

**LIGO Project Modifications to the GS-13.  
LIGO E0900027-v1**

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The LIGO project will require 2 different custom versions of the GS-13, one version dedicated for horizontal use, and 1 version for vertical use.

The LIGO project is procuring roughly 99 units in the vertical configuration, and roughly 99 more in the horizontal configuration.

For both configurations, we would like the follow assembly procedures followed:

- 1) All set-screws to be secured with a drop of thread-locker (e.g. lock-tite).
- 2) Electrical connector to be oriented according to figure 1.



Figure 1. (Left) Incorrect connector orientation. (Right) Correct connector orientation. Note the location of the large key slot. If the seismometer is in the horizontal mode, the large key slot is 'up'. Also note that the 4 screws which secure the connector should be installed (unlike the photo on the right).

3. Hole sealing - Many parts will be removed as described below. The resulting holes in the can should be closed to prevent contamination of the interior of the instrument during testing and shipping. Method for sealing the holes is at Geotech's discretion, but must be approved by LIGO before the method is finalized. Seals must not rattle or be shaken loose by vibration, and should age well (eg, threadlocker on nuts, no tape). Customized faces without the holes would be acceptable.

4. No Paint – we would prefer to get the instruments without the paint of the cans. This is a simple way to (slightly) reduce the potential for vacuum contamination.

5. The instruments will be modified to better suit our in-vacuum needs according to the flowing:

Vertical configuration:

The vertical configuration will be modified to remove several components which are not needed to use the instrument in the LIGO vacuum pod, and to add parts to damp the resonances of the offload springs.

In particular, we would like the following changes:

- a. remove Calibration Coil and the cap to which it is attached .
- b. remove Calibration Magnet
- c. remove the handle
- d. remove the front horizontal foot
- e. remove the rear horizontal foot assembly.
- f. remove adjustable feet  
(but leave the 3 vertical posts which the adjustable feet attach to)
- g. INSTALL a new viton o-ring, parker size 2-006 on each vertical offload spring  
these are available from McMaster Carr  
PN 1201T16

(they were listed at \$4.82/50 in Feb. 2009)

These are to be installed as shown in figure 2, around the spring, on the end near the top of the seismometer. LIGO personnel will slide the o-ring down so that it spans the gap between the first and second coil of the spring.

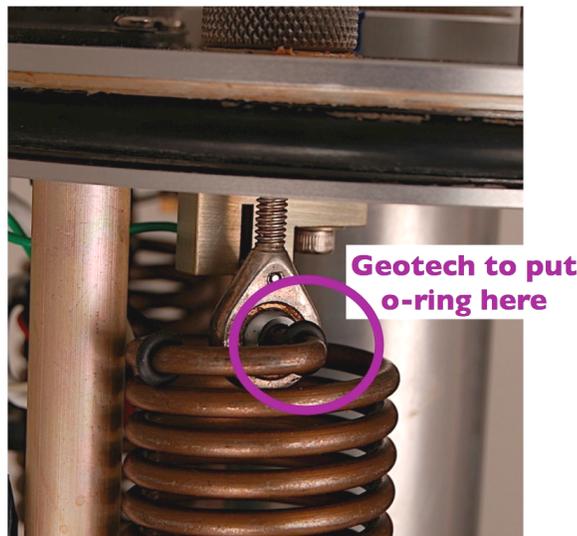


Figure 2. Picture of the correct placement of the o-ring on the vertical off-load spring. There is to be one o-ring per spring, installed around the spring, on the end near the top. In this location, the o-ring should not touch the next coil LIGO may move the o-ring around to the location of the other o-ring in this picture, so that the o-ring does touch the next coil.

- h. Seal holes (from handle, horizontal feet, etc) against dust.  
LIGO must approve the sealing method.  
Seals must be resistant to vibration and aging,  
(e.g. no tape, bolts should have lock-tite, etc)
- i. calibration magnet should be replaced with a weight to  
replace the mass of the calibration magnet.

Horizontal configuration:

The horizontal configuration will be modified to remove several components which are not need to use the instrument in the LIGO vacuum pod, and will be modified to remove the components which are necessary to convert the unit into the vertical sensor mode.

In particular, we would like the following changes:

- a. remove Calibration Coil
- b. remove Calibration Magnet
- c. remove the handle
- d. remove the front horizontal foot
- e. remove the rear horizontal foot assembly.
- f. remove adjustable feet  
(but leave the 3 vertical posts which the adjustable feet attach to)
- g. remove the 3 vertical offload springs
- h. remove mechanisms associated with vertical offload springs, including
  - spring tension adjust knobs, screws, bushings, etc.
  - cantilever assemblies which connect spring to mass
  - flexures for the spring and cantilevers
  - cantilevers stops
  - spring guides (slotted parts which accept the spring guide pins)
  - please provide a clear and complete list for our approval

NOTE – please leave the period adjustment mechanism in place.

- i. Seal holes (from handle, horizontal feet, tension adjust knobs, etc) against dust.  
LIGO must approve the sealing method.  
Seals must be resistant to vibration and aging,  
(e.g. no tape, bolts should have lock-tite, etc)
- j. calibration magnet should be replaced with a weight to  
replace the mass of the calibration magnet.