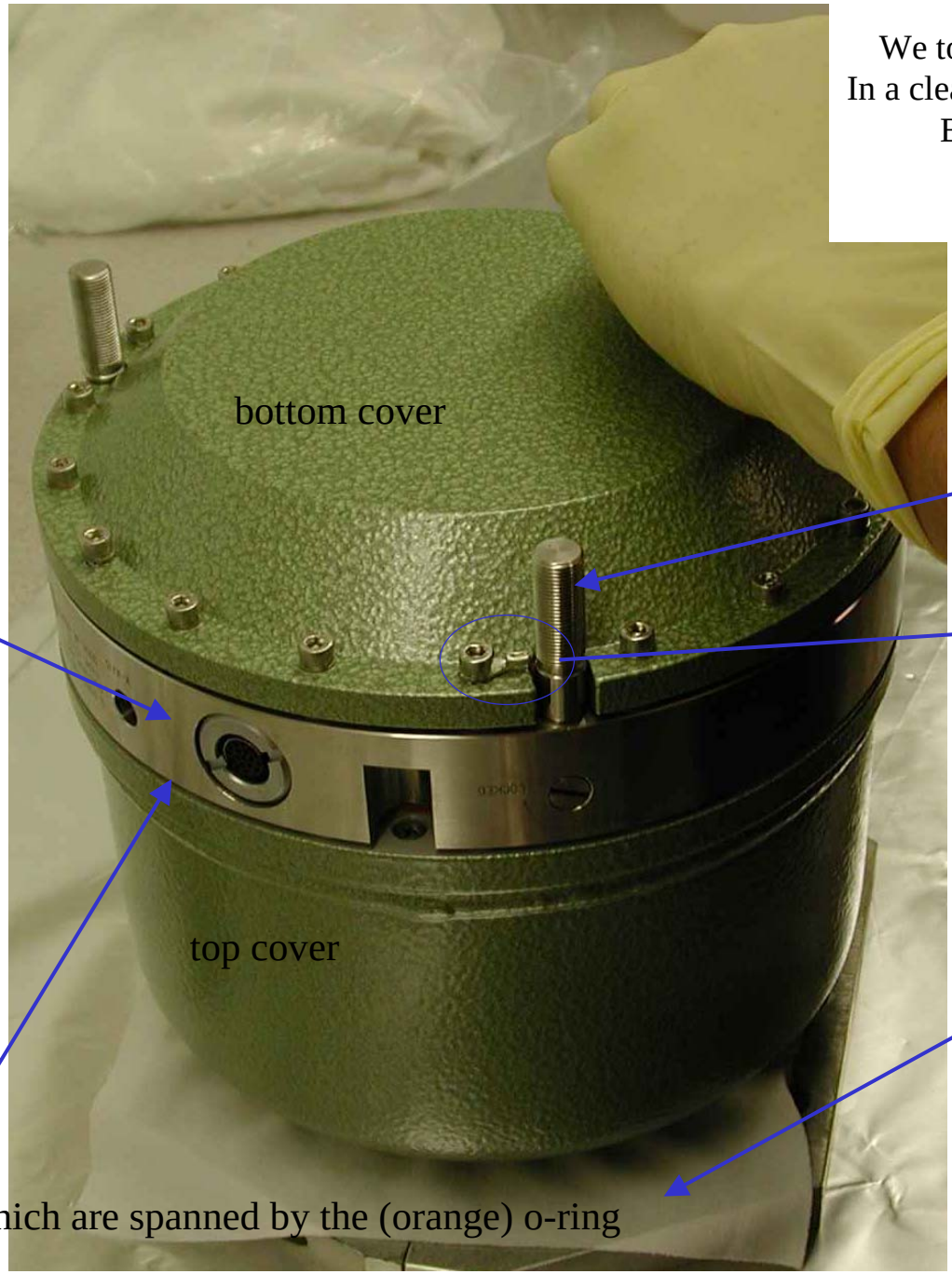
Thursday May 21 2004
We took the domes off of an STS-2 (SN 89950)
In a clean bench, wearing gloves, using clean tools
Brian Lantz, and Joe van Niekerk presiding,
Dan DeBra and Dave Beech brought the
Precision Engineering class to watch

