

Source Carriage Assembly Instructions

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1 Introduction

This document describes the cleaning, handling, and assembly of the elements of the source carriage. This includes the source pivot, the UFO housing, and the source connector (top screw and nut). These parts are not very well documented elsewhere, but they are key to the assembly of the calibration hardware system. These pieces are permanently fixed to the umbilical

2 Part Descriptions

2.1 Source Pivot

The source pivot is the upper most element of the source assembly. This consists of a nut that fits snugly to the umbilical with a rotating collar (the pivot) intended to provide a tie-off point for the central rope. The pivot attaches to a pulley flange, which supports the fixed side rope pulleys, via a pin joint. The assembly supports lower elements of the source via a pair of brackets. Design drawings of the completed assembly are shown in Fig.1.

2.2 UFO housing

The umbilical flasher object (UFO) was intended to provide information of the source location to the detector independent of the manipulator system. As the central boards are not ready at this, this functionality will not be available. However the housing for the UFO will be used for the source assembly. The housing consists of a top plate, an acrylic cylinder and a steel

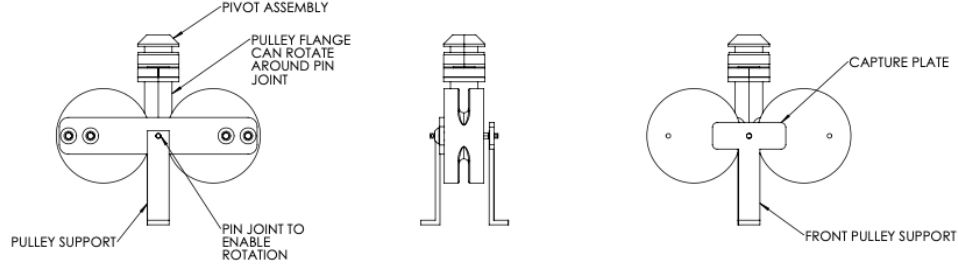


Figure 1: Source pivot and side rope pulleys

cylinder. The three pieces are held together using long screws that connect the top plate to the steel cylinder through conduits in the acrylic housing. The umbilical is clamped into the UFO housing using a series of pressure plates that are secured to the top plate. The source pivot also attaches to the top plate of the UFO. Design drawings for the UFO cylinder and plate are shown in Fig.2.

2.3 Source Connector

The last permanent installation on the umbilical is the source connector. This consists of a barrel with a left handed screw thread on one end which is capped by a feed through which couples the optical fibre in the umbilical to the quartz rod in the Laserball (which terminates in a right hand thread source connector). The source connector and a source (either the Laserball or the AmBe source) are held together with a nut that contains corresponding threads (left handed on the top half, right handed on the bottom half) such that the umbilical side and the source side can be drawn together simply by turning the nut in a clockwise direction while the umbilical and source remain stationary. Alignment rods installed on the source connector plates ensure the source and umbilical alignment through source installation. A detail of the source connector is shown in Fig.3a with a picture of the assembled source connector in Fig.3b.

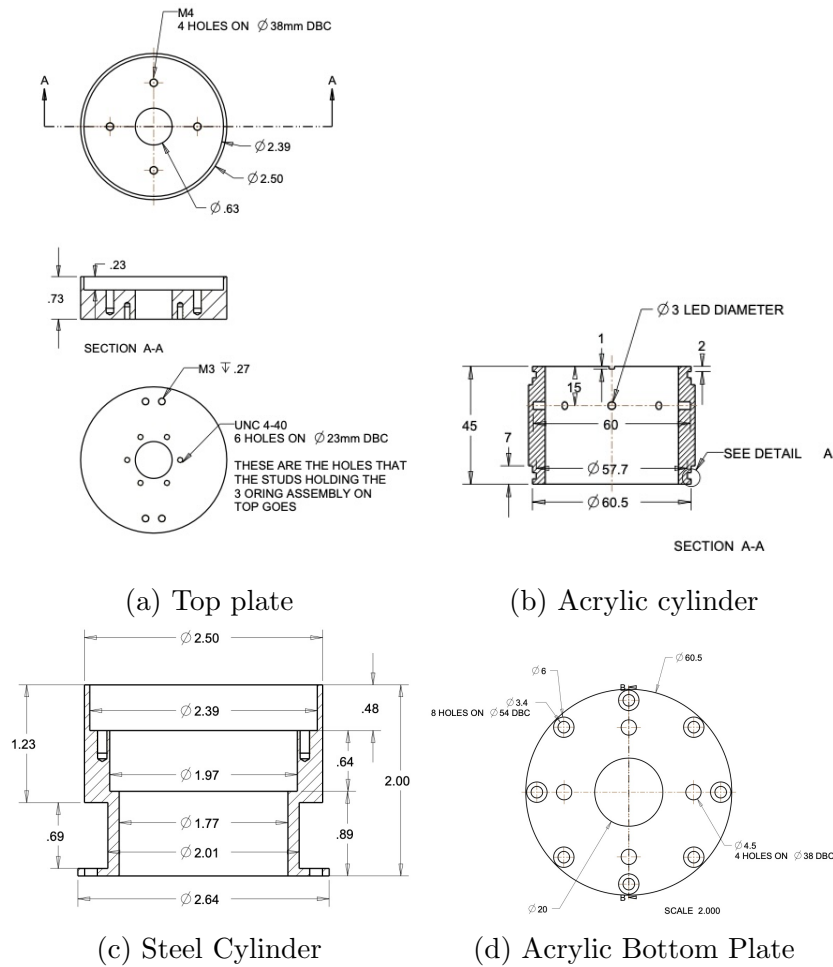
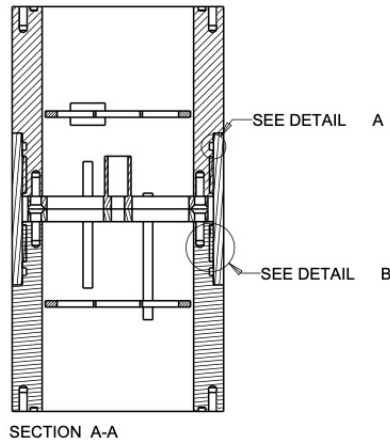


