ENGINEERING CHANGE ORDER

Center for Astrophysics & Space Astronomy
University of Colorado, Boulder

ECO No. **COS-050**
Date 11 January 2001
Sheet 1 **of** 6

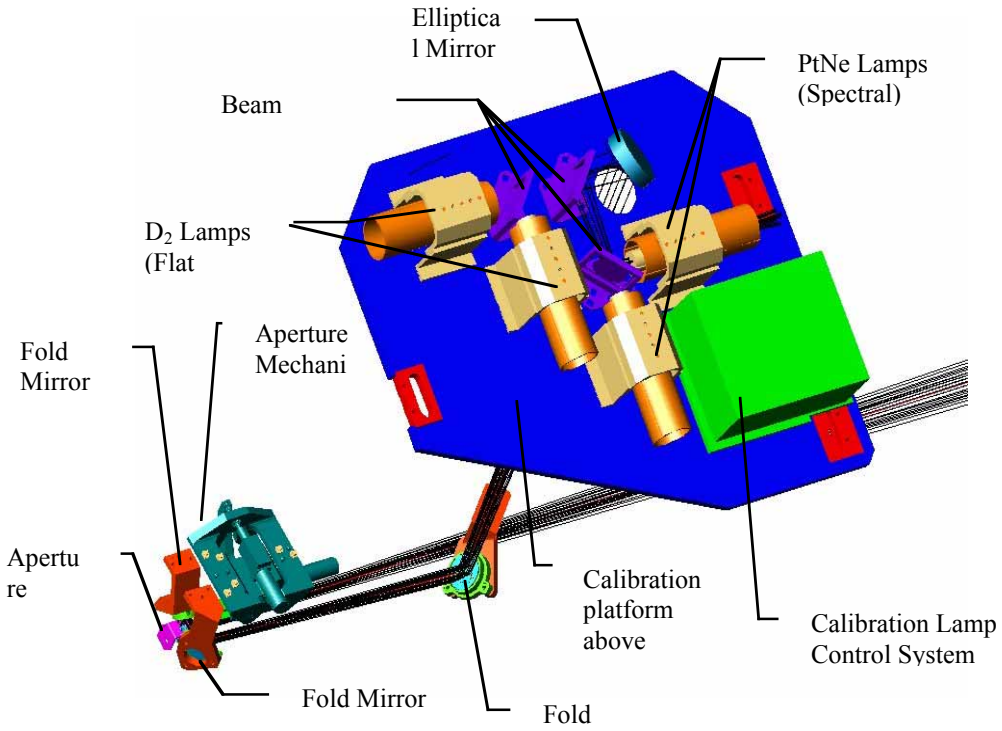
Drawing Title	Drawing No.	Revision Letter		Special Distribution
		Current	New	
OP-01	COS-01-0001	5	6	
				Stop Production Now
				❑ Yes
				❑ No

Description of changes:

1. A new copy of Figure 2.2-1 follows.

Reason for Change:	**Disposition/Effectivity**				
Updates to COS operations.	To Comply With ECO				
	Use As Is				
	Rework To ECO				
	Scrap And Rebuild				
	Record change Only				
	Other (See Above)				

Prepared By:	**Jon Morse**	Date	**11 Jan 2001**	CCB Required ❑Yes ❑No	❑Approved ❑Not Approved
Design Engr		Date			
Project Engr (EE)		Date		❑Class I ❑Class II	Immediate Incorporation ❑Yes ❑No
Project Engr (ME)		Date			
QA Mgr		Date		Completion	
Project Mgr		Date		Date	
Sponsor		Date			



2. Pg. 54: Create a new Section 2.3 with the following text.

2.3 VACUUM SENSING SYSTEM

COS contains a vacuum sensing system which is used to monitor the *in-situ* vacuum pressure of the instrument's optical cavity. Vacuum sensing is implemented by monitoring the voltage and current of a cold-cathode ion pump (Varian model 913-0038). The raw voltage and current data from the ion pump are carried in the RIU direct telemetry and these data can be converted to vacuum pressure via calibration data acquired during the instrument's integration and test effort. The ion pump is mounted on the center of the COS thermal shelf.