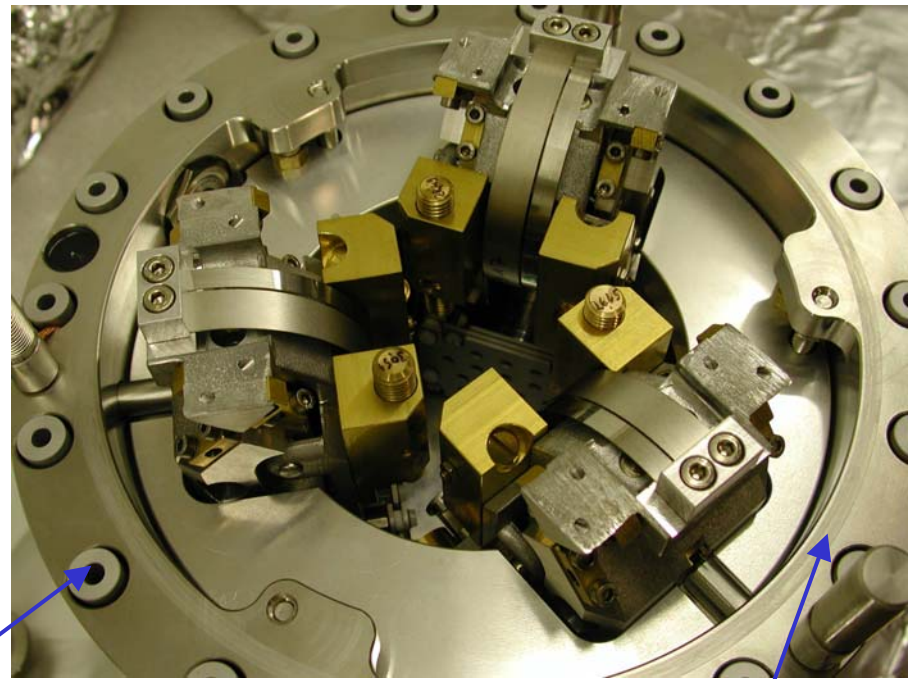


Pressure Sealing the Can: According to the manual,

"… The top and bottom of the STS-2 have aluminum covers that are gasketed to the base plate.

The STS-2 is vacuum-tight. The construction is designed to minimize the distortion of the package by barometric pressure changes by insulating the top and bottom covers from the massive base plate, in a way similar to the insulation of a seismograph pier from its surrounding building. The top and bottom covers are secured to the base plate with compliant o-rings, allowing the covers to compress without stressing the entire package. The sealed construction and and massive metal base plate provide thermal insulation and inertia."

