ENGINEERING CHANGE ORDER Center for Astrophysics & Space Astronomy University of Colorado, Boulder				**ECO No.** COS-069 Date 1 October 2001 Sheet 1 of 3
Drawing/Document Title	Drwg/Doc No.	Revision Letter Current	 New	Special Distribution
OP-01	COS-01-0001	15	16	
				Stop Production Now ❑ Yes ❑ No

Description of Change:

1. **Page 35 (Rev. 15), Sec. 2.1.2.3.1: Add the following sentence to the end of the 4th paragraph about "motor speed selection".**

Laboratory testing shows that the ApM motors should be operated at a preferred speed, therefore the LAPERINI macro has a CARD item which states that the preferred speed for both ApM motors is TWOTHIRD (52.08 steps/second).

2. **Page 36 (Rev. 15), Sec. 2.1.2.3.2: Replace the existing paragraph with the following text.**

The "Move ApM to Relative Position" macro specifies the motor (X, Y), the number of motor steps to move, and the direction of travel. For both ApM motors, it is desirable that moves in the non-preferred direction overshoot and return to the desired destination in the preferred direction to eliminate mechanism backlash. The relative move macro does not perform this overshoot, therefore, for relative moves in the non-preferred direction, the STScI ground system will need to perform overshoot processing by adding the overshoot to the number of steps in the non-preferred direction and commanding a separate relative move macro for the return move.

3. **Page 36 (Rev. 15), Section 2.1.2.3.3: Replace the phrase "[See table in DM-05?]" with the sentence:**

See DM-05 (macro sheet LAPER) for the name of the flight software look-up table patchable constant.

Reason for Change: Updates to COS operations in OP-01.	Disposition/Effectivity				
	To Comply With ECO				
	Use As Is				
	Rework To ECO				
	Scrap And Rebuild				
	Record change Only				
	Other (See Above)				

Prepared By:	Jon Morse	Date	1 Oct 2001	CCB Required	❑Approved
Approved By:		Date		❑Yes ❑No	❑NotApproved
Approved By:		Date			Immediate
Approved By:		Date		❑Class I	Incorporation
Approved By:		Date		❑Class II	❑Yes ❑No
Approved By:		Date		Completion	
Project Mgr:		Date		Date	

4. Page 42 (Rev. 15), Section 2.1.5.2.1: Add the following sentence to the end of the 4th paragraph about "motor speed selection".

Laboratory testing shows that the OSM1 and OSM2 motors should be operated at preferred speeds, therefore the macro sheet for LOSMINIT has a CARD item which states that the preferred speed for the rotational motors is ROTFULL (78.12 steps/second), and that the preferred speed for the OSM1 translational (focus) motor is FOC2THRD (52.08 steps/second).

5. Page 43 (Rev. 15), Section 2.1.5.2.2: Replace the existing paragraph with the following text.

The "Move OSM to Relative Position" macro specifies the motor (rotational, focus), the number of motor steps to move, and the direction of travel. For all OSM motors, it is desirable that moves in the non-preferred direction overshoot and return to the desired destination in the preferred direction to eliminate mechanism backlash. The relative move macro does not perform this overshoot, therefore, for relative moves in the non-preferred direction, the STScI ground system will need to perform overshoot processing by adding the overshoot to the number of steps in the non-preferred direction and commanding a separate relative move macro for the return move.

6. Page 44 (Rev. 15), due to code changes made in late August to separate the clear OH bits and close relay functions, item 2) under section 2.1.6 should be changed (slightly) to read:

As a second level of protection, the hardware overheat protection circuitry automatically disables an ApM or OSM motor when its temperature rises above 62 ° C by opening its motor winding relay. Any attempt to move the motor when in a hardware overheat condition will be ignored by the FSW. Before a motor that is in an overheat condition can be re-enabled, a "Clear Overheat" macro must be issued followed by a "Close Relay" macro. The "Clear Overheat" macro will not be allowed to clear the overheat status bit until the motor has cooled to [TBD] degrees. This automatic overheat protection is enabled upon power-on, but may be disabled via a ground macro. Under normal conditions, it will remain enabled.

7. Page 45 (Rev. 15), add the following text to the end of section 2.1.6.1 :

5) The COS mechanism motor relay control electronics use a pulse circuit to close the relay for any given motor. The relay pulse circuit is edge-triggered. This means that for a pulse to be sent to close the relay, the pulse circuit must see a transition from 0 to 1. The inputs to a pulse circuit are the overheat status bits for a group of motors all OR'd with the nominal relay control bit. This means that all the OR'd overheat status bits must be cleared for the nominal control bit (for any of the motor relays) to close any relay controlled by that pulse circuit. So, if motor A and motor B are both in an

overheat condition, an attempt to clear the motor A overheat condition will not be successful because the motor B overheat status bit will prevent the input to the pulse circuit from going to 0 to later create the rising edge to close the selected relay. For COS, the two OSM rotational axes motors are part of one pulse circuit (SES#2) and the OSM1 focus and aperture cross-dispersion and dispersion motors are part of the other pulse circuit (SES#3).

8. Page 45 (Rev. 15), the following sentence should be added to the end of item 2) of section 2.1.6.2:

To successfully close the winding relay, any other overheat bits on the same pulse circuit that have been set must be cleared first.

9. Page 70 (Rev. 15), Section 4.1.1, last paragraph (Precautionary Note), 3rd sentence:

Old text -

"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 reading from the ion pump indicate adequate vacuum has been achieved."

New text -

"The door shall be opened only when the DVA is in a vacuum tank with a pressure of $<10^{-5}$ Torr (for ground and instrument I&T processing) or after COS has been installed in the observatory and the vacuum reading from the onboard ion gauge indicates the pressure inside the enclosure is $<10^{-4}$ Torr. The lower pressure for ground operations is required to insure that the detector ion pumps can safely pump down and maintain the vacuum in the vacuum housing assembly. When installed into the observatory the detector ion pumps are inert, thus the concern no longer exists."