



COMPONENT SPECIFICATION

TITLE
Hybrid OSEM Testing Specification

APPROVALS:	DATE	REV	DCN NO	BY	CHK	DCC	DATE
DRAWN: J. Romie	2-20-03						
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1.0 Scope

This specification covers the testing of the **Mode Cleaner Coil Assembly, D020225** and the **Recycling Mirror Coil Assembly, D030073**, used in the Advanced LIGO suspensions. Sensor/actuator head assemblies are commonly called osems, which is an abbreviation for Optical Shadow sensor and Magnetic actuator. This testing document specifically details the testing of the sensor/actuator and coil, detailed in **D030105, Hybrid OSEM Assembly**.

2.0 Documents

- D020225: Mode Cleaner Coil Assembly**
- D030073: Recycling Mirror Coil Assembly**
- under both of which is the assembly of the sensor/actuator and the coil:
- D030105, Hybrid OSEM Assembly**
- E030084 Hybrid OSEM Assembly Specification**

3.0 Test Box

The MIT test box will measure the LED and photodiode current, the coil resistance and inductance and the leakage current. There are three sets of tests which use this box. The first is the positioning of the circuit boards relative to each other in the sensor/actuator assembly stage, section 6.0 of E030084. The second set of tests are the pre and post bake tests for the sensor/actuator assemblies. The third test is the feedthrough test after installing the suspensions in the chamber and mounting the doors back on the chambers. The form for recording data from the second test is found in the Appendix 9, Hybrid OSEM Test Data, E030084.

Osem Test Box Switch Positions and Acceptable Ranges:

1. **Battery test.** New should read about 9.5 V. Replace battery at 7.0 V.
2. I_{LED} , LED Current. Preset to 50mA. Acceptable range: **49 - 51 mA**
3. I_{PD} , Photodiode Current. Scale 200 μ A, records illumination from LED. Acceptable range: **> 90 μ A, open light (no shadow between LED & PD)**
4. **Coil Resistance.** Scale 20 Ω . Acceptable range: **15 - 17 ohm**
5. **Coil Inductance.** Scale 20mH. Measure at 1 kHz. Acceptable range: **2.9 - 3.3 mH**
6. **Leakage current.** Scale 2 μ A. Voltage=2.5V. Acceptable range: **< or = 0.01 μ A**

To use the box, connect a sensor/actuator pigtail, D990675, or a minigrabber cable to the 6-pin receptacle on the box. The pigtail must exit away from the LED display. The minigrabber cable must be aligned so that the white



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end of the connector is over the white mark above the receptacle. Proper mating of the 6 pins will have the connector centered to the right of the display. Connect the banana jack to the metal sensor/actuator plate. Turn tester on by moving toggle switch either up or down (center off). Select function and record reading.

The minigrabbers are color-coded as follows:

Black - inductor Grabber with white paint is positive

White - LED Grabber with white wire is positive

Violet - photodiode Grabber with white paint is positive

Leakage Current Caution Note: In the past, osem heads may have been tested for leakage current, test #6, using a digital multimeter (DVM). When a DVM was used a lower limit of $>30M\Omega$ was acceptable. A DVM may not have an adequately high resistance range to test for leakage current; $>250 M\Omega$ is required. Megaohmmeters ("meggers") may apply too high a voltage to be suitable for sensor/actuator testing. Therefore, the Osem Test Box must be used.

3.1 Positioning the Circuit Boards with the Test Box

Document the final photodiode current after optimally positioning the boards, from section 6.3 of E030084. Twist knob to #2 position. Check that the current is within the range listed above. Position the former at least 1" away from magnetic material (i.e. on top of a beaker.) Change knob position to #4, #5 and record values. Keep this data with the traveler. Change knob position to #6 and make sure the value is within range. See caution note above.

3.2 Pre and Post Bake Tests with the Test Box

Pre-Test: Perform a visual inspection of the sensor/actuator assemblies for any workmanship defects, failed wire insulation, contamination, or loose wires. Reject parts which are clearly deficient. Position the heads at least 1" away from magnetic material (i.e. on top of a beaker.) Using the test box, perform tests #2 - #6, recording values for #2 - #6 on the Sensor/Actuator Test Data form, E000388, Appendix. See caution note above. Make sure the values are within the acceptable ranges. Perform metalization inspection and testing, per instructions in section 3.5 of E000388. Mark the values for the resistance measurements on the form.

Post-Test: Again, perform a visual inspection of the sensor/actuator assemblies for any workmanship defects, failed wire insulation, contamination, or loose wires. Reject parts which are clearly deficient. Position the head at least 1" away from magnetic material (i.e. on top of a beaker.) Retest the assembled sensor/actuator assemblies, test steps #2 - #6, using the test box. See caution note above. Record data in Appendix 9, Sensor/Actuator Test Data form, under "Post". Compare this data to the "Pre" data. Determine that there have been no appreciable changes and that the values are within the ranges listed.

3.3 Feedthru tests with the Test Box

Using an adapter pigtail and the test box, measure values #2 - #6 and make sure they are within the acceptable ranges. Connect the pigtail to the chamber feedthru connector. Also, check the shadow sensor voltage with an oscilloscope, which should be at the 50% level. Record this data on the check out sheet.