view of bottom with cover removed

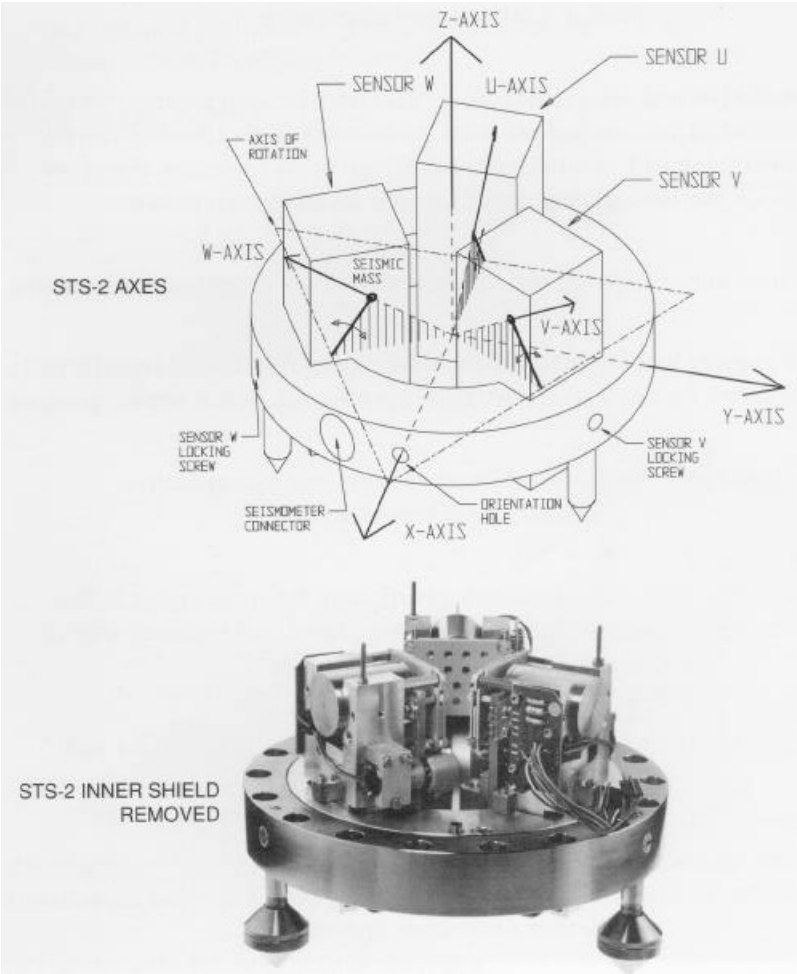


Spacers. These have no metal contact with base plate – one per sector has a rubber spacer to center it in the base plate hole. The top and bottom cover sit directly on spacer, and a bolt runs through.

o-ring seal line

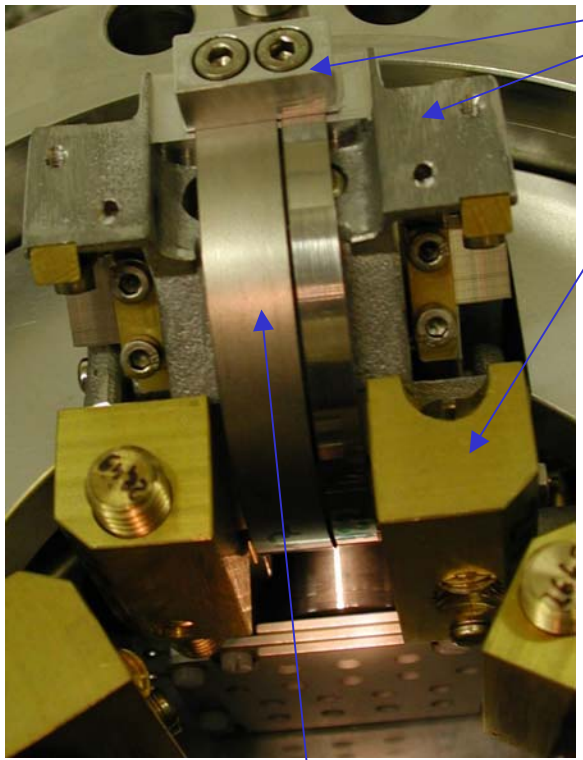
Sensor configuration

There are 3 identical sensors set in the can. These are electrically recombined to generate signals in x, y, and z. This is shown below in a picture clipped from the manual. The sensor on the left is right side up. Almost all the pictures we have are taken with the sensor upside down. I'm not willing to take the "inner shield" and electronics package off. The shield is probably a magnetic shield, among other things.



Views of one sensor –

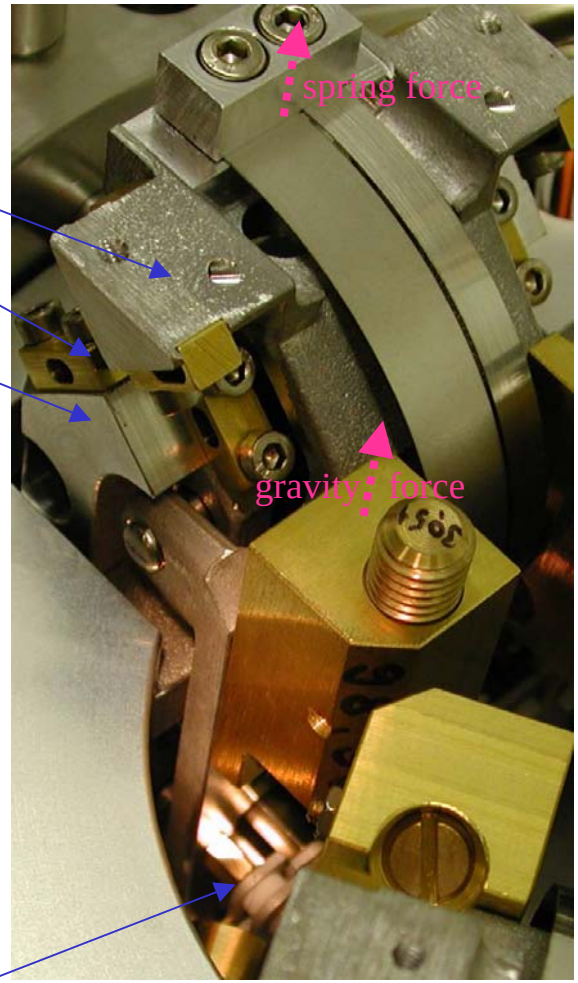
sensor is upside down, proof mass is locked



