

HXS Integration Plan

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The Hard X-ray Spectrometer (HXS) diagnostic instrument consists of 7 sub-components:

1. Spectrometer Hardware

- 1) Nose cone with an LLE designed pointer interface
- 2) Hard x-ray shielded (Pb) entrance aperture
- 3) Removable blast filter assembly
- 4) Pin-hole open/closed selector assembly
- 5) Hard x-ray shielded (Pb) crystal entrance aperture
- 6) Cylindrically bent transmission crystal assembly
- 7) Crossover point step-wedge filter assembly
- 8) Hard x-ray shielded (Pb) slit aperture
- 9) Charge Coupled Device (CCD) sensor assembly.

2. Drive Electronics (DE)

- 1) CCD readout/drive board
- 2) PC104 solid state computer
- 3) Power management board
- 4) House keeping board
- 5) Fiber-optic data in/out board
- 6) Trigger fiber-optic board

3. TIM Interface Plate (TIP)

Functions as the support structure for the Drive Electronics (DE) and the spectrometer hardware. The TIP has lifting handles and interfaces to the TIM boat with tooling balls and captive screw hardware. The cooling of the HXS instrument is accomplished by interfacing to the LLE standard Parker dry connectors with a cooling loop integrated onto the TIP.

4. Internal Battery Pack (IBP)

Supplies 7.2 VDC power to the HXS DE. The IBP contains 42 Nickel Cadmium 1.2 VDC (4400 mA-H) batteries housed in a hermetically-sealed enclosure mounted in the rear of the TIM boat. The IBP hardware has captive screws and lifting handles.

5. Diagnostic Control Processor (DCP)

Consists of a laptop computer which is located outside the TIM on the target chamber support structure. The DCP is powered by LLE 110 VAC and interfaces to the LLE DAS via an Ethernet connection.

6. TIM Diagnostic Interface Unit (DIU)

Converts the 50 ohm coax BNC diagnostic trigger pulse (that is sent by LLE) to a fiber-optic-transmitted light pulse.

7. Battery Recharge Interface Control Keeper (BRICK)

Recharges the Internal Battery Pack (IBP) while still mounted inside the TIM. After the instrument is retracted and the TIM is vented and the TIM door is opened, the operator disconnects the right-angle 25 pin D-sub male connector cable at the battery output and connects the straight-inline 25 pin D-sub male connector that is attached to the BRICK. The BRICK system interfaces to the DC and gives charging status and battery health information while connected for recharging.

Instrument Arrival at LLE

The HXS instrument will arrive at LLE in a shipping case. The shipping case has a support interface that simulates the TIM boat structure and can serve as the off-line storage container for the instrument. The shipping case contains the entire assembled HXS instrument, including the battery pack.

HXS Integration with the TIM

The HXS instrument initially will be tested off-line at LLE (see the **Static Test Plan** document that is provided with the HXS instrument). The following six instrument sub-components are then carried into the OMEGA target chamber bay:

1. Internal Battery Pack (IBP) in its hermetically-sealed enclosure
2. Assembled spectrometer and TIM Interface Plate (TIP)
3. LLE designed pointer assembly (supplied with the HXS instrument)
4. Diagnostic Control Processor (DCP) laptop computer
5. Diagnostic Interface Unit (DIU)
6. Battery Recharge Interface Control Keeper (BRICK)

The HXS components are assembled into the TIM in the following order:

- 1) The Internal Battery Pack (IBP) has lifting handles and is installed into the rear of the TIM boat. The IBP has spring-loaded captive 10-32 PEM hardware to interfaces with the existing TIM boat mounting holes.
- 2) The assembled spectrometer and TIM Interface Plate (TIP) attaches to the TIM boat with tooling balls and spring loaded captive 10-32 PEM hardware.
- 3) The two vacuum-side SMA fiber optics, Jack cable assemblies approximately 36” long, go between the TIM boat connector block assembly and the TIP SMA fiber optic connectors that are located on the topside of the Drive Electronics (DE). The LLE OTIS F/O SMA functions as the HXS trigger fiber optic. The LLE Fiducial F/O SMA functions as the HXS data fiber optic (routed through the opening in the handles of the DE).
- 4) Insert the mating Parker dry connectors from the TIP structure to complete the connection of the TIM cooling loop (routed through the opening in the handles of the IBP).
- 5) Connect the right-angle 25 pin D-sub male connector cable from the Drive Electronics (DE) to the Internal Battery Pack (IBP). This action initiates the HXS instrument's Shutdown Mode.
- 6) Connect the atmosphere-side SMA fiber optic Jack cables to the DIU. The LLE OTIS F/O SMA functions as the trigger fiber optic, and the LLE Fiducial F/O SMA functions as the HXS data fiber optic.
- 7) Power-up the DC, which initiates the HXS instrument's Wake-Up Mode. The instrument's self test is performed.
- 8) Connect the DC to the LLE Ethernet near the HXS instrument TIM.
- 9) Conduct the LLE DAS system test of the HXS instrument. Conduct the CCD aliveness test as discussed in the HXS Static Test Plan document. Proceed if the test image is acquired.
- 10) Verify that all cables are safely routed inside the TIM space envelope and that the 37 pin D-sub connector RF cover is installed.
- 11) Install the HXS instrument's pointer and proceed with the normal LLE diagnostic instrument pointing operation. Save the deployed position values, retract the instrument, remove the pointer, and stow the pointer in the storage location on the HXS Drive Electronics (DE).
- 12) Pump down the TIM and deploy the HXS instrument to the previously saved position in preparation for the OMEGA shot.