DATA CHANGE NOTIFICATION FORM
CSM/LM SPACECRAFT OPERATIONAL DATA BOOK

SNA-8-D-027

VOLUME V PART

DATE January 25, 1971

PAGE 1 OF 11

AMENDMENT 7

SHORT TITLE OF CHANGE Specific changes to SIDE/CCGE data for ALSEP Array "C". Apollo 15

CHANGE DESCRIPTION

Insert revised pages as follows:

C-3-41, C-3-52, C-4-19, C-4-20, C-5-11, C-5-12, C-5-13

NA
CONTRACTOR SUBSYSTEM APPROVAL

PHONE

NA
CONTRACTOR MANAGEMENT APPROVAL

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CHANGE AUTHORITY PD7 EXT 2457

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CHIEF, MISSION OPERATIONS BR.

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VOLUME V

REVISIONS

REV.	AMEND. NO.	DESCRIPTION	DATE	APPROVAL
	1	Insert revised pages 3-11, 3-12, 3-13, 3-14, 3-16, 3-22, 3-24, 3-30, 3-34, 3-37, 3-46, 3-47, 3-48, 3-49, 3-54, 3-55, 3-56 4-4, 4-6, 4-8, 4-10, 4-11, 4-13, 4-17, 4-19, 4-21, 5-3, 5-4, 5-8, 5-9, 5-10, 5-13	10/1/69	SED
	2	Insert revised pages 3-7, 3-28 and 4-8	11/7/69	SED
	3	Insert complete, new Appendix B for ALSEP Array "B". 96 Pages plus tabs.	1/15/70	SED
	4	Insert revised pages B-3-34, B-3-35 and B-3-43. Insert newly added Apollo Lunar Surface Drill pages B-3-40.1 through B-3-40.6 and B-4-16.1.	3/20/70	SED
	5	Add Appendix C for ALSEP Array "C".	11/13/70	MOB
	6	Insert revised pages C-i, C-ii, C-3-2, C-3-5, C-3-6, C-3-7, C-3-21, C-3-22, C-3-23, C-3-33, C-4-4.1, C-4-5.1, C-4-12, C-4-14.1, C-4-16.1, C-4-18.1, C-4-20.1, C-4-22.1, C-4-24.1, C-5-11	1/15/71	MOB
	7	Insert revised pages C-3-41, C-3-52, C-4-19, C-4-20, C-5-11, C-5-12, C-5-13	1/25/71	MOB

3.6 SUPRATHERMAL ION DETECTOR EXPERIMENT/COLD CATHODE GAUGE EXPERIMENT (SIDE/CCGE)

In the ALSEP Array C configuration, the instrument comprising the SIDE has been integrated with the instrument comprising the CCGE to constitute one combined SIDE/CCGE experiment subsystem.

The purpose of the experiment is to measure the ionic environment of the moon by detecting the ions resulting from the ultraviolet ionization of the lunar atmosphere and the free streaming and thermalized solar wind. The SIDE will measure the flux, number density, velocity, and energy per unit charge of positive ions in the vicinity of the lunar surface. The CCGE will determine the density of the lunar ambient atmosphere, including temporal variations, either of a random character or associated with lunar local time or solar activity. In addition, the rate of loss of contaminants left in the landing area by the LM and its crew will be measured by the CCGE.

The SIDE/CCGE hardware consists of a velocity filter, a low-energy curved plate analyzer ion detector, a high-energy curved plate analyzer ion detector, a cold cathode gauge, a wire-mesh ground plane, and associated electronics.

3.6.1 SIDE/CCGE Turn-On Sequence

The SIDE/CCGE will be commanded ON after deployment, by direction from the PI, to verify proper operation. After commands have been sent to remove the aperture seal from the CCGE, the SIDE/CCGE will be commanded to OFF. The SIDE/CCGE will be commanded ON during LM ascent, then the SIDE dust cover will be removed. After the SIDE/CCGE has monitored the impact of the LM ascent stage, the experiment high voltages (-3.5KV and + 4.5KV) will be commanded OFF. The SIDE/CCGE will be turned ON during the first lunar eclipse following ALSEP deployment. Once again the SIDE/CCGE will be commanded ON with the two high voltages OFF until telemetry measurement DI-5, internal experiment temperature, decreases to approximately 25°C during the lunar afternoon. At this time, the SIDE/CCGE high voltages may be commanded ON.