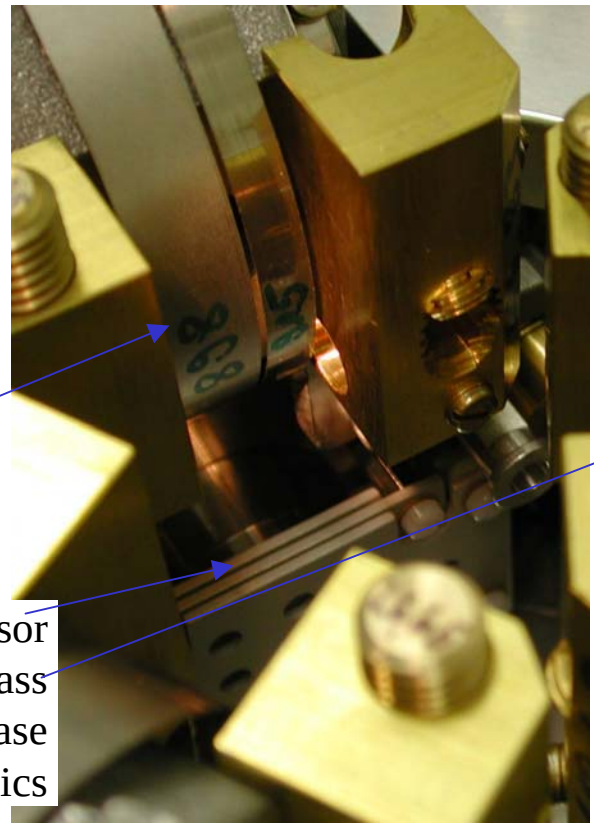
proof-mass

cross-flex hinges

base



suspension spring
note two different materials,
note hand-marking,
springs probably start flat.

