

The Connection System for Layers 0 and 1 in the Inner Silicon Subsystem in the Run2b Upgrade.

Colin H. Daly, Dept of Mechanical Engineering

Bill Kuykendall, Dept of Physics

Joshua Wang, Dept of Physics

University of Washington

February 6, 2003

Introduction:

The design requirements for the connections between the L0 and L1 silicon detector layers for D0 are:

1. The relative alignment of the L0 and L1 silicon must be maintained within very tight tolerances.
2. The L0 structure must be mounted within L1 in such a way as to ensure that the tolerances are maintained consistently if the connection is assembled /disassembled several times.

The L1 connection to the L2-L5 structure has similar requirements.
Both of the connections are made at $Z=0$ mm and at $Z=605$ mm (Figure 1).

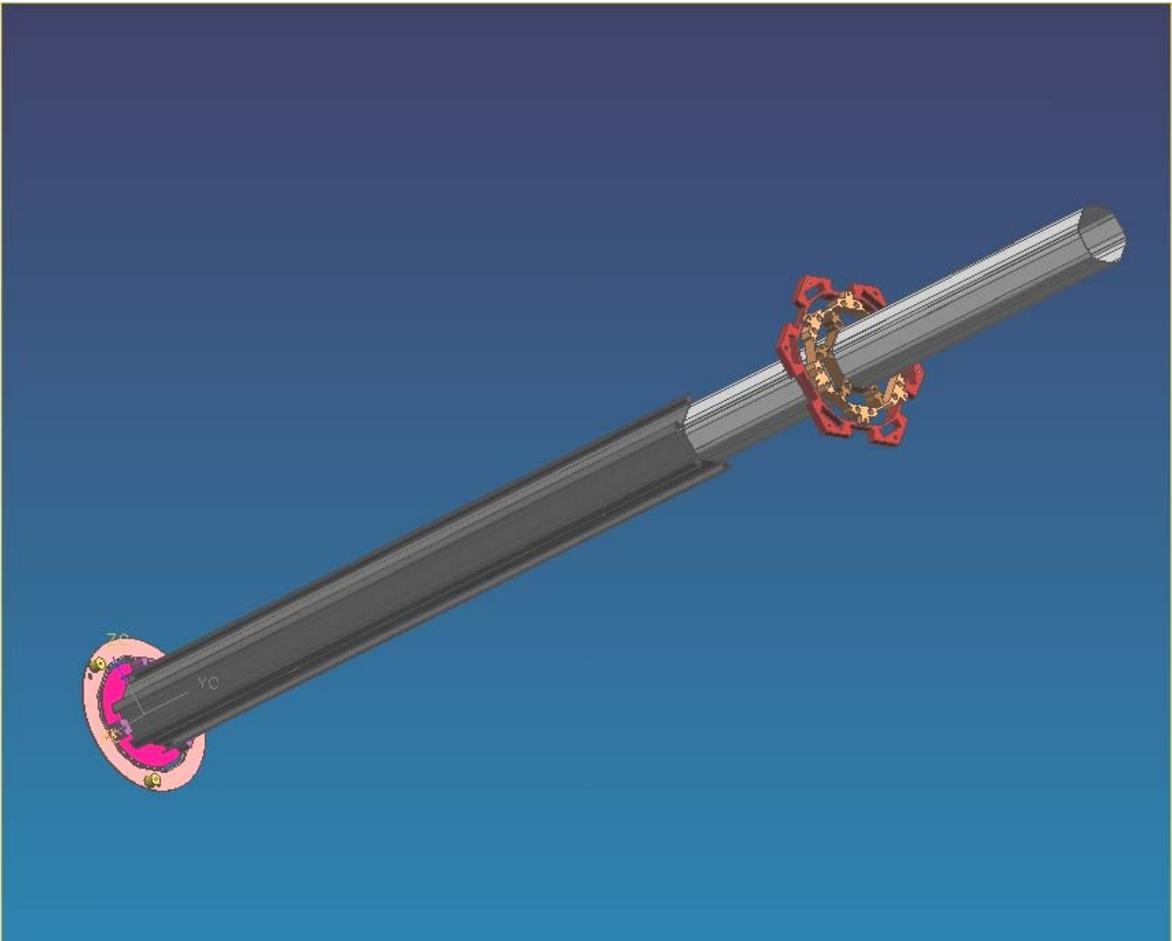


Figure 1: L0 and L1 Connection Membranes

Connections at Z=0 mm:

These connections are made using a pair of carbon fiber composite membranes and sets of precision sapphire pins and jewel bearings

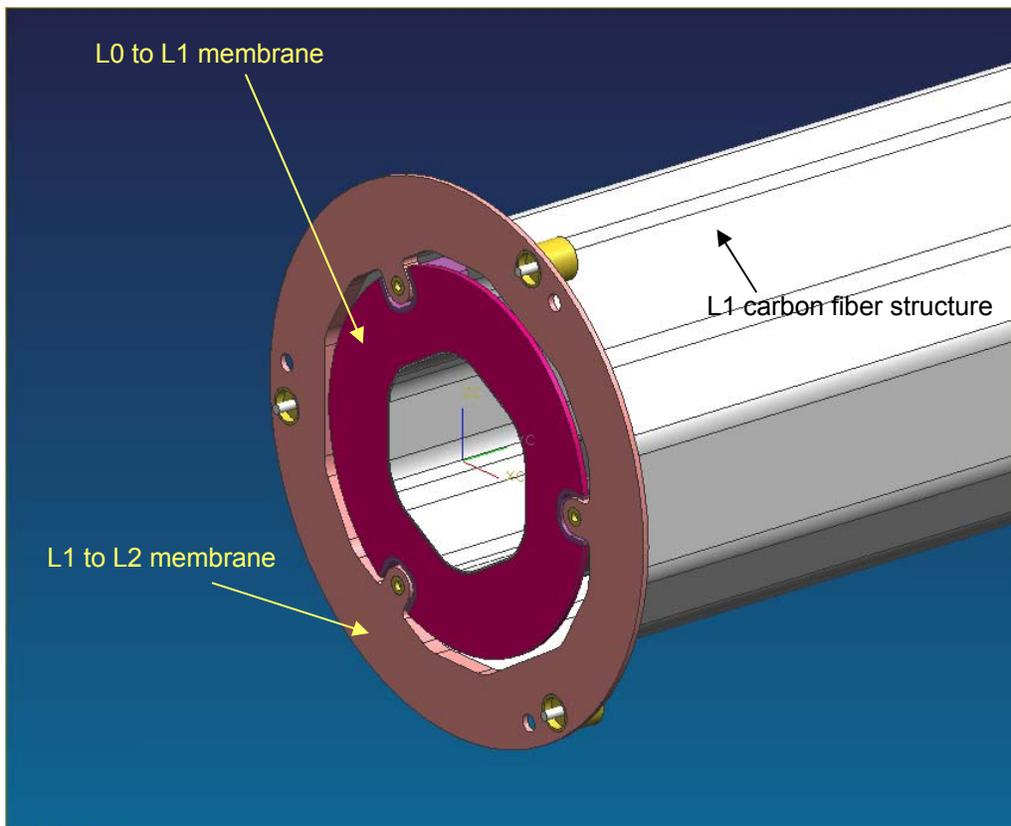


Figure 2: Connection membranes at Z=0

The holes in each membrane are machined to CNC tolerance. The L0 pins engage with jewel bearings in the L1 membrane..

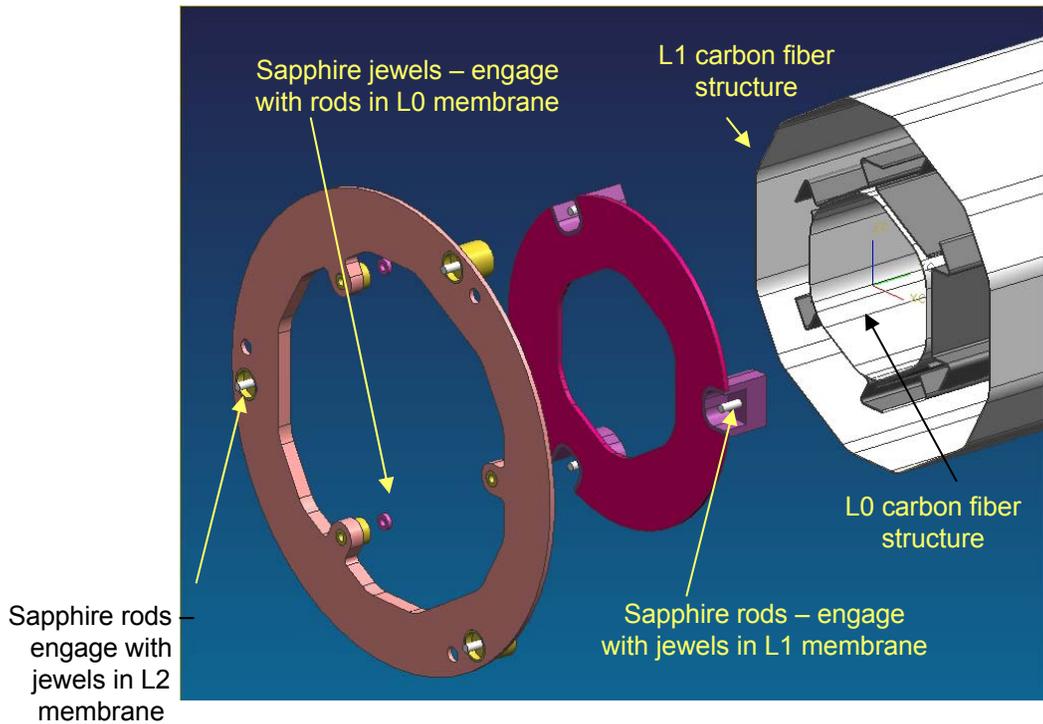


Figure 3: Connection membranes at Z=0

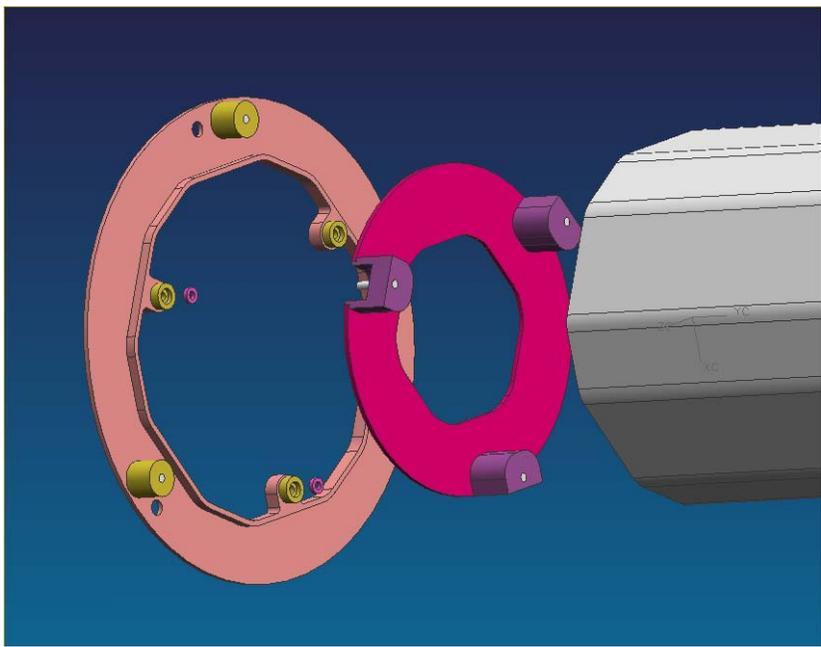


Figure 4: Connection membranes at Z=0

Connections at Z=605 mm:

These connections are done using sapphire pins and jewels in the same way as described above.

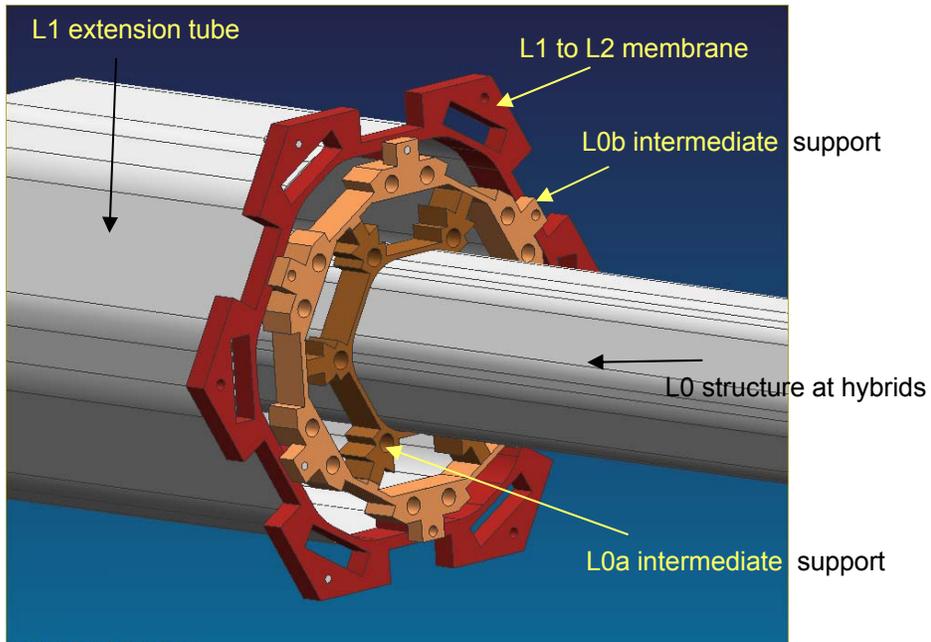


Figure 5: L0 and L1 membranes at Z = 605 mm

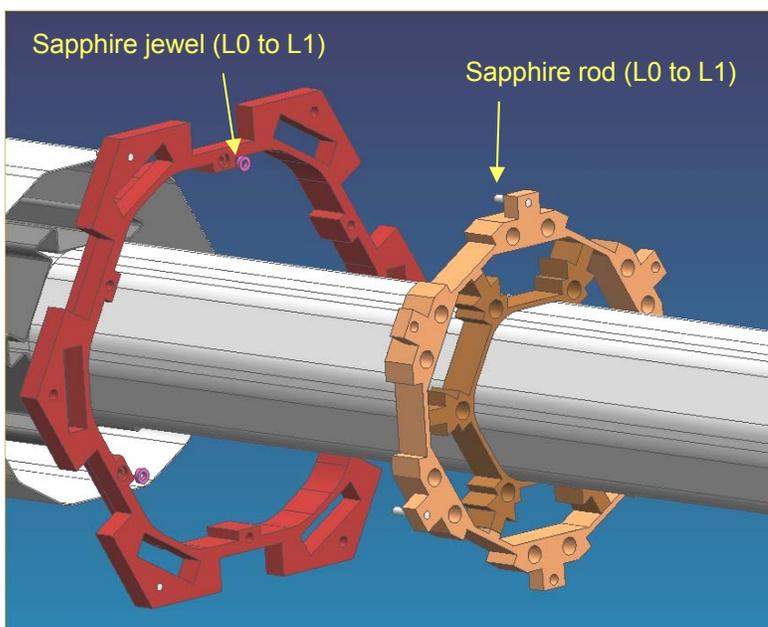
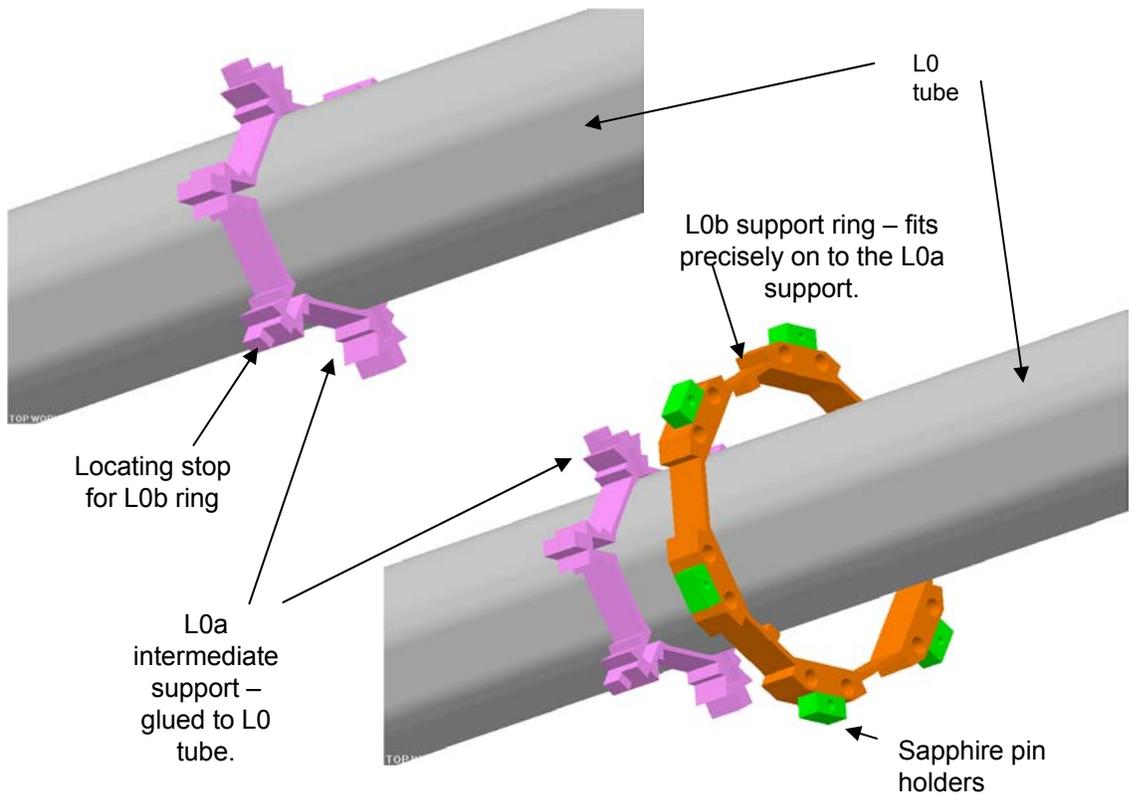


Figure 6: L0 and L1 membranes at Z = 605 mm

In L0, the structure is supported on the inner, 12-sided carbon fiber tube that is made double thickness along this section. The support loads then have to be transferred through the supports and cooling system of the L0 hybrid circuits. This is done using two intermediate structures, the L0a and L0b supports.



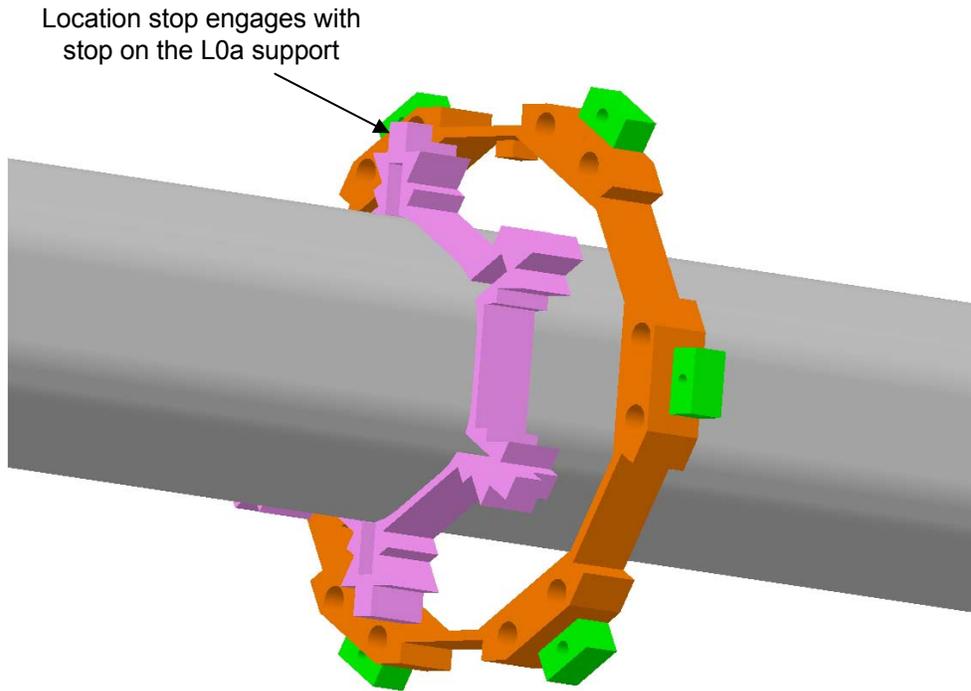


Figure 8: Location stops on intermediate support rings.

The L0b support ring is part of the L1b hybrid cooling and support system. This system is assembled and leak tested. A 'dry' assembly of this system to the L0 structure is done to ensure that all parts fit correctly.

The pins in the L0b ring mate with jewel bearings on the membrane that is mounted on the L1 structure at $Z=605$ mm.

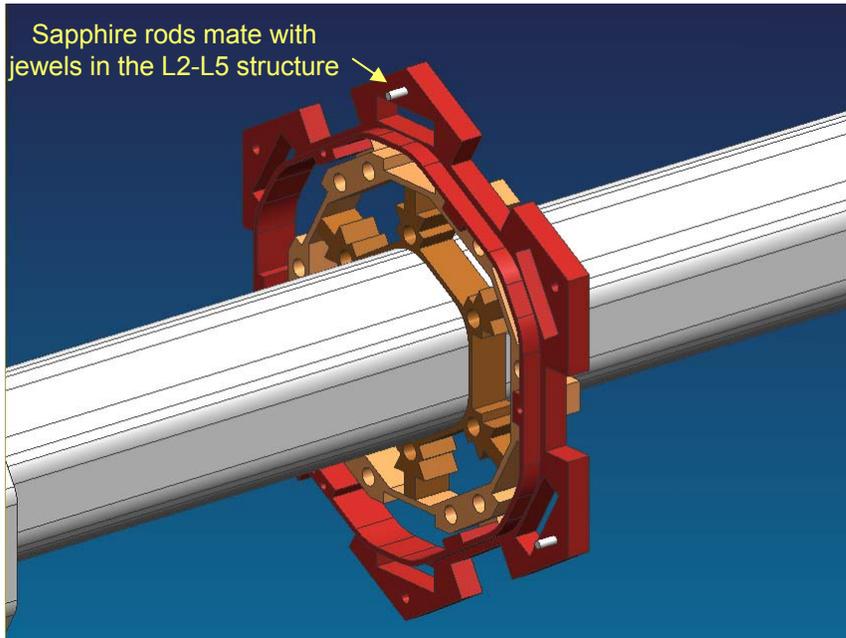


Figure 9: L1 support membrane at $Z = 605$ mm

The jewels are mounted on this membrane in an identical manner to that described above for the membranes at $Z=0$ mm. Together with the three pins on the L1 membrane at $Z=0$ they provide the basis for a reference coordinate system on the completed L0 assembly.

The connection membranes at $Z=605$ mm also provide for an axial stop that determines the axial location of L0 within L1. This is done at only one pin/jewel point to avoid any over constraint. At one azimuthal location between the pins, a screw is used to lock the axial location. A similar system is used to fix the axial position of L1 within L2.