3.6.2 SIDE/CCGE Operation

There are five basic commands which are encoded by the SIDE/CCGE into the two one-time commands mentioned above plus fifteen operational commands. The five basic commands are:

104	SIDE Load 1
105	SIDE Load 2
106	SIDE Load 3
107	SIDE Load 4
110	Side Execute

The fifteen operational SIDE commands are listed and described in Section 5.0, ALSEP Array C Command Descriptions.

The timing for the SIDE/CCGE downlink TM data is as follows:

5 SIDE words/ALSEP main frame	= 0.604 second
2 ALSEP main frames/SIDE frame	= 1.208 seconds
128 SIDE frames/SIDE cycle	= 2.58 minutes
24 SIDE cycles/SIDE field	= 1.031 hours

Normal operating ranges, upper and lower red-line limits for critical SIDE/CCGE telemetry measurements are shown in Tables 3.6-1, 3.6-2, 3.6-3 and 3.6-4. Peak power requirements are listed in Table 3.6-5. Figure 3.6-1 shows the power profile and Figure 3.6-2 shows the programmed sensor voltage variations.

TABLE 3.6-5 SIDE/CCGE PEAK POWER REQUIREMENTS

COMMAND NUMBER	FUNCTION	POWER DEMAND
105, 110	Remove CCGE Seal	No Change in Power Demand
107, 110	Blow SIDE Dust Cover	11.2 watts for 2.5 seconds
046	Standby Power On:	
	(a) Above 0°C	2.0 watts
	(b) Below 0°C	6.0 watts
045	Operational Power On:	
	(a) Turn-On Transient	13.3 watts for 0.120 seconds
	(b) Above 0°C	6.0 watts
	(c) Below 0°C	10.0 watts