Figure 2: Umbilical flasher object housing



(a) Source connector detailed drawing



(b) Source connector in hand

Figure 3: Source connector.

3 Cleaning, Handling and Assembly

All of the components of this assembly are stainless steel and acrylic. It is assumed that the majority of cleaning for the various components will be completed using ultra-sonic cleaning. The steps for ultra-sonic cleaning involves

- Placing all of the items in the cleaner basket.
- Fill the US cleaner volume with UPW
- Add NuClean to the volume with a 1:50 concentration (NuClean to UPW)
- Run the cleaner through a 60 minute cycle. This involves heating the volume to 60 degrees celcius, while applying ultra sonic frequencies.
- Drain the cleaner with the components in place. Refill the cleaner volume with UPW. Run the cleaner for 30 minutes for a first rinse.

- Drain the cleaner with the components in place. Refill the cleaner volume with UPW and run the cleaner for 60 minutes for a second rinse.
- Drain the cleaner and remove the components from the ultra sonic cleaner
- Dry all of the components with lint free cloths.
- Place the components in plastic bags as appropriate.

Nitrile gloves must be worn at all times when handling the components before, during and after the cleaning procedure.

At the present time, all of the parts for the source pivot assembly are underground, the parts of the source connector and UFO housing are on surface and were cleaned as part of the Laserball preparation, and a second source connector assembly (for the AmBe source) is also on surface and still to be cleaned. The parts that remain on surface are intended to be taken underground by hand after triple bagging all of the components. An additional plastic bag should be added for drift travel, to be removed immediately upon entering the lab. The next most outer bag should be removed before the assembly is moved to the control room. The second to last layer should be wiped down with a lint free cloth and UPW before the assemblage is moved to the DCR.

Assembly of the source carriage assembly requires the cleaned and installed umbilical and central. It may be reasonable to conduct a limited pre-assembly of the source pivot well before the final installation. Assembly consists of

- ☐ 1. Wet the bottom metre of umbilical with LAB
- ☐ 2. Pre-wet all of the screws with LAB
- ☐ 3. Install o-rings on the UFO acrylic cylinder, the source connector top and bottom surfaces.
- ☐ 4. Threading the umbilical through the pivot
- ☐ 5. Thread the umbilical through the pressure plates with appropriate o-rings.

- ☐ 6. Thread the umbilical through the top plate of the UFO.
- ☐ 7. Ensuring that there is a surplus of umbilical below the top plate of the UFO run the umbilical through the UFO acrylic, steel plate and stainless steel cylinder, and the upper source connector body.
- ☐ 8. Couple the end of the fibre bundle to the source connector plate.
- ☐ 9. Secure the source connector plate to the source upper source connector body with 8 m2 screws.
- ☐ 10. Fasten the UFO bottom plate to the top of the UFO steel cylinder.
- ☐ 11. Align the acrylic cylinder between the top section and the UFO plate and thread the support rods into the top plate. Once the threaded rod is secured, tighten the UFO assembly together using the appropriate nuts.
- ☐ 12. Fasten the UFO steel cylinder to the top of the upper source connector with 8 m3 cap screws.
- ☐ 13. Tighten the pressure plates against the top of the UFO assembly using four M3 screws.
- ☐ 14. Secure the source pivot pulley support plates to the UFO assembly.
- ☐ 15. Tie the central rope to the rotating collar on the pivot assembly.

Questions:

- Do we have the pressure plates with the Laserball? Are these plates elsewhere?
- Does the source pivot clamp down on the umbilical?
- Is there enough room to turn a wrench to secure the threaded rod?
- Is the fibre bundle assembly procedure written elsewhere?

4 Usage

Once the source connector has been assembled with the umbilical, sources can be exchanged with little difficult. At this time only two sources are planned; the Laserball and the AmBe source. Installation of the laserball is the more sensitive of the two. The steps for this involve two people equipped with standard PPE and nitrile gloves. Assuming the source connector is exposed below the bellows gate valve;

- ☐ 1. Remove the source connector end of the source from it's storage bag (leave the diffuser inside the bag).
- ☐ 2. Match the source connector to the umbilical source connector with the nut between them using the guide studs to locate the relative location of the two plates.
- ☐ 3. With the help of a colleague push the two source connector ends together until they meet the threads of the nut, then hold the source connector ends in place while turning the nut clockwise.
 - If the nut does not thread easily, the nut will have to be flipped.
 - If there is any resistance before the nut is completely threaded stop, check the orientation of guide studs and the alignment of the quartz rod before starting over.
- ☐ 4. With the nut completely threaded, the complete source assembly should be snugly in place. Test by applying a little more force in the clockwise direction.
- ☐ 5. Remove the bag from the diffuser flask. Raise the source into the URM.

These steps will be identical for the AmBe source except there will be no guid rods to align as there is no optical rod to match.