



		IDENTIFICATION MODSEQ			
TITLE	FINAL ALIGNMENT AND MODULE TESTING SEQUENCE	REFERENCE NO. <b>930212</b>		SHT	1 OF 4
		OFFICE RDE		REVISION 1	
PRODUCT	LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY	MADE BY	CHKD BY	MADE BY	CHKD BY
		GLW	KHF	WLR	SWP
		DATE	DATE	DATE	DATE
		2/4/94	3/14/94	5/16/95	5/16/95

## 1.0 SCOPE

This procedure outlines the final installation and testing sequences to be followed during the testing of the of the beam tube modules after all beam tube can sections have been installed.

- 1) Detail or supporting procedures for final alignment and testing are referenced as required. See paragraph 3.0 for listing.
- 2) The sequence is based upon the following conditions:
  - 1.1 All beam tube can sections for the beam tube module to be tested have been successfully HMS tested at time of fabrication, final cleaned and installed. The installed beam tube can sections have also had the closing weld joints HMS tested and locally cleaned.
  - 1.2 All isolation valves to pump ports, LN2 pumps, accessories, and RGA monitoring equipment have been installed and commissioned and flange seals to pump ports and have been successfully HMS tested and locally cleaned. (At present, LN2 pumps etc. are not in the workscope, only the installation of the valves and blind covers are included.)

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### Note

**LN2 Pump Furnish and Installation  
Is By Others.**

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- 1.3 The permanent vacuum pump sets for the applicable beam tube module have been installed at each end of the module, tested and are operational. (INSTALLATION BY OTHERS)



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		930212			
PRODUCT		OFFICE			
		RDE			
		REVISION			
		1			
LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY		MADE BY	CHKD BY	MADE BY	CHKD BY
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1.4 Preliminary alignment has been completed and all supports are installed.

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**Reference**

See

**Final Alignment and Maintenance  
of Beam Tube Modules  
Doc ID "ALI-B"**

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1.5 Beam tube module precast concrete cover has been installed by others.

**2.0 FINAL ALIGNMENT AND TESTING SEQUENCE**

2.1 Perform final alignment on each beam tube can section verifying alignment of the beam tube module.

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**Reference**

See

**Final Alignment and Maintenance  
of Beam Tube Modules  
Doc ID "ALM-B"**

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2.2 Complete alignment records and reports.



TITLE FINAL ALIGNMENT AND MODULE TESTING SEQUENCE		IDENTIFICATION MODSEQ			
		REFERENCE NO. <b>930212</b>		SHT <b>3</b> OF <b>4</b>	
PRODUCT LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY		OFFICE RDE		REVISION <b>1</b>	
		MADE BY GLW	CHKD BY KHF	MADE BY WLR	CHKD BY SWP
		DATE 2/4/94	DATE 3/14/94	DATE 5/16/95	DATE 5/16/95

2.3 Perform RGA performance (air signature) test of beam tube module. See Section 3.0 of procedure HMST4N.

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**Reference**

See

**RGA Performance (Air Signature)  
Test of Beam Tube Module  
Doc ID "HMST4N"**

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2.4 Complete RGA performance (air signature) records and reports.

2.5 Skip step 2.6 if the results indicate no or acceptable inleakage.

2.6 Perform helium mass spectrometer hood test of beam tube module if step 2.3 was not acceptable.

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**Reference**

See

**Helium Mass Spectrometer Hood  
Test of Beam Tube Module  
Doc ID "HMST5N"**

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2.7 Install, inspect and checkout I<sup>2</sup>R Bakeout equipment and controls.

2.8 Install, Inspect & Accept insulation of modules (by Others).



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		MADE BY GLW	CHKD BY KHF	MADE BY WLR	CHKD BY SWP
		DATE 2/4/94	DATE 3/14/94	DATE 5/16/95	DATE 5/16/95

2.9 Perform bakeout of beam tube module under vacuum.

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**Note**

**Bakeout of Beam Tube Module  
Is By Others.**

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- 2.10 Perform RGA performance (air signature) test of beam tube module. See Section 3.0 of procedure HMST4N.
- 2.11 If after bakeout, unacceptable leakage rates are recorded, see "HMST5N" for decision tree and appropriate remedial operations.
- 2.12 If leakage rate is acceptable, complete RGA performance (air signature) test and HMS records and reports.

**3.0 REFERENCED PROCEDURES AND SPECIFICATIONS**

This installation sequence is to be used in conjunction with the following procedures and/or specifications:

- 3.1 Initial and Final Alignment During Construction and Installation of Beam Tube Can Sections  
Doc ID "ALI-B" and "ALM-B"
- 3.2 Planned Approach to Leak Testing for LIGO Project  
Doc ID "LIGOTP"
- 3.3 RGA Performance Test of Beam Tube Module  
Doc ID "HMST4N"
- 3.5 Helium Mass Spectrometer Hood Test Beam Tube Module  
Doc ID "HMST5N"
- 3.6 Insulation Specification (by Others, later).
- 3.7 I<sup>2</sup>R Bakeout Specification (by Others, later).