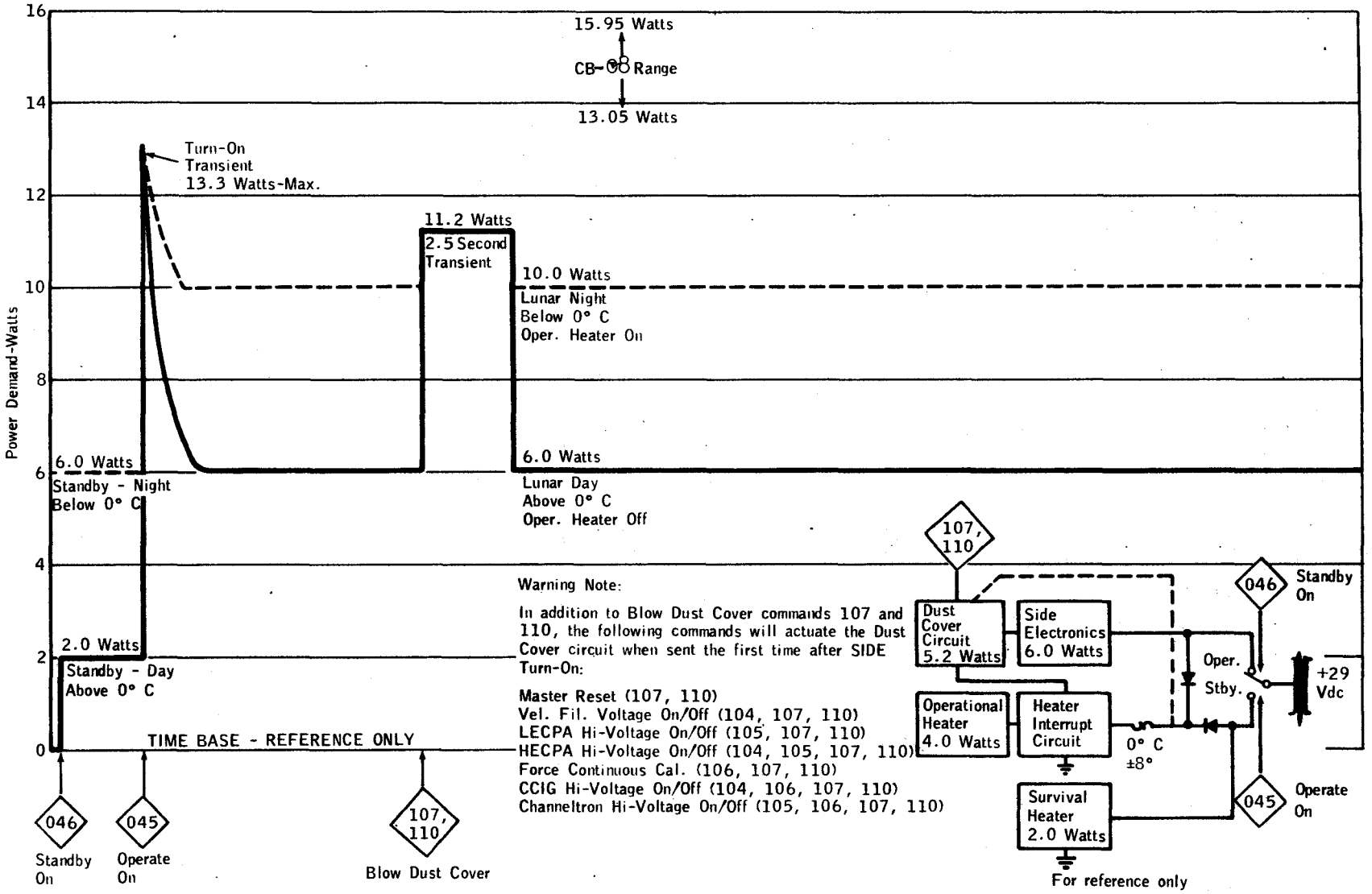

Figure 3.6-1 SIDE POWER PROFILE

4.5 SUPRATHERMAL ION DETECTOR EXPERIMENT/COLD CATHODE GAUGE EXPERIMENT (SIDE/CCGE)

4.5.1 SIDE/CCGE Turn-On Constraints

Deployment constraints for the SIDE/CCGE are listed in Table 4.5-1.

Operating power must be provided to the experiment no later than 6 days after removal of ALSEP from the LM. The SIDE must survive with the dust cover in place for a maximum of four days after deployment, while consuming not more than 6.0 watts of thermal control survival power.

The one-time command sequences establish operational capability for the SIDE/CCGE. Command 105 followed by Command 110 will cause seal removal from the aperture of the CCGE. Similarly, Command 107 followed by Command 110 will cause SIDE dust cover removal. Neither of these one-time sequences are to be commanded until specifically directed by the PI.

4.5.2 SIDE/CCGE Operational Constraints

Red-line limit constraints for the SIDE/CCGE telemetered measurements are shown in various tables in Section 3.6. Peak power demands are listed in Table 3.6-5 and illustrated in Figure 3.6-1.

TABLE 4.5-1 SIDE/CCGE DEPLOYMENT CONSTRAINTS

PARAMETER	CONSTRAINT
Site Selection	50 to 60 feet Southeast of Central Station, limited by 60-foot cable. Astronaut will choose a spot sufficiently smooth to allow emplacement of ground screen and two instruments.
SIDE Leveling	SIDE must be level within 5 degrees. Astronaut will utilize bubble level.
SIDE Alignment	Astronaut will rough align unit utilizing arrow on top of unit. Arrow points toward subearth point-East. Then he will fine align unit within ± 5 degrees of sun line so that the shadow cast by the UHT is parallel to long sides of unit.
CCGE Site	3.5 to 4 feet South of SIDE, limited by 5-foot cable. CCGE must not be emplaced on the SIDE ground screen.
CCGE Alignment	Orifice must be pointed within ± 20 degrees of lunar South with a clear field-of-view away from all other units.