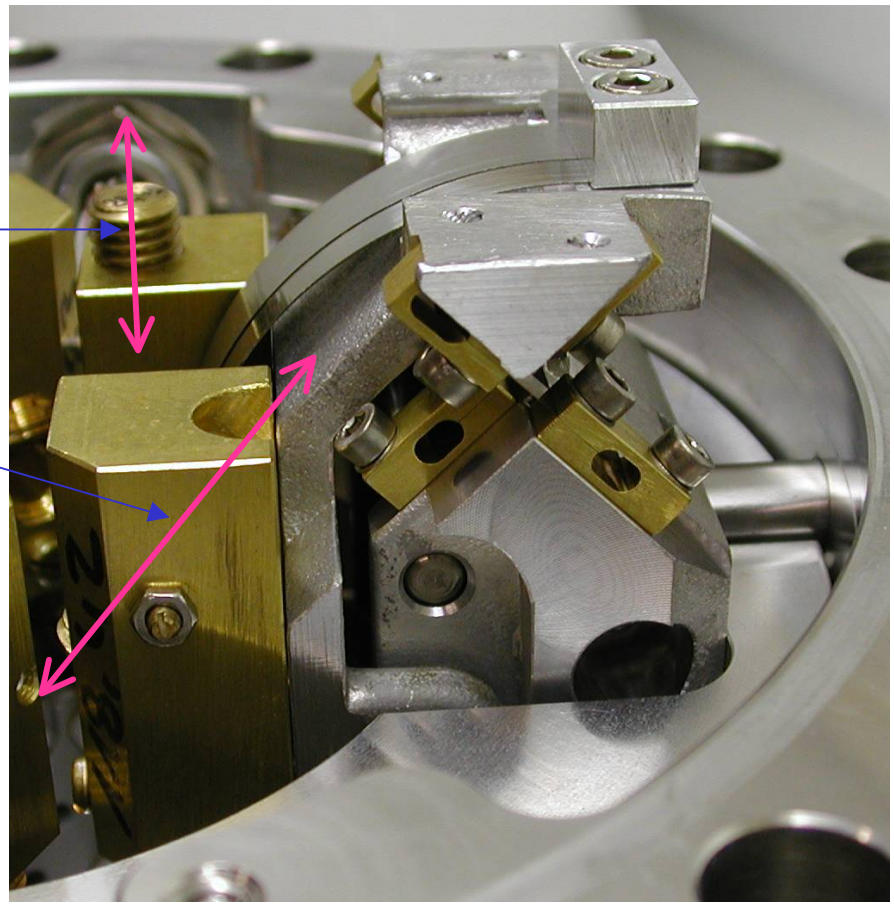


capacitive sensor
outer plates are attached to proof-mass
inner plate is attached to base
two tiny magnet wires attach to electronics

when sensor is turned over, the springs will pull down on one side of the flex-hinge, and the brass weights will pull down on the other side.

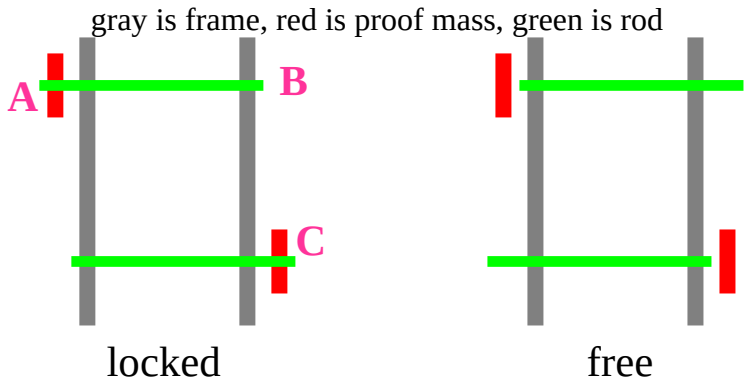
Trim weights

It appears that the trim weights (the two brass screws in the brass chunks) are set up so that:
The one straight up and down adjusts the sensitivity to motion by moving the cg closer or farther from the rotation axis, but doesn't affect the balance.
The one at an angle (close to viewer) will adjust the set point of the balance by moving the cg closer or farther from the hinge. This changes the torque, and can balance the torque from the springs.