The vacuum sensing system is configured to accurately monitor vacuum pressure over a three decade range from 10^{-4} to 10^{-7} Torr. Although the pump can be turned on after the vacuum pressure is less than 0.1 Torr, it is recommended that the pump be turned on only after the vacuum pressure is less than 10^{-4} Torr. Based upon the venting experience with previous HST science instruments, 10^{-4} Torr should be reached within a few days after SI installation into the observatory. Once turned on, the ion pump is used to monitor the instrument's vacuum pressure in order to determine if conditions are appropriate for opening the FUV detector door and then for FUV high voltage (HV) to be operated (see Sec. 4.1).

Although the ion pump itself is single-string, it is serviced by both the A and B sides of the COS electronics. At start-up (~10^{-4} Torr) the ion pump will typically draw several hundred microamps of current and run around 500 volts. As the vacuum improves within COS, the current drawn will decrease and the operating voltage will increase to approximately a few microamps and a few thousand volts at 10^{-6} Torr. The actual values of current and voltage for determining the vacuum level will be calibrated during COS I&T and will be provided in DM-

14. Four discrete commands that come from each of the RIUs are used to activate the ion pump. Two of the commands select the source of power for the pump (LVPS1 or LVPS2). Additionally there are Enable and Disable commands to the pump from each RIU. The discrete commands operate relays inside the ion pump box.

The ion pump electronics are self-protecting. The output HV is limited by design to approximately 3 kV into an open circuit. There is an input current limiter to shut the circuitry down if the HV output (or some other internal circuitry) should happen to short out. There is no autonomous means of shutting down the ion gauge by itself. It is possible to damage the pump itself if it is powered at too high a pressure; pump life is a function of pressure. A safe start-up pressure would be less than 0.1 Torr, but the preferred pressure is below 10^{-3} Torr and measurements will only be accurate below 10^{-4} Torr. The pump will take longer to "fire" at extremely low pressures.

It is expected that the ion pump will only be used until that point in time when the vacuum inside COS is of adequate quality that the FUV detector door can be opened and FUV HV operations can commence (see Sec. 4.1.1 for FUV detector vacuum requirements). In the advent of a future servicing mission or for future monitoring of the vacuum conditions within COS, the ion pump can be restarted (although if the pressure is too low, it may not be possible to start the pump). Because the ion pump can contribute significantly to the noise background of the FUV detector, the ion pump should be turned off when the FUV detector door is to be opened and science operations commence.

3. Pg. 68: Add the following as the 4th paragraph of Section 4.1.1.

Precautionary note: The FUV detector is an open face MCP detector. As such, it can be hazardous to the health and safety of the detector to expose the face of the detector to vacuum levels in excess of 10^{-4} Torr. For this reason, the detector is equipped with a door atop the DVA. The door shall be opened only when the DVA is in a vacuum tank (for ground and instrument I&T processing) or after COS has been installed in the observatory and the vacuum readings from the ion pump (see Sec. 2.3) indicate adequate vacuum has been achieved. Additionally, safe operation of the FUV detector's high voltage (HV) systems requires the proper ambient environment. In a vacuum environment, it is only safe to activate the FUV detector's HV after a vacuum of 10^{-5} Torr or better has been achieved.

4. Pg. 77, Sec. 4.1.3: In the text for item C. LDCHVPWR, change "-2000 V" to "-2500 V".

5. Pg. 77, Sec. 4.1.3, last paragraph, first sentence: Change "FUVHVLow puts the HV to a minimal value of –2.5kV as fixed in the hardware." to read "FUVHVLow puts the HV to a minimal value as defined in Table 4.1-1."

6. Pg. 77, Sec. 4.1.3, last paragraph, 3rd sentence: Change "(1 bit = TBD volts)" to (1 bit = 15.69 volts)".

7. **Pg. 79-80, Sec. 4.1.3, Table 4.1-1, in the entry row for LFHVLOW: Change "TBD – TBD Volts" to "-6500 – -2500 Volts".**

8. **Pg. 125, Section 5.3.4, first paragraph: Add the following sentence to the beginning of the first paragraph.** "Stim pulse rates are chosen based on exposure time only, and are independent of the acquisition mode (either Time-tag or ACCUM)." Then change the last two sentences to read: "The highest rate of 2000 Hz will be used for observations <10s and during ground calibration; this rate may also be used as a diagnostic mode on orbit. The stim pulses may be turned off by setting the rate to be 0 Hz (e.g., during target acquisition or Local Rate Checks)."