TABLE 5.2-6 SIDE/CCGE COMMAND DESCRIPTIONS

OCTAL COMMAND NUMBER	COMMAND TITLE	COMMAND DESCRIPTION	REMARKS
	One-Time Commands		
105 110	Break CCGE Seal	Irreversibly breaks CCGE Seal and simultaneously initiates the reset SIDE Frame Counter at frame 10 mode.	Also generated by the Delayed Command Sequencer at hour 96.
107, 110	Blow SIDE Dust Cover	Irreversibly blows SIDE Dust Cover and simultaneously activates the SIDE master reset.	Also generated by the Delayed Command Sequencer at hour 96.
	Operating Commands		
1. 104, 110	Ground Plane Step Programmer On/Off	Two-state command turns programmer On or Off to start or stop stepping sequence.	Steps through 24 voltage levels; one step per SIDE cycle. See Figure 3.8-2. Preset condition: On.
2. 105, 110	Reset SIDE Frame Counter at 10	Mode command that steps SIDE Frame Counter to frame 10, then resets to zero.	Activated by same code that breaks CCIG Seal.
3. 104,105 110	Reset SIDE Frame Counter at 39	Mode command that steps SIDE Frame Counter to frame 39, then resets to zero.	
4. 106, 110	Reset Velocity Filter at 9	Mode command that causes the Velocity Filter to execute only 10 of the normal 20-step programs.	
5. 104, 106, 110	Reset SIDE Frame Counter at 79	Mode command that steps SIDE Frame Counter to frame 79, then resets to zero.	

TABLE 5.2-6 SIDE/CCGE COMMAND DESCRIPTIONS

OCTAL COMMAND NUMBER	COMMAND TITLE	COMMAND DESCRIPTION	REMARKS
6. 105, 106, 110	Reset SIDE Frame Counter at 79, Velocity Filter Counter at 9	Mode command that simultaneously performs operations normally performed separately by commands 106, 110 and 104, 106, 110.	
7. 104, 105, 106, 110	X10 Accumulation Interval On/Off	A two-state command which selects one of the two accumulation time periods. The On command selects X10 (12 seconds) and the Off command selects X1 (1.2 seconds).	The time period is the interval for the accumulation of the high and low energy curved plate analyzer output pulses at each analyzer.
8. 107, 110	Master Reset	Mode command to return SIDE to the normal operational mode.	Activated by same commands that blow Dust Cover (i.e., 107,110).
9. 104, 107, 110	Velocity Filter Voltage On/Off	Two-state command to enable or disable Velocity Filter step voltages. On enables; Off disables. Preset condition: On.	Upon retransmitting the command, the Velocity Filter assumes the voltage level of the SIDE frame in progress.
10. 105, 107, 110	Low Energy CPA High Voltage On/Off	Two-state command to enable or disable Low Energy Curved Plate Analyzer (LECPA) step voltages. On enables; Off disables. Preset condition: On.	Upon retransmitting the command, the LECPA assumes the voltage level of the SIDE frame in progress.

TABLE 5.2-6 SIDE/CCGE COMMAND DESCRIPTIONS

OCTAL COMMAND NUMBER	COMMAND TITLE	COMMAND DESCRIPTION	REMARKS
11. 104, 105, 107, 110	High Energy CPA High Voltage On/Off	Two-state command to enable or disable High Energy Curved Plate Analyzer (HECPA) step voltages. On enables; Off disables. Preset condition: On.	Upon retransmitting the command, the HECPA assumes the voltage level of the SIDE frame in progress.
12. 106, 107, 110	Force Continuous Calibration (Reset to 120)	Mode command causes a reset to SIDE frame 120, then steps through to frame 127 before repeating.	No scientific data can be transmitted during calibration.
13. 104, 106, 107, 110	Cold Cathode Gauge High Voltage On/Off	Two-state command to enable or disable high voltage to the CCGE sensor, turning On or Off all CCGE scientific data.	Preset to On.
14. 105, 106, 107, 110	Channeltron High Voltage On/Off	Two-state command to enable or disable high voltage to SIDE ion detectors, thereby turning On or Off all SIDE scientific data.	Preset to On.
15. 104, 105, 106, 107, 110	Reset Command Register	This command clears command register of any SIDE command awaiting execution.	Cannot be used anytime prior to CCGE seal break or SIDE Dust Cover commands without activation of these functions.