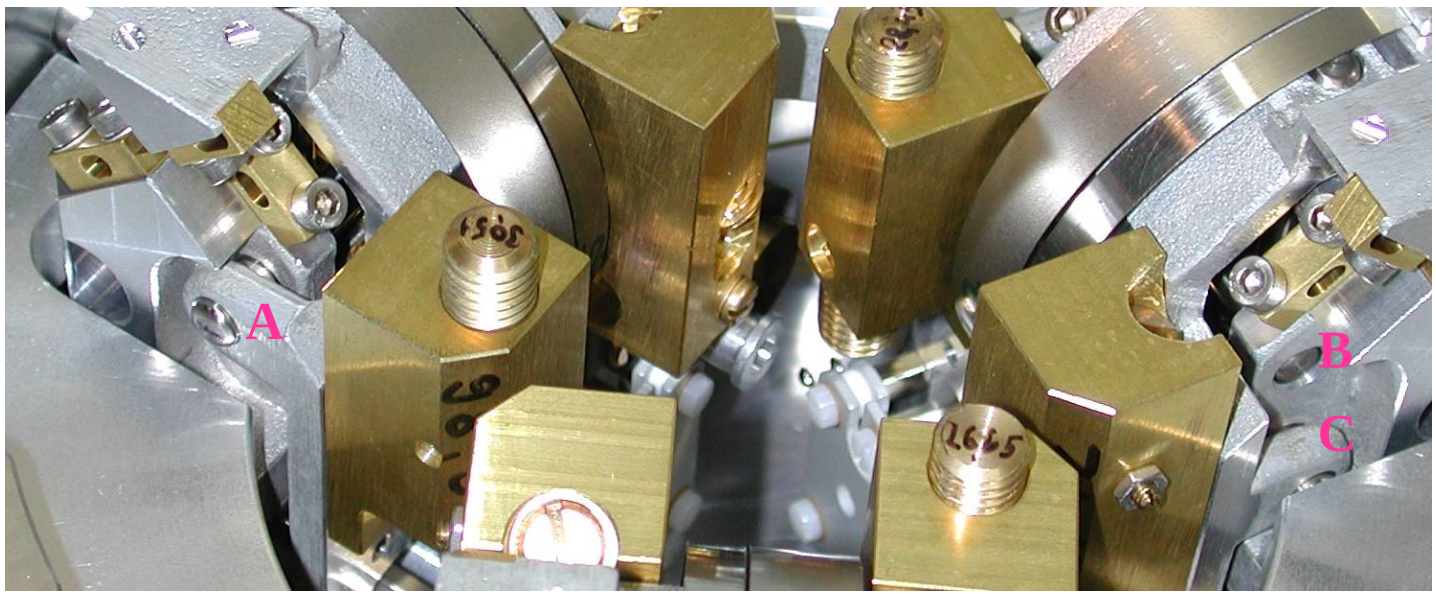


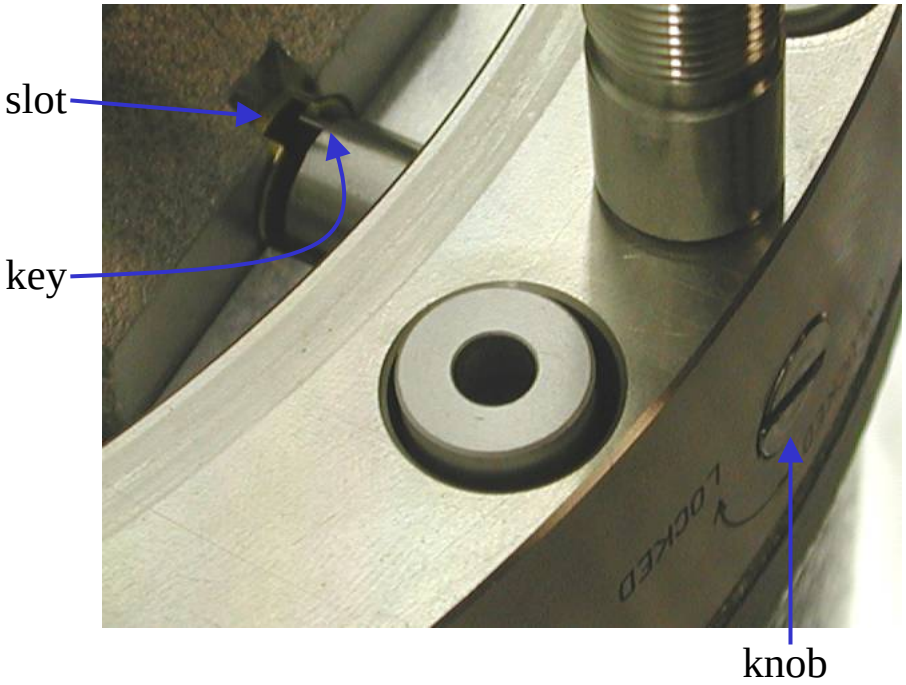
Locking mechanism

There are 3 locks, one per sensor unit. Turning the lock on seems to push a pair of rods, bank vault style, out from the base and into the proof mass

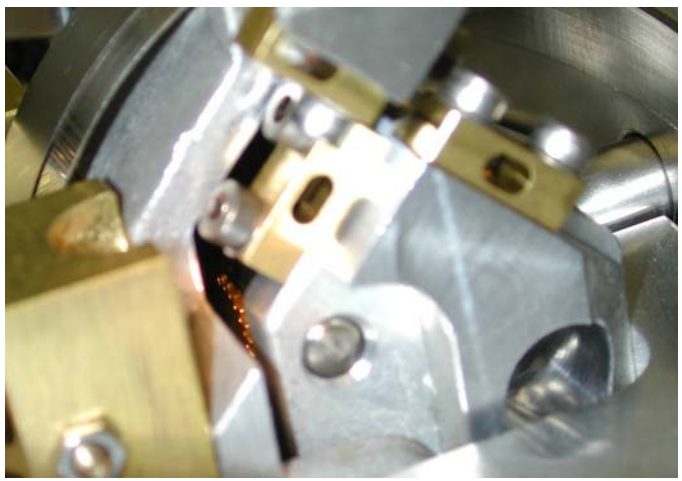


colored letters in diagram match colored letters on photo, the rod tips are the round bits, masses are locked



