D1101613)
- Remove the **Mover Plate** with the four SHCS and washers attaching the **Mover Plate** to STAGE-0. Set SHCS and washers aside for re-use in next step. Remove the **Mover Plate** from vacuum system.
- Attach **Interface Mounting Plate** to STAGE-0 with four “**SLC Interface Mounting Clamps**” (D1001700), four Class A SHCS (3/8-16 x 2”) and four 3/8” washers.
- Remove the two **Pusher Fixtures** with the four SHCS and washers attaching the **Pusher Fixtures** to STAGE-0. Remove from vacuum system.
- Remove the five SHCS attaching “**STAGE-0 Guide Block**” (D1101595) and “**STAGE-0 Dog Clamp**” (D1101613). Remove from vacuum system.

6.5 Removal of Fixtures and Tooling

- Remove Pushers
- Remove Mover Plate
- Remove Variable Height Adjustment Bracket Assembly
- Remove Transport, Locking, ACB (D1101285)