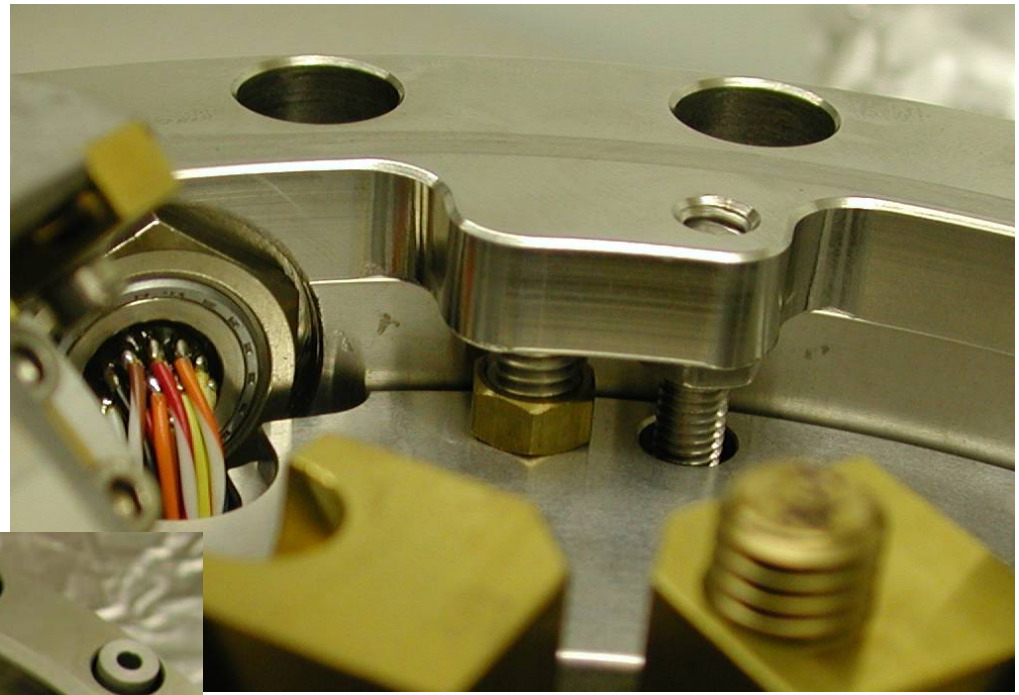


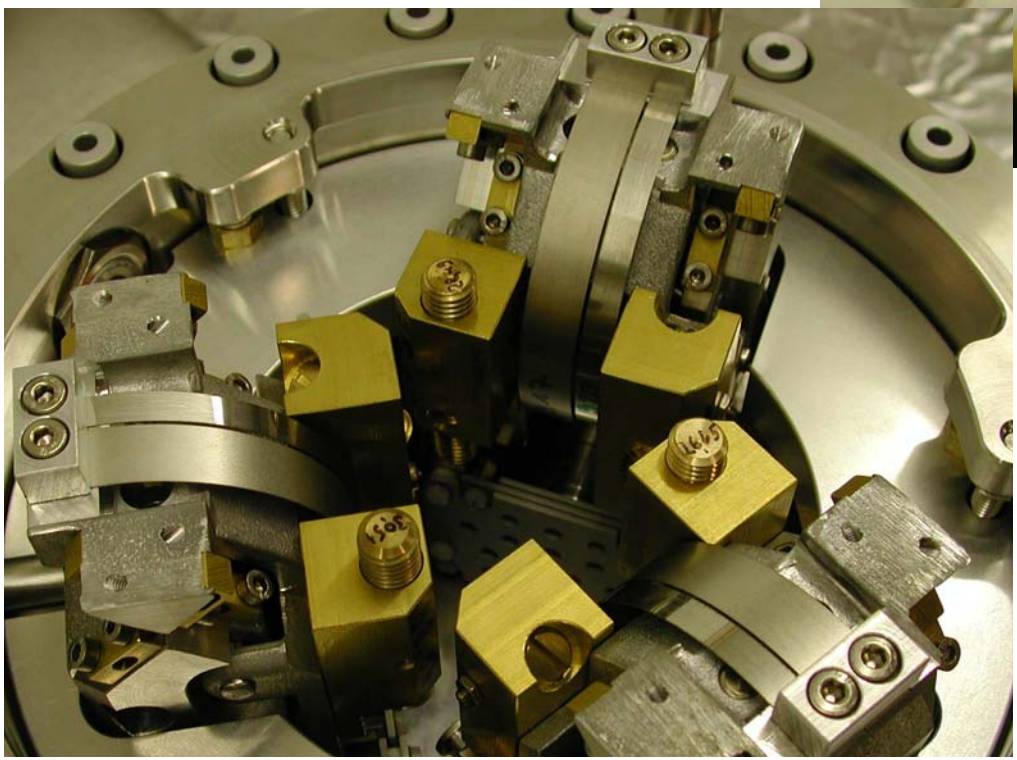
Here we see the connection from the external knob to the internal mechanism. The slot on the internal mechanism is much larger than the key on the external knob. Now, the device is locked, and the key is firmly engaged against the slot. One might guess that in the unlocked position, the key does not touch the slot. (As has been supposed by Shyang and others)



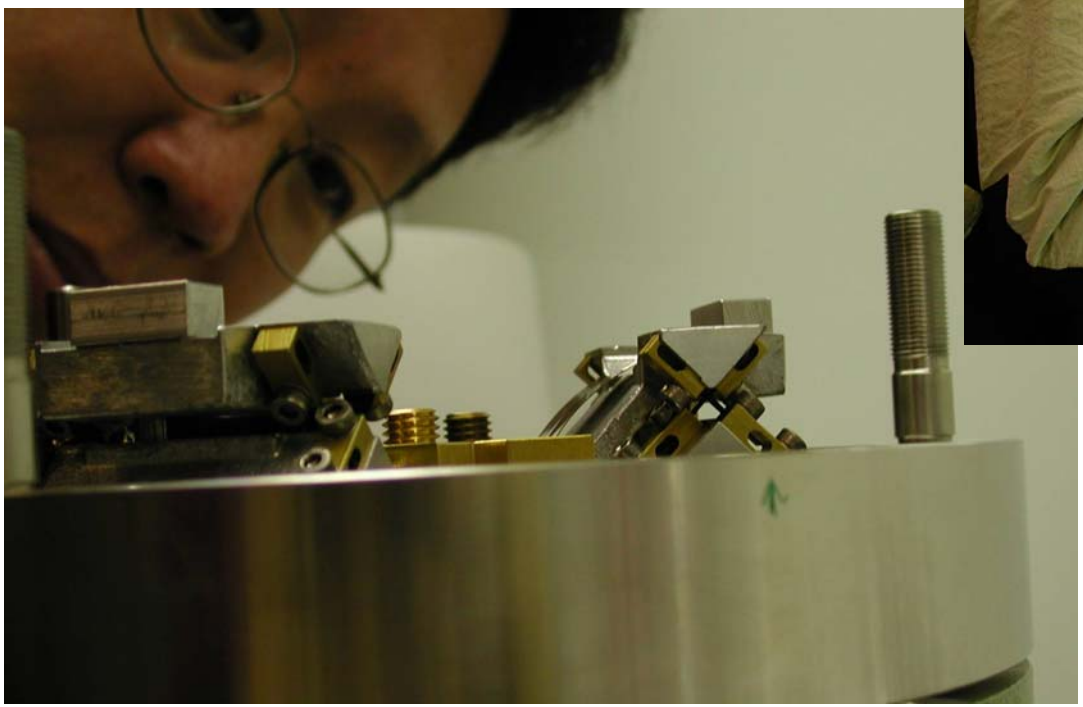
edge of a gear is visible in the internal locking mechanism. It appears slightly more complicated than a single gear rack-and-pinion, but it’s very hard to see inside to tell what is actually going on.

It’s interesting to see that the big, steel ring is not actually the instrument base. The ring is attached by 3 sets of bolts to the plate which holds the 3 sensors.





Our fearless leader points out one of the delicate thingies.



The pivot point of the hinge is about 0.27 inches from the edge of the baseplate

I don’t have a picture of this, but the top cover is hollow. There is an outer and an inner dome. The space between them can be accessed by a pair of screws which are next to the o-ring, and can be removed after the top cover is taken off. The screws have plastic seal washers which probably